OUTCOMES 1

PERSONAL DEVELOPMENT, HEALTH AND PHYSICAL EDUCATION

PRELIMINARY COURSE FOURTH EDITION

Ron **RUSKIN** Kim **HARPER**



jacaranda
A Wiley Brand

Fourth edition published 2014 by
John Wiley & Sons Australia, Ltd
42 McDougall Street, Milton, Qld 4064

First edition published 2000 © L. Fitzgibbon, R. Ruskin
Second edition published 2008 © R. Ruskin, L. Fitzgibbon, K. Harper
Third edition published 2010 © R. Ruskin, K. Harper, L. Fitzgibbon

Typeset in 10/13 pt Palatino LT

© John Wiley & Sons Australia, Ltd 2014

The moral rights of the authors have been asserted.

National Library of Australia
Cataloguing-in-publication data

Author:	Ruskin, Ron, 1947–
Title:	Outcomes 1 Preliminary course / Ron Ruskin, Kim Harper, Lyndall Fitzgibbon.
Edition:	4th ed.
ISBN:	978 0 73030 871 3 (pbk.) 978 0 73030 875 1 (web.)
Notes:	Includes index.
Target Audience:	For secondary school age.
Subjects:	Health — Juvenile literature. Physical fitness — Juvenile literature. Maturation (Psychology) — Juvenile literature.
Other Authors/ Contributors:	Harper, Kim. Fitzgibbon, Lyndall.
Dewey Number:	613

Reproduction and communication for educational purposes
The Australian Copyright Act 1968 (the Act) allows a maximum of one chapter or 10% of the pages of this work, whichever is the greater, to be reproduced and/or communicated by any educational institution for its educational purposes provided that the educational institution (or the body that administers it) has given a remuneration notice to Copyright Agency Limited (CAL).

Reproduction and communication for other purposes
Except as permitted under the Act (for example, a fair dealing for the purposes of study, research, criticism or review), no part of this book may be reproduced, stored in a retrieval system, communicated or transmitted in any form or by any means without prior written permission. All inquiries should be made to the publisher.

Front and back cover images: © NotarYES/Shutterstock.com

Internal design images: © Digital Vision, © Photodisc

Cartography by MAPgraphics Pty Ltd Brisbane and the Wiley Art Studio

Illustrated by various artists and the Wiley Art Studio

Typeset in India by diacriTech

Printed in China by
1010 Printing International Ltd

10 9 8 7 6 5 4 3 2

All activities have been written with the safety of both teacher and student in mind. Some, however, involve physical activity or the use of equipment or tools. All due care should be taken when performing such activities. Neither the publisher nor the authors can accept responsibility for any injury that may be sustained when completing activities described in this textbook.

This textbook may contain images of Indigenous people who are, or may be, deceased. The publisher appreciates that this inclusion may distress some Indigenous communities. These images have been included so that the young multicultural audience for this book can better appreciate specific aspects of Indigenous history and experience.

It is recommended that teachers should first preview resources on Indigenous topics in relation to their suitability for the class level or situation. It is also suggested that Indigenous parents or community members be invited to help assess the resources to be shown to Indigenous children. At all times the guidelines laid down by the relevant educational authorities should be followed.

Contents

Preface vii
About eBookPLUS viii
Acknowledgements ix

PRELIMINARY CORE 1
BETTER HEALTH FOR INDIVIDUALS 1

1 What does health mean to individuals? 3

Meanings of health 4
Definitions of health 4
Dimensions of health 5
Relative and dynamic nature of health 9
Perceptions of health 12
Perceptions of our health 12
Perceptions of the health of others 13
Implications of different perceptions of health 15
Perceptions of health as social constructs 17
Impact of the media, peers and family 20
Health behaviours of young people 26
The positive health status of young people 26
Protective behaviours and risk behaviours 31

2 What influences the health of individuals? 55

The determinants of health 56
Individual factors 57
Sociocultural factors 61
Socioeconomic factors 69
Environmental factors 75
The degree of control individuals can exert over their health 84
Modifiable and non-modifiable health determinants 85
Changing influence of determinants through different life stages 89
Health as a social construct 93
The interrelationship of determinants 93
Challenging the notion that health is solely an individual's responsibility 94

3 What strategies help to promote the health of individuals? 99

What is health promotion? 100
Responsibility for health promotion 102
Individuals 103
Community groups and schools 105
Non-government organisations 108
Government 109
International organisations 113
Health promotion approaches and strategies 115
Lifestyle and behavioural approaches 115
Preventative medical approaches 117
Public health approaches 118
The Ottawa Charter as an effective health promotion framework 123
Developing personal skills 124
Creating supportive environments 125
Strengthening community actions 125
Reorienting health services 126
Building healthy public policy 126
Principles of social justice 129
Equity 129
Diversity 131
Supportive environments 131

PRELIMINARY CORE 2
THE BODY IN MOTION 135

4 Body systems and movement 137

Skeletal system 138
- Major bones involved in movement 140
- Structure and function of synovial joints 142
- Joint actions 144

Muscular system 147
- Major muscles involved in movement 149
- Muscle relationship 152
- Types of muscle contraction 153

Respiratory system 155
- Structure and function 155
- Lung function 157
- The exchange of gases 158
- Effect of physical activity on respiration 159

Circulatory system 160
- Components of blood 160
- Structure and function of the heart, arteries, veins and capillaries 162
- Pulmonary and systemic circulation 166
- Blood pressure 167

5 Physical fitness, training and movement efficiency 175

Health-related components of physical fitness 176
- Cardiorespiratory endurance 177
- Muscular strength 181
- Muscular endurance 183
- Flexibility 185
- Body composition 187

Skill-related components of physical fitness 190
- Power 190
- Speed 192
- Agility 193
- Coordination 195
- Balance 197
- Reaction time 198

Aerobic and anaerobic training 204
- Aerobic training 204
- FITT principle 205
- Anaerobic training 208

Immediate physiological responses to training 211
- Heart rate 212
- Ventilation rate 213
- Stroke volume 214
- Cardiac output 215
- Lactate levels 217

6 The biomechanics of human movement 223

Introduction to biomechanics 224

Motion 224
- Linear motion 224
- Velocity 226
- Speed 226
- Acceleration 228
- Momentum 229

Balance and stability 231
- Centre of gravity 231
- Line of gravity 234
- Base of support 235

Fluid mechanics 237
- Flotation 237
- Centre of buoyancy 239
- Fluid resistance 240

Force 248
- How the body applies force 248
- How the body absorbs force 250
- Application of force on an object 252

OPTIONS 259

7 First aid 261

Setting priorities for managing a first aid situation and assessing the casualty 262
- Situational analysis 262
- Priority assessment procedures 263
- DRSABCD 264
- STOP regime 270

Crisis management 272
- CPR 272
- Bleeding 272
- Shock 272
- Neck and spinal injury 273
- Moving the casualty 273

Medical referral 274
Care of the unconscious casualty 274
Management of injuries 275
Applying bandages, slings and splints 277
Management of medical conditions 279
Physical environment 282
Traffic accidents 282
Water environment 283
Electricity 283
Infection control and protection 284
HIV/AIDS 284
Blood-borne viruses (hepatitis B and C) 285
Legal and moral dilemmas 285
Legal implications 285
Moral obligations 287
Commonsense versus heroics 288
Support following first aid situations 288
Debriefing 288
Counselling 289

8 Composition and performance

eBookplus ONLINE ONLY

9 Fitness choices 291

Meanings of exercise 292
Exercise as a form of physical activity 293
Exercise and its relationship to fitness 296
The value that people place on exercise and fitness 298
Changing attitudes to fitness 298
Fitness as a commodity 300
Individual fitness activities 303
Power walking 304
Running 304
Swimming 305
Cycling 305
Weight training programs 307
Tai chi 308
Pilates 309
Yoga 309
Emerging individual fitness activities 309
Group fitness activities 311
Aerobics 311
Aquarobics 311
Pump classes 312
Step classes 313
Spin classes 313
Circuit training 313
Team games 314
Exercise for specific groups 315
Emerging group fitness activities 318
Settings for exercise 318
Exercise at home 319
Community facilities 319
Fitness centres and personal trainers 319
Exercise clubs 323
Cultural groups 324
Advertising and promotion 324
How do you know who to believe? 325
Promotional techniques 325
Accuracy of information 325
Ethics of advertising 326
Motivators and barriers to participation 327
Access to facilities 327
Convenience of use 327
Cost 328
Feelings about fitness and exercise 328
Exercise as a priority 328
Influence of other responsibilities 328

10 Outdoor recreation 331

Reasons for participation in outdoor recreation 332
Stress management and relaxation 332
Enjoyment, challenge and excitement 333
Social interaction 335
Appreciation of the environment 335
Health and fitness 336
Planning skills 336
Environmental planning 337
Emergency management planning 337
Food and water considerations 341
Resources for safe participation 344
Legal and administrative requirements 344
Camp site selection 349
Geographic, environmental and climatic considerations for establishing a camp site 349
Tree fall evaluation 351
Conservation skills 352
'Leave no trace' camping 354

Minimal impact practices 354
Ethical issues 355
Navigational skills 357
Check list for navigation 357
Map reading 357
Grid bearings 360
Magnetic bearing 361
Measuring distance 364
Natural navigation 364
Emergency management skills 365
Wilderness first aid 365
What to do when you are lost 367
Bushfire procedures 367
Lightning 368
Flooded rivers 368
Skills needed for other outdoor activities relevant to the experience 369
Leadership styles 371
Understanding group dynamics 372
Conflict resolution 373
Team building 373
Cooperation 373
Facilitation skills 374
Communication skills 374
Decision making 374
Flexibility 374
Understanding strengths and weaknesses 376
Participant readiness 376
Self-efficacy 376
Balancing challenge and safety 376
Pushing the comfort zone 377

APPENDIX 1 381
Ottawa Charter for Health Promotion 381

APPENDIX 2 384
Syllabus key words 384

Glossary 387
Index 393

Preface

This fourth edition of *Outcomes 1: Preliminary Course* covers the Preliminary Course as outlined in the 2009 Stage 6 PDHPE Syllabus. In this edition, the content has been revised with a particular focus on updating data and statistics, especially throughout Core 1. Important updates in the First Aid option have also been incorporated. Snapshots and case studies have been updated and new inquiry questions have been written.

The text continues to focus on the most recent trends and practices in health and physical performance and provides the most relevant information to help you complete the course successfully and enjoy your studies along the way.

Additional online resources accompany this edition to take the *Outcomes* package to a new level. Online student resources, such as video eLessons, weblinks, chapter quizzes and revision tests, are available in your eBookPLUS (see page viii). For teachers, the eGuidePLUS provides a range of support material.

The structure of the textbook mirrors the structure and content 'dot points' of the 2009 Stage 6 PDHPE Syllabus. The first part of this book covers the two Preliminary core strands, which represent 60 per cent of course time, followed by chapters covering three of the four option topics, of which you will study two for the remaining 40 per cent of the course. Preliminary Option 2: Composition and Performance can be accessed only via the eBook in this edition.

This full-colour text places a strong emphasis on critical inquiry exercises and practical applications as fundamental learning tools to engage you with the content and reinforce understanding. The inquiry exercises challenge your thinking and inspire deeper research, while the applications invite you to put theory into practice with individual and group tasks.

Key terms are defined in context to enhance understanding, as well as in a comprehensive glossary at the end of the book.

You will be prompted to use ICT for presenting your work and sharing your research findings. Weblinks are provided to encourage you to explore contemporary issues in greater depth or to access the latest available data.

Revision and extension questions at the end of each chapter link to the most relevant syllabus outcomes and aim to consolidate your understanding of the topics. Key words used in the syllabus and in assessment have been highlighted in bold type. Mark allocations indicative of those allocated in HSC examinations have been added as a guide. Appendixes include the Ottawa Charter for Health Promotion and definitions of the syllabus key words.

A range of contemporary snapshots and case studies feature throughout the chapters — a popular feature of the *Outcomes* series as these enhance the content and help you to appreciate the relevance and importance of health and physical activity issues for Australians in today's world.

About eBookPLUS

jacarandaplus

This book features eBookPLUS: an electronic version of the entire textbook and supporting digital resources. It is available for you online at the JacarandaPLUS website (**www.jacplus.com.au**).



Using JacarandaPLUS

To access your eBookPLUS resources, simply log on to **www.jacplus.com.au** using your existing JacarandaPLUS login and enter the registration code. If you are new to JacarandaPLUS, follow the three easy steps below.

Step 1. Create a user account
The first time you use the JacarandaPLUS system, you will need to create a user account. Go to the JacarandaPLUS home page (**www.jacplus.com.au**), click on the button to create a new account and follow the instructions on screen. You can then use your nominated email address and password to log in to the JacarandaPLUS system.

Step 2. Enter your registration code
Once you have logged in, enter your unique registration code for this book, which is printed on the inside front cover of your textbook. The title of your textbook will appear in your bookshelf. Click on the link to open your eBookPLUS.

Step 3. Access your eBookPLUS resources
Your eBookPLUS and supporting resources are provided in a chapter-by-chapter format. Simply select the desired chapter from the table of contents. Digital resources are accessed within each chapter via the resources tab.

Once you have created your account, you can use the same email address and password in the future to register any JacarandaPLUS titles you own.

Using eBookPLUS references

eBookPLUS logos are used throughout the printed books to inform you that a digital resource is available to complement the content you are studying.

eBookplus

Searchlight IDs (e.g. **INT-0001**) give you instant access to digital resources. Once you are logged in, simply enter the Searchlight ID for that resource and it will open immediately.

Searchlight

Minimum requirements

JacarandaPLUS requires you to use a supported internet browser and version, otherwise you will not be able to access your resources or view all features and upgrades. The complete list of JacPLUS minimum system requirements can be found at **http://jacplus.desk.com**.

Troubleshooting

- Go to **www.jacplus.com.au** and click on the Help link.
- Visit the JacarandaPLUS Support Centre at **http://jacplus.desk.com** to access a range of step-by-step user guides, ask questions or search for information.
- Contact John Wiley & Sons Australia, Ltd.
  Email: support@jacplus.com.au
  Phone: 1800 JAC PLUS (1800 522 7587)

Acknowledgements

The authors and publisher would like to thank the following copyright holders, organisations and individuals for their permission to reproduce copyright material in this book.

Images

Australian Bureau of Statistics: **68**; **327**/© ABS data used with permission from the Australian Bureau of Statistics, Constraints on participants in sport and physical recreation, 2005–06 'Participation in Sports and Physical Recreation', cat. no. 41770, 2005–06, p. 11 • Australian Federation of AIDS: **128** (middle)/ Australian Federation of AIDS Organisations (AFAO) , AFAO HIV & STI Prevention and Health Promotion Program © Arone Meeks • Australian Institute of Health and Welfare: **26**/ Fig. 2.29 from *Young Australians: their health and wellbeing 2007*, p. 64 • Australian National Preventive Health Agency: **86** (top) • BoysTown: **82**/ Reproduced with permission Kids Helpline • Carol Grabham: **342** (top left); **342** (top right) • Corbis Australia: **335**/Robert Garvey • Creative Commons: **29** (figs 1.16 and 1.17), **39**; **41**/*Australian secondary school students use of tobacco, alcohol, over-the-counter and illicit substances in 2011* report, December 2012 © Australian Government; **94** • Department of Health and Ageing: **116**/Health warning image © Professor Laurence J Walsh, The University of Queensland • Digital Stock: **199** • Digital Vision: **6** (top centre) • Getty Images: **73**/© CSA Plastock; **90**/Digital Vision; **189** (bottom)/SPL/Jay Coneyl; **224**/AFP/Olivier Morin; **228**/Stuart Hannagan; **249**/Ian Hitchcock; **297** (bottom)/Daniel Berehulak • Glaxosmithkline: **156** (top) • Headspace: **60** (top), **108** • Heart Foundation: **32**/Sourced from Healthy Kids at www.healthykids.nsw.gov.au • Human Kinetics: **212**, **214** (bottom), **216**/Reprinted with permission from J. H. Wilmore and D. L. Costill, 2004, *Physiology of Sport and Exercise*, 3rd ed., (Champaign, IL: Human Kinetics) p. 230, figs 7.15a, b and c • Image Disk Photography: **128** (top) • Image 100: **60** (bottom) • iStockphoto.com: **15**/artbyjulie; **64** (top)/David_Ahn; **128** (second from bottom)/GlobalStock; **247** (bottom right)/dwphotos; **356**/noticelj; **370** (bottom)/searagen; **370** (top left)/carlofranco • John Wiley & Sons Australia: **57**, **264**/Photo by Renee Bryon; **78** (top)/Photo by Kari-Ann Tapp; **168** (bottom right), **338**/Photo by Carol Grabham; **170**, **182** (2 images), **189** (top and middle), **191** (3 images)/Photo by Jo Patterson; **343** (top, middle and second from bottom)/Photo by Catherine Spedding; **351** (top)/Photo by Paul Grabham • Kobal Collection, The: **61** (top)/© Universal/Reed, Eli • Lippincott Williams and Wilkins: **217**/W. McArdle, F. Katch and V. Katch, *Exercise Physiology*, Lippincott, Williams and Wilkins, 2006, p. 357. Reproduced by permission • McGraw-Hill USA: **159**, **214** (top)/ from *The Physiological Basis of Physical Education and Athletics*, 3rd Edition, by E. L. Fox and D. K. Matthews, 1981, p. 168 © The McGraw-Hill Companies, Inc.; **294** (fig 9.3), **295**/from *Concepts of Fitness & Wellness: A Comprehensive Lifestyle Approach*, 5E by Corbin, Welk, Lindsey & Corbin, 2004 © The McGraw-Hill Companies, Inc. • Newspix: **48**/Alan Pryke; **105**/Justin Lloyd; **107**/Renee Nowtarger; **129**/Vanessa Hunter; **131**/John Fotiadis; **177**/Troy Bendeich; **193**/Colleen Petch; **297** (top left)/AFP/ Antonio Scorza • NSW Department of Health: **4**; **33**, **35** (fig 1.21), **36** (figs 1.22 and 1.23)/Reproduced with the permission of the NSW Department of Health from *NSW schools physical activity and nutrition survey* (SPANS) 2004, Summary Report and Short Report; **34**/Reproduced by permission, NSW Ministry of Health © 2014; **37**/Graph — Percentage of students who ate dinner in front of TV at least once a week, by school year, *NSW schools physical activity and nutrition survey* (SPANS) 2010 Full report, Sydney, NSW Ministry of Health, Nov 2011; **299** (fig 9.7)/*Trends in physical activity in NSW, 1998–2005*, NSW Centre for Physical Activity and Health, University of Sydney, Jan. 2007, p. 5 • Photodisc: **6** (top left, top right, bottom left, bottom right), **45**, **88**, **95** (3 images), **112**, **190**, **223**, **232**, **237** (3 images), **315**, **343** (second from top) • Picture Media: **254**/Reuters/Kim Kyung-Hoon • Ron Tandberg: **355** • Shutterstock.com: **1**/michaeljung; **3**, **99**/oliveromg; **8** (bottom left)/photomatz; **12**/© Yuri Arcurs; **14** (bottom left)/© Kuzma; **14** (bottom right)/Daniel Korzeniewski; **14** (top centre)/ © michaeljung; **14** (top left)/fritz16; **20**/Chinaview; **24**/Maxim Blinkov; **25**/Andrey Armyagov; **40**, **299** (bottom)/Kzenon; **49**, **71**, **187**/Monkey Business Images; **50**/Tyler Olson; **55**/Dmitry Kalinovsky; **59**/Jacek Chabraszewski; **61** (bottom)/Olesia Bilkei; **64** (bottom left)/s_bukley; **64** (bottom right)/Jaguar PS; **72**/© Keith Spencer; **75**/Alexander Tihonov; **77**/Milosz_M; **78** (bottom)/Visun Khankasem; **83**/© place-to-be; **91**/Andy Dean Photography; **101**, **291**/Syda Productions; **104**/kurhan; **125**/Mat Hayward; **126**/© Lisa F. Young; **128**/ (bottom)/Ivelin Radkov; **128** (second from top)/Pablo Hidalgo; **137**/Pressmaster; **153** (bottom left)/Greg Epperson; **175**/Nicholas Piccillo; **181**, **183**/William Perugini; **185**/S. M. Beagle; **197**/Ipatov; **198**/Kaliva; **205**/© Aaron Belford; **209**/© holbox; **209**/Pete Niesen; **240**/© Chen Wei Seng; **263**/Warren Goldswain; **270**/Dario Lo Presti; **282**/© James E. Knopf; **292** (bottom left)/jordache; **292** (top left), **306**, **313**/wavebreakmedia; **302**/© dafne; **307** (bottom right)/Minerva Studio; **310**/arek_malang; **311**/AMA; **316**/Vladislav Gajic; **317**/ StockLite; **323**/Visionsi; **326** (left)/CandyBox Images; **326** (right)/ pio3; **331**/Diego Cervo; **343** (bottom)/Janet Faye Hastings; **351** (bottom)/Dmitry Naumov; **370** (top right)/Einherjar • St John Ambulance: **269** • Stockdisc: **342** (bottom) • Transport for NSW: **86** (bottom)/Plan B • World Health Organization: **113**/P. Virot.

Reproduced by permission of the World Health Organization • 123RF.com: **8** (bottom right)/Elena Ray; **8** (top left)/Wavebreak Media Ltd; **8** (top right)/Dmitriy Shironosov; **14** (top right)/kzenon; **63**/yanlev; **135**/Linda Bucklin; **195**/Richard Thomas; **227**/D D; 261/Amawasri Naksakul; **292** (bottom right)/Warren Goldswain; **292** (top right)/Wavebreak Media Ltd; **304**/Elena Elisseeva; **305**/Viktor Cap; **321**/Andrew Bassett; **334**/ammit; **340**/joseelias

Text

Australian Institute of Health and Welfare: **27**/Table 2.1 from *Young Australians: their health and wellbeing 2007*, p. 12; **70**/ from *Australia's health 2004*, p. 207 • Australian Red Cross: **130**/Reproduced with permission of Dietitians Association of Australia • Australian Sports Commission: **271**/© The STOP Regime, Matthew Reid, Sportsafe, Australian Sports Medicine Federation and Australian Sports Commission, Canberra, 1990 • Australian Venom Research Unit: **278** • Australian Broadcasting Corporation: **79**/'Rural patients more likely to die from cancer than those in cities', Sophie Scott, ABC , http://www.abc.net.au/news/2013-11-04/study-shows-country-cancer-survival-rates-still-lower/5067186 • Australian Research Centre in Sex, Health and Society (ARCSHS), LaTrobe University: **46**, **47–8**/ from *Secondary Students and Sexual Health 2002*, by Anthony Smith, Paul Agius, Sue Dyson, Anne Mitchell and Marian Pitts, September 2003 • Ben Maddison, Dr: **356**/Dr Ben Maddison is a Senior Lecturer in History at University of Wollongong. His most recent book is *Class and Colonialism in Antarctic Exploration 1750–1920* (Pickering & Chatto, 2014) • Blitz Publications: **306**/'Get on your bikes and go indoors', Chris Rabba, *Women's Fitness Australia*, Vol. 5, No. 3, pp. 60, 62. For more information and articles on related topics, visit www.sportzblitz.net • Confederation of Bushwalking: **352–4**/Extracts from 'The Bushwalkers Code', Confederation of Bushwalking Clubs, NSW, Inc. pp. 12–19. www.bushwalking.org.au • Copyright Agency Limited: **22–3**/Open letter by Stella Lycos to advertisers, media decision makers and teenagers, Stella Lycos, *The Age*, 21/07/2013; **42**/'A generation lost to the demon drink', *The Daily Telegraph* website, Richard Noone and Chelsea White, 12/02/2011; **43**/'Teen drinking falls but concern over risk takers', Amy Corderoy, *The Sydney Morning Herald*, 28/08/2013; **52–3**/'Young men in crisis', *The Australian*, Clifford Fram, 22/07/2013; **58**/'School lessons for optimism with new mental health classes', Bruce McDougall, *Daily Telegraph*, 07/03/2012; **62**/ 'Fitness is a family affair', by Ilsa Cunningham, *Illawarra Mercury*, 18/02/2009; **65**/'Under the sway of social media', Cosima Marriner, *The Sydney Morning Herald*, 21/07/2013; **69**/'More than a million people drink just to feel normal', Anthony Gough, *The Sydney Morning Herald*; **72–4**/'What does it cost to be healthy?', Rosalyn Page, *Sun Herald*, Section: Sunday Life, 27/01/08; **81–2**/'Telehealth trial declared a success', Brad Howarth, 24/07/2012; **320**/'Exercise guru labels outdoor fitness groups "embarrassing"', Nicole Hasham, *The Sydney Morning Herald*, 13/03/2013; **348**/'Drinking too much water probably killed bushwalker, coroner declares', *The Age* , 18/08/12 • Creative Commons: **67**/from *About time! Women in sport and recreation in Australia* reproduced with permission from the Senate Environment, Communications and the Arts Committee © Commonwealth of Australia, 2006, pp. 28–9, 51–2 • Dr Boonseng Leelarthaepin: **186**, **190** • Heart Foundation: **120**/Sourced from Healthy Kids at www.healthykids.nsw.gov.au • Human Kinetics: **215**/Reprinted with permission from J. H. Wilmore and D. L. Costill, 2004, *Physiology of Sport and Exercise* 3rd ed. (Champaign, IL: Human Kinetics), p. 277, table 9.1 • Inspire Foundation: **11**/Reachout.com provides young people with the skills, tools and connections they need to make positive choices about their mental health and wellbeing • Jimmy Possum: **121–2** • Mind Tools Ltd: **372** • Board of Studies, Teaching and Educational Standards NSW: **3**, **55**, **99**, **137**, **175**, **223**, **261**, **291**, **331**/Personal Development, Health and Physical Education Stage 6 Syllabus © Board of Studies, Teaching and Educational Standards NSW, 2009; **384–5**/A Glossary of Key Words © Board of Studies, Teaching and Educational Standards NSW, 2014. The most up-to-date version of this document can be found at www.boardofstudies.nsw.edu.au/syllabus_hsc/glossary_keywords.html • St John Ambulance Australia: **264** • Stefan Hajkowicz: **301** • Sutherland Shire Council: **312**/© Sutherland Council Leisure Unit • Ultra-FIT Magazine: **321–2** • World Health Organization: **114**; **123**/Adapted from Fran Baum 1998, *New Public Health: an Australian Perspective*, Oxford University Press, Melbourne, pp. 16–17. Original Source: © World Health Organization 1st International Conference on Health Promotion, Ottawa, 21/111986, WHO/HPR/HEP/95.1; **381**/'The Ottawa Charter for Health Promotion' from the 1st International Conference on Health Promotion, Ottawa, 21 November 1986.

Every effort has been made to trace the ownership of copyright material. Information that will enable the publisher to rectify any error or omission in subsequent editions will be welcome. In such cases, please contact the Permissions Section of John Wiley & Sons Australia, Ltd.

Acknowledgements

Chapter 8 Composition and performance

The authors and publisher would like to thank the following copyright holders, organisations and individuals for their permission to reproduce copyright material in this book.

Images

Digital Stock: **13** (bottom centre and top centre) • Digital Vision: **1**, **18** (top) • Getty Images: **30**/Mark Nolan • Human Kinetics: **11**/Reprinted with permission from S. C. Minton, 2007, *Choreography: a basic approach to using improvisation*, 3rd ed., (Champaign, IL: Human Kinetics), p. 37. • Image Addict: **26** (top) • Image 100: **13** (right) • Photodisc: **10**, **27** (bottom), **29** • PureStock: **27** (top) • Shutterstock.com: **5**/© Neale Cousland; **6** (top)/ID1974; **12**/muzsy; **15**/Jeff Chandler; **16** (bottom left)/testing; **18** (bottom)/manzrussali; **19** (bottom)/Diego Barbieri; **28** (left)/Jack.Q; **28** (right)/col • Viewfinder Australia Photo Library: **21** • 123RF.com: **38**/freerlaw

Text

• Board of Studies, Teaching and Educational Standards NSW: **1**/Personal Development, Health and Physical Education Stage 6 Syllabus © Board of Studies, Teaching and Educational Standards NSW, 2009 • Human Kinetics: **25**/Reprinted with permissions from S. C. Minton, 2007, *Choreography: a basic approach to using improvisation*, 3rd ed. (Champaign, IL: Human Kinetics), pp. 19, 22, 35

Every effort has been made to trace the ownership of copyright material. Information that will enable the publisher to rectify any error or omission in subsequent editions will be welcome. In such cases, please contact the Permissions Section of John Wiley & Sons Australia, Ltd.

PRELIMINARY CORE 1

Better health for individuals



eBook*plus*

eLESSONS

Video lessons with worksheets for Preliminary Core 1:

- **Perceptions of health**
  Searchlight ID: eles-0107
- **Issues in youth health**
  Searchlight ID: eles-0108
- **Health promotion approaches and strategies**
  Searchlight ID: eles-2141

These eLessons are available in the student resources tab of your eBookPLUS. Visit **www.jacplus.com.au** to locate your digital resources.

CHAPTER 1

What does health mean to individuals?



OUTCOMES

On completion of this chapter, you will be able to:

- identify and examine why individuals give different meanings to health (P1)
- explain how a range of health behaviours affect an individual's health (P2)
- describe how an individual's health is determined by a range of factors (P3)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

OVERVIEW

MEANINGS OF HEALTH
Definitions of health
Dimensions of health
Relative and dynamic nature of health

PERCEPTIONS OF HEALTH
Perceptions of our health
Perceptions of the health of others
Implications of different perceptions of health
Perceptions of health as social constructs
Impact of the media, peers and family

HEALTH BEHAVIOURS OF YOUNG PEOPLE
The positive health status of young people
Protective behaviours and risk behaviours

This chapter provides an understanding of foundation concepts in preparation for the chapters that follow and for the HSC course. It examines the meaning of health, explores the interactions between the various dimensions of health and considers how health is a dynamic and relative concept.

We investigate how people's perceptions of health differ and analyse the degree to which these perceptions are socially constructed. In addition, we investigate the health behaviours of young people, challenge the accuracy of common perceptions of young people's health behaviours and consider the impact these behaviours could have on their current and future health.



MEANINGS OF HEALTH

Health is a topic of considerable interest to individuals, medical professionals, community and welfare groups, and all levels of government. The level of interest expressed in issues related to health is not surprising: it is the subject of extensive research, receives significant coverage in the media, is a major focus of government policies, and is an area of concern for many people seeking to improve their lifestyle and maximise their current and future health.

Health is considered one of the most important determinants of our quality of life and many people feel that they have some control over it. It is a valuable resource, but it is often taken for granted and not clearly understood.



Figure 1.1: Health is a topic of considerable interest to many people and organisations.

Definitions of health

People attribute different meanings to the term health. In order to understand issues related to health, it is firstly important to understand what is meant by the term health as it applies to individuals and the community.



INQUIRY

What does health mean to me?

1. Using at least 15 words, complete the following unfinished sentences.
   (a) Good health to me means . . .
   (b) The signs of being healthy are . . .
   (c) To lead a healthy lifestyle you need to . . .

(d) The things I do that are good for my health …
(e) When I am healthy I feel …
(f) The unhealthy things I do include …

2. After completing this activity, write your own definition of what health means to you.
3. Discuss your answers as a class group. What do your answers tell you about your health beliefs and attitudes?

The concept of health is diverse and means different things to different people. This diversity can be recognised by considering the different meanings of health that have developed over time.

Early meanings of 'health'

In the past the term health was closely associated with how well a person's body functioned physically, and in particular with their capacity and ability to perform physical activity. Prior to World War II, health was viewed as the opposite of illness. If there was no evidence of disease or physical illness, we were considered healthy and any breakdown in the body system meant that it was not healthy. This view of health suggested that if you were ill, medicine, drugs and doctors were able to return you to a healthy state.

This early definition of health was recognised as being too narrow and one dimensional in its perception of what was involved in a person's health. Its failure to take into account an individual's mental, social or spiritual well-being meant that the definition had severe limitations. For example, a person may not be suffering from a physical illness, but may be experiencing depression or emotional stress. Without appropriate support and treatment this could develop into distress that significantly impacts on the person's everyday life and their overall level of health.

World Health Organization's definition of 'health'

In 1946, the World Health Organization (WHO) developed a definition of health that is still accepted today. Health was defined by the WHO as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. This definition gave greater recognition to a more holistic concept of health by recognising the whole person and focusing on more than the physical aspect of health and the absence of disease or illness.

However, the definition has limitations as it suggests that people cannot be considered truly healthy unless they have *complete* physical, mental or social well-being. Under this definition an individual who has a physical impairment, a mental health diagnosis or is socially isolated cannot be considered healthy. The fact that we all experience times when we are sick, sad or lonely means that according to this definition optimal health is virtually unachievable. A further weakness of this definition is that it fails to acknowledge that a person's state of health is always changing.

Dimensions of health

We now understand that a number of dimensions all play an important role in determining a person's state of health. These dimensions include a person's physical, mental, social and spiritual well-being. We also understand that a

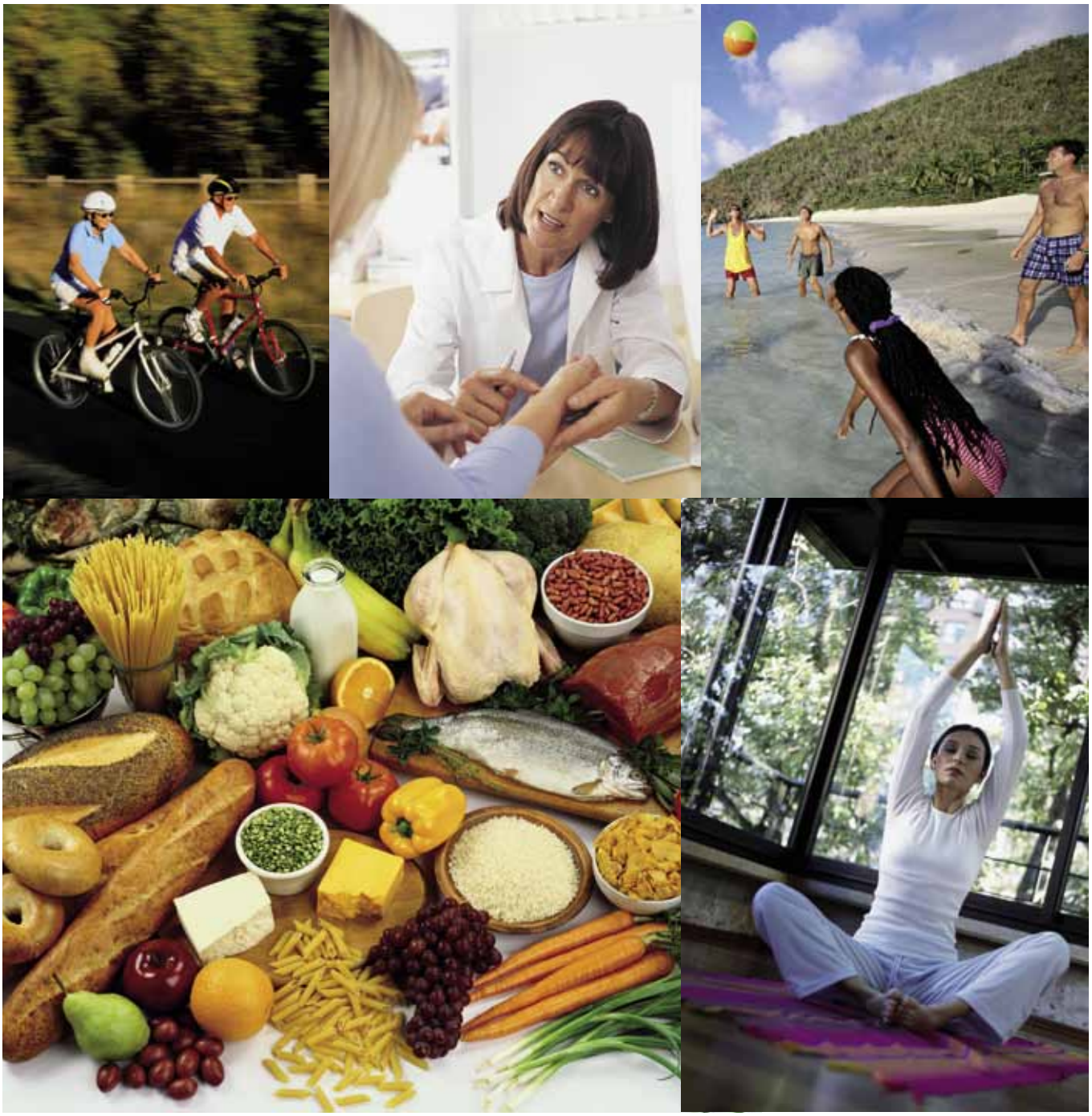


Figure 1.2: Good health is much more than a physical state — it encompasses many dimensions.

person's level of health is the result of an interaction between these different dimensions and that a balance between all four dimensions is essential to produce general well-being and satisfaction.

Physical health

Physical health is the wellness of the body and the absence of chronic pain or discomfort.

Physical health refers to the state of the physical body, which includes

- the efficient functioning of the body organs
- our level of fitness

- nutritional status
- degree of energy
- body weight
- resistance to disease.

While our heredity and genetic makeup determine our physical potential, physical health is largely determined by lifestyle and behaviour. People who are physically healthy are generally free of chronic pain or discomfort.

Social health

Social health is our ability to interact with other people in an interdependent and cooperative way.

Social health refers to our interactions with other people (family, friends and others), as well as the social and communication skills and abilities we display. Good social health means we feel a sense of connection and belonging to various people, and to the wider community in which we live. We are able to interact effectively with people in an interdependent, appropriate and cooperative way. We can form and maintain positive relationships that provide us with a network of support and appropriately manage situations where relationships may break down.

Mental health

Mental or **emotional health** is a state of well-being where we can realise our abilities, cope with the normal stresses of life, work productively and make a contribution to the community.

Mental or **emotional health** refers to our state of emotional well-being. People who have good mental health generally possess a positive outlook and a sense of purpose and control over their lives. This enables them to realise their own abilities, cope with the everyday stresses of life, work productively and contribute effectively to the community. Factors that contribute to our mental health and the resilience needed to cope when faced with sad or difficult times include:

- our self-concept (the way we see ourselves), self-confidence and self-esteem (the way we feel about ourselves)
- our sense of connection or belonging to different significant groups such as family, peers or school
- our ability to appropriately express emotions such as love, anger and frustration
- our ability to think creatively and be flexible when making decisions and resolving problems
- our capacity to function productively within society without exhibiting personally and socially disruptive behaviour.

Spiritual health

Spiritual health relates to a sense of purpose and meaning in our life, and to feeling connected with others and society.

Spiritual health relates to feeling a sense of purpose and meaning in our life. Good spiritual health helps us to feel connected with others such as family members, peers, our community, to a religion or the environment. Ideals, values, morals and aspirations are factors that influence our spiritual health. Our level of spiritual health can be influenced by an awareness and understanding of ourselves. It can also relate to our ability to do things such as set realistic goals, appreciate the needs and feelings of others, and have ambitions and aspirations.

Our individual level of health is the result of a complex interaction between these four aspects and is continually changing. A breakdown in one aspect of health is likely to impact on the other aspects, while improvements in one area can enhance our overall sense of health and well-being in all areas. For example, if you are hospitalised after a cycling accident, as well as suffering



Figure 1.3: Health is a result of interactions between all the dimensions of health.

physical injuries, you might feel angry about what happened, frustrated about being confined to bed and lonely because you are away from family and friends. Once you recover from these injuries and are discharged from hospital you will be able to resume school or work and socialise with others. This will help you overcome concerns about your injuries, and feel happier and less cut off from friends and family.

INQUIRY

Dimensions of health

Recall a time in your life when one dimension of your health was poor; for example, when you had a virus. Consider how other dimensions of your health were also affected during this time. Draw a mind map or a flow chart to illustrate your ideas.

Relative and dynamic nature of health

Health is the result of a continually changing process. From a personal perspective it may be represented as a continuum, with optimum health or a positive state of well-being at one end and very poor health or being extremely unwell at the other end. Judging where we are along the health continuum at any point in time is highly subjective as people see health in different ways, have different perceptions about what is optimal or 'normal' and define the extremes of the continuum differently. Furthermore, when assessing their level of health people consider their past and current circumstances, as well as comparing themselves to others. For example, if we compare our physical health to that of an Olympic athlete we may not believe ourselves to be totally healthy.

The **relative nature** of health refers to how we judge our health compared to other people or other points of time in our life.

The subjective judgements that people make about their level of health demonstrate the **relative nature** of health, with our health being relative to others and ourselves over time. For example:

- someone with breast cancer who has a breast removed in a mastectomy may consider her health poor compared to how it was previously or compared



Figure 1.4: We perceive our health relative to the health of others. Our health may not be as good as that of an elite athlete, but it is better than that of a patient in hospital.

to others without cancer. However, she may consider her health good during her recovery compared to how it was while she was undergoing treatment.

- a person who has bipolar disorder may consider themselves well when they are taking prescribed medication, undergoing treatment, and are able to fulfil work and personal responsibilities, compared to how they felt prior to diagnosis and treatment
- people with a disability or chronic disease may describe themselves as healthy, especially on days when their disabilities seem less severe than usual
- we might consider ourselves very healthy, but believe we are very ill when we have influenza, which is a passing virus.

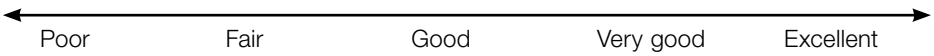


INQUIRY

Relative and dynamic nature of health

Read the case study 'Elsha's story' (page 11) and answer the following questions.

1. Explain how each of the following dimensions of Elsha's health were affected by different circumstances in her life and discuss the interactions that occurred between the various dimensions:
   - physical health
   - emotional health
   - social health
   - spiritual health.
2. Identify the events described by Elsha that have:
   (a) positively impacted on her health and well-being
   (b) negatively impacted on her health and well-being.
3. Draw a health continuum similar to the one shown below.



   Use this continuum to rate Elsha's health at the following times in her life. Place each letter (a) to (e) at the relevant place on the continuum.
   (a) living on a property in a small country town
   (b) parents separating and moving house, so Elsha had to change schools
   (c) being diagnosed with depression
   (d) finding a clinician who Elsha was comfortable with and who she felt listened and understood
   (e) completing her diploma in counselling.
4. Explain the reasons for the ratings you have given Elsha's health at each of those points in time. What does this tell you about how a person's health changes over time?
5. As a class, discuss how this case study demonstrates the dynamic nature of health.

The case study demonstrates that health is relative to our own circumstances and that of others, and that our level of health is never static. Our health varies over time, fluctuating from minute to minute, day to day and year to year. Illness, accidents, personal experiences or environmental factors can move our level of health any number of times during our lives from very well to well, off-colour to ill, very unwell to critically ill and then back to full health. These continual changes in our state of health mean that health is **dynamic**.

The **dynamic** nature of health refers to the constant fluctuations that occur in our level of health.

CASE STUDY

Elsha's story

My life up until secondary school had been fairly uneventful in regards to traumatic events. Living in a country town on a property meant that we were fairly sheltered from the world around us.

When I got to secondary school my life as it had been changed rather drastically. My nanna passed away after a long battle with cancer. Later that year my parents separated as my Dad had an affair. My Mum and sister and I moved, and my sister and I moved schools. All of those events occurred in a very short period of time leaving me feeling overwhelmed and unable to cope and with so many mixed feelings.

My Mum noticed how down and fatigued I was and took me to our GP. It was then that I was diagnosed with depression. I was so confused as to what to feel. I was relieved to know why I had been feeling the way I had, but I was also scared that people would label me as crazy or different.

I went to several clinicians, whom I felt didn't really listen or understand where I was coming from. I eventually found one that I was comfortable with and was empathic to my thoughts and feelings. He helped me confront the hurt and anger I was experiencing, and taught me to think in a more positive manner, using affirmations when I felt really down. I would tell myself that despite feeling down, I had felt this way before and I got through it. I[t] was a matter of taking one step forward and three back but just reminding myself that I would survive.

The worst thing about having depression was the constant sadness I felt, sometimes for no particular reason at all, which left me feeling helpless and out of control. I experienced a lot of anxiety which led to panic attacks which made me feel like I was having a heart attack. My life was always on edge, like something was always behind me and I was running away from it always knowing it was eventually going to catch up with me and something terrible was going to happen.

Unfortunately I was unable to stay at school, and thus felt even more isolated and alone.

A major venture I have recently become involved with is launching the Dr Link campaign with other dedicated people, to help increase community awareness of depression. That will hopefully let other young people suffering from depression know they are not alone and that there is great help out there.

The community at large don't seem to know the difference between feeling sad — which of course is normal — and clinical depression, which we know isn't. This is because sadness only lasts minutes, hours or days. Depression seems to go on forever — like a pervasive and relentless sense of despair.

Since I have recovered I have completed a diploma in counselling in the hope of helping other young people overcome the battle with depression.

Source: www.reachout.com.au. ReachOut.com provides young people with the skills, tools and connections they need to make positive choices about their mental health and well-being.



APPLICATION

Conduct a polarised debate

Conduct a debate to explore the relative nature of health and the different interpretations that people have of the concept of good health. Some questions for debate are:

1. It is possible for a person who requires regular medication to be considered healthy.
2. You can be healthy without being physically active.
3. Elderly people cannot achieve the same level of health as young people.

A polarised debate is set up by dividing the class into two sides, one supporting the affirmative and the other side the negative. The debate begins with a comment from the affirmative and proceeds with a comment in turn from each side. If a comment reaffirms their side's position, the student remains on that side. If a student speaks against their side's position, they 'cross the floor' and move to the other side. The debate is concluded when there is no movement from either side or there are no further comments.

Evaluate the arguments presented by members of your class at the conclusion of the debate.

PERCEPTIONS OF HEALTH

People's perceptions of health can be highly subjective. These differing perceptions have implications for the priority we give to taking action to maintain or improve our health and the type of action that is taken.

Perceptions of our health

Making judgements about your current state of health can be highly subjective. The way we judge our health may be different from the way a health professional or a professional athlete does. The meanings we give to health will most likely be based on what we have learned about health, along with our own experiences or on those of people we know. They will be reflected in our behaviour and may be different to the interpretation that others have.

Statistics such as the number of visits to a health professional, number and length of hospital admissions, or number of days absent from school or work due to illness can be used to provide some objective information about a person's physical health status. However, to determine a person's state of health more holistically — that is, their state of social, mental and spiritual well-being — some level of self-assessment is needed.

Perception refers to the way something is seen or viewed by an individual or group.

When making judgements about our level of health and well-being our **perceptions** are influenced by a range of factors, including:

- our personal interpretation of the term health
- our beliefs about our capacity to achieve good health
- our environment
- our health behaviours and lifestyle
- our past level of health
- the attitudes about health conveyed by family, peers and the media
- the value we place on the importance of striving for and maintaining a positive state of well-being.

These perceptions vary constantly throughout our lives. As we age, our definition of health changes to reflect our changing experiences, expectations and beliefs about what good health looks and feels like.



Figure 1.5: The way we perceive our health is influenced by a wide range of factors.

Table 1.1: Changes in the meaning of health during our life cycle

Period	Health
Childhood (birth to 11 years)	• generally take health for granted
Early adolescence (12–16 years)	• health seen as important to help establish and maintain a positive body image • health behaviours and values being formed
Late adolescence (17–24 years)	• majority enjoy good health and realise benefits of health-promoting behaviours, even if it is not a priority for them • more likely to have specific health concerns related to nutrition, drug use, injury, relationships, sexual health and mental health • develop intimate relationships • may engage in risk taking with a sense of impunity ('it won't happen to me' attitude)
Early adulthood (25–39 years)	• seen as a resource; realise the value of having all dimensions of health in balance in order to function effectively
Middle years of adulthood (40–59 years)	• preventative health behaviours and screening procedures become necessary as age increases
Senior years (from 60 years)	• good health seen as a precious resource • more likely to suffer from failing health due to ageing process



How do perceptions of health change with age?

1. Divide the class into six groups. Each group is allocated a period within the life cycle (see table 1.1 for the six periods).
2. Using five questions devised by your group, interview 10 people whose age falls in the life cycle period allocated to your group; for example, 10 people aged between 17 and 24 years. The five questions you ask people should reveal the views these people have about health; for example:
   - What does the term health mean to them?
   - Why is health important to them?
   - What type of behaviours do they consider healthy?
3. As a group, summarise and report on your findings to the class. Compare your findings with the information in table 1.1.



How healthy do others think I am?

1. Using a five-point scale (excellent, very good, good, fair, poor) rate your current level of health.
2. Write an explanation that clearly shows the reasons for your rating.
3. Choose four other people (including at least two adults) and ask them to rate your health using the same five-point scale, then ask them to explain the reasons for their rating. Record their comments.
4. Compare and contrast the perception you have of your own health and the perceptions of your health by others. Propose possible reasons for any differences that are found.
5. Discuss your findings with the class, highlighting similarities and differences.

Perceptions of the health of others

Just as our perception of our own level of health is influenced by a range of factors, so too are our judgements about the health status of others.

Our different ways of seeing and interpreting the living conditions, fitness levels and health behaviours of various groups significantly shape our notions of how healthy people in different circumstances are likely to be. We may hold stereotypical beliefs about particular groups in the community and this may limit our ideas about their likely health status.

Figure 1.6: Different interpretations of people's health and fitness influence the perceptions we have of others' health.



APPLICATION

How healthy do we think other people are?

1. Divide the class into small teams and allocate each team a card with the name of one of the following groups:

Elderly people	Homeless people
People with a physical disability	Parents
Elite sports players	Aboriginal people

2. Each team then discusses where they believe their particular group of people is placed on the health continuum. Record ideas on butcher's paper about the reasons for the group's placement.
3. Use two sheets of A4 paper (one labelled excellent and the other labelled poor) to set up a health continuum on the floor of the classroom. Have a representative from each team place the card identifying their group on the continuum to show how healthy they perceived their group to be.

4. Allow all class members to view where various groups have been placed on the continuum. After several minutes invite students to pick up any card they believe should be placed elsewhere on the continuum and stand holding the card in the spot it was placed.
5. Facilitate a class discussion on where they feel the group could be placed and why they have different perceptions of the health status of the group.
6. As a class discuss the reasons that people's perceptions of health can be similar or different from others. Summarise the ideas generated by the discussion in a mind or bubble map.

Implications of different perceptions of health

People develop their own interpretation of what being healthy means and are likely to perceive their level of health and the health level of others differently. This has a number of implications for both the individual and society as a whole.

Implications at an individual level

On an individual level, people's perceptions of their health have a significant influence on their lifestyle choices and behaviours relating to health. For example, a person who regularly drinks large amounts of alcohol and recognises that this drinking behaviour is having a detrimental effect on their health is more likely to stop drinking, limit their alcohol intake or seek professional help than someone who does not believe their alcohol consumption is causing them harm. Similarly, a person who recognises that they are experiencing symptoms of depression is more likely to seek support or



Figure 1.7: Inaccurate perceptions of health can lead to behaviours that may harm our health.

undergo counselling than someone who is unfamiliar with the symptoms of depression, or disregards or dismisses these symptoms.

Being able to accurately assess our level of health assists us to be proactive about our health and take appropriate action to address health concerns. On the other hand an incorrect or distorted assessment of our health status, such as perceiving ourselves to be overweight when our weight fits within a healthy range, could lead to health behaviours that are likely to harm our overall health and well-being.



INQUIRY

An individual's health behaviour

Read the case study on 'An individual's health behaviour', then answer the following questions.

1. Predict how Kris would define the concept of good health.
2. Using examples, describe how you think Kris is likely to perceive her current level of health.
3. Explain the impact that Kris's perception of health has upon her behaviour, using examples.
4. Using a continuum, rate how healthy you perceive Kris to be, giving reasons for your rating.

CASE STUDY

An individual's health behaviour

Kris is a year 11 student who sees herself as being fairly healthy. She is rarely absent from school, keeps up with her school work and is doing well in most of her subjects. However, she is often tired from the study she does. She sleeps in late most days and so doesn't always have time to have breakfast. Instead she buys a Mars bar and a can of Red Bull from the local shops on the way to school to keep herself going. She attends a lunchtime study group twice a week. On these days she misses lunch, so she stops at the local takeaway shop on her way home and grabs some hot chips and a soft drink to keep herself going.

While Kris was previously physically active — she played in a touch football competition one night a week, trained and played for the school soccer team and walked to school — her level of activity has dropped since she started year 11. Having her driver's licence has allowed her to drive to school most days to save time and her increased study demands have made her feel that there is not enough time for playing sport. Kris is not overly concerned about her lack of physical activity as she is not overweight and her clothes size has not changed. People often comment on how good she looks when she goes to the beach.

At weekends, Kris likes to relax and spend time with her partner and friends. She has been going out with her partner for two years. They are sexually active, but don't usually use a condom as Kris is on the Pill. They feel they can trust each other.

Kris often goes to parties on the weekend with her partner and a close group of girlfriends. Most of the group drink fairly heavily at these parties. When Kris is driving she has one or two drinks early in the night. She has trouble in passing up a cigarette or two when her friends are smoking. Even though she does smoke at these parties, Kris does not see her smoking having any effects on her health and she does not intend to keep smoking.

A **stereotype** is a simplified and fixed image, opinion or concept to which people may feel expected to conform.

Differing perceptions of health also have the potential to reinforce **stereotypes**. For example, a belief that being skinny or well tanned is healthy may encourage negative health behaviours such as skipping meals, excessive dieting, or sun baking. The perception that women's health and well-being could be endangered by competing in traditionally male sports such as rugby league

and boxing serves to reinforce notions of women being weak and delicate. This perception also limits the range of physical activities available to female athletes and restricts opportunities to test their capabilities.

Differing perceptions of health may also contribute to varying expectations of people's capabilities and levels of responsibility for managing their health. A perception that the elderly are frail, weak and unable to participate in strenuous activity may discourage older people from continuing to be active. Alternatively it may result in others taking control of aspects of elderly people's lives and thereby limiting their participation in everyday tasks that involve a degree of physical exertion. Likewise the belief that young people should be strong, fit and active may mean that those who are overweight are seen as solely responsible for their condition and any necessary action required to improve their health. The differing expectations that come with people's different perceptions of health are therefore likely to impact on the degree of support that individuals provide to others.

Implications at the policy level

At a societal level the perceptions of the health status of Australians held by various levels of government, health professionals, non-government organisations and other interest groups are likely to drive government policy, expenditure and action, and impact on the agenda set by various organisations. Statistics of ill health are often gathered to measure the health of individuals, communities and nations. These statistics show rates of **mortality**, **morbidity**, **life expectancy** and years of life lost to premature mortality, as well as causes of hospitalisation. The analysis of trends of illness and disease evident in these figures, known as epidemiology, has significant implications for health promotion and health care within Australia. It is used to identify areas of health that are emerging concerns, determine risk factors that contribute to ill health and target prevention or intervention strategies towards particular population groups or health issues. This determination of health priorities impacts significantly on the allocation of expenditure and the provision of resources and support by all levels of government.

Mortality is the number of deaths in a given population from a particular cause and/or over a period of time.

Morbidity is the incidence or level of illness or sickness in a given population.

Life expectancy is the average number of years of life remaining to a person at a particular age, based on current death rates.

Conflicting perceptions often arise about the areas of health that should be given highest priority, leading to competing demands for the finite resources allocated by the various levels of government. This can result in insufficient funding for particular health issues, inadequate or inappropriate support being provided to meet specific needs, or poor resourcing or a perception by certain groups that this has occurred. People who feel that funding and resources have been incorrectly allocated may feel resentful and disempowered. They may feel that resources have not been distributed equally.

Insufficient allocation of resources and limited budgets can also limit the number and range of strategies that can be implemented to address various health issues. Decisions need to be made about how to most effectively allocate money, meaning that opportunities to undertake research, instigate proactive approaches or commit to long-term projects may be restricted.

Perceptions of health as social constructs

We should now recognise that different people have different perceptions about what is meant by the concept of good health. So what is it that shapes our perceptions? Our views regarding what constitutes good health and who possesses it are largely influenced by the social, economic and cultural

A **social construct** is a concept that recognises that people have different views based on their social circumstances and ways of seeing, interpreting, interrelating and interacting with their environment.

conditions of our family and the society in which we live. This is referred to as our **social construct**.

A number of factors are likely to play a role in our social construct of health, including:

- socioeconomic status
- geographic location
- cultural background
- gender
- age
- level of education
- community values and expectations.

All of these factors have an influence on:

- the expectations we form about our health potential
- the understanding we develop of what good health involves
- the ability we have to act on information and exert control over our own health
- the value we place on the importance of continually working to improve our health
- our choices about whether we use health products and services and how they are used
- how we respond to challenges to our health and well-being.

Socioeconomic status

Socioeconomic status is a measure of an individual's place in society, based on their income, education, employment and other economic factors such as house or car ownership.

Our **socioeconomic status** is linked to our level of income, education, employment and occupation. People from a lower socioeconomic background generally have poorer health outcomes than those who are well off. They live shorter lives, suffer more illnesses and have more risk factors for ill health present in their lives, such as smoking, drinking alcohol at harmful levels (males) and having high blood pressure (*Australia's health 2008*). They are also more likely to perceive their health as fair or poor and feel they have less control of their own destiny.

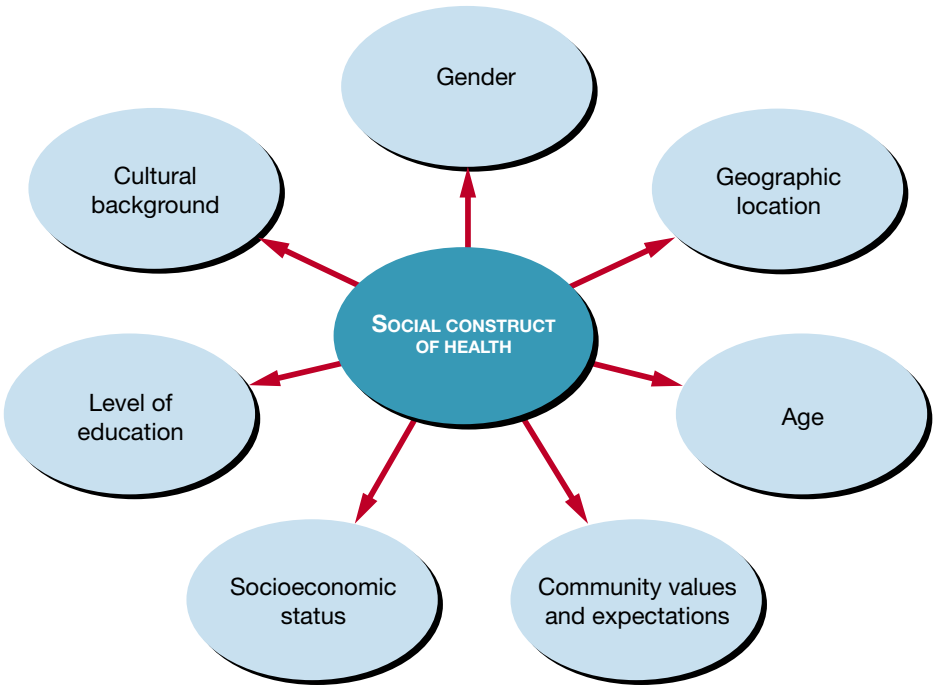


Figure 1.8: Numerous factors play a role in the social construct of health.

Social and economic disadvantage is closely linked with poorer levels of emotional health, which is characterised by:

- a loss of a sense of control, status or power
- higher levels of stress
- low self-esteem
- feelings of vulnerability, bitterness and resentment.

The differences in health status that are evident between people from different socioeconomic backgrounds are likely to lead to people from lower socioeconomic backgrounds having

different expectations about their health potential. They have less money to invest in positive health behaviours, such as taking out fitness centre memberships, are exposed to more dangerous working and living environments, and have limited choices when accessing health care. Therefore it is likely that those from lower socioeconomic backgrounds will develop different meanings of health and well-being to people belonging to a higher socioeconomic group.

Geographic location

Location is also likely to play a role in the formation of people's definition of what it means to be healthy. Geographical areas can be broadly divided into urban, rural and remote. People from each area have varying social constructs for health and well-being. This is due to the unique features of these locations and the different social circumstances of the people who live there. In comparison to urban dwellers, people in rural and remote areas have relatively poor access to health services and recreational facilities, meaning they consult medical practitioners less often and may have restricted opportunity to participate in organised physical activity and receive social support. They are also exposed to harsher environments and are less exposed to health promotion and self-care messages. These differences are likely to affect the perceptions of health formed by people living in remote locations, as well as how they assess their current state of health.



Figure 1.9: The social construct of health for people in rural and remote areas is influenced by their relatively poor access to health and medical services, and the harsh environments in which many people live and work.

Cultural background

Population groups with similar ethnic backgrounds or cultural heritage (for example, Aboriginal people) may have vastly different explanations or meanings for health and well-being to other racial groups (for example, people from a European background). From an Aboriginal and Torres Strait Islander's perspective, health is a holistic concept, encompassing the social, emotional, spiritual and cultural well-being of an individual, together with their families and communities (*National Aboriginal and Torres Strait Islander health survey* 2000). Their emphasis on spiritual dimensions means that in traditional Indigenous communities traditional healers or 'clever people' may be consulted to help treat the sick.

People from different cultural backgrounds may also share beliefs, ideas and habits about behaviours relating to health that are learned and passed on by members of their culture. For example, in some cultures participation in physical activity, especially sport, may not be seen as a healthy pursuit for girls. This belief can restrict or prevent participation in physical activity opportunities by women. Differences in beliefs, values and attitudes about health that are learned and conveyed from one generation to another can see perceptions of health take on different meanings within some cultural groups.

INQUIRY

Perceptions of health: effects of social setting and circumstances

Dan and Marco are both 16 years old and suffer from asthma. Their condition is under control if they follow their asthma management plan and avoid the triggers that have led to asthma attacks in the past, such as strenuous exercise and poor air quality.

- Dan lives in Palm Beach, Sydney, where his mother has a medical practice and his father teaches yoga. Dan attends the local high school and surfs or swims for an hour before doing homework and having dinner.
- Marco lives with his father and younger brother on a property in far west New South Wales. He rises at 5.00 am to help with farm work, does school work by correspondence, cooks dinner, then studies again before bed.

Describe:

(a) how each of the boys might perceive their own health
(b) the influences that might affect each boy's perceptions of their health.

The values and beliefs of the dominant culture act as a powerful influence on ideas constructed about health. Dominant cultures have greater social power and therefore more participation and influence in decision making among administrators, politicians and economists. Ultimately this affects the way health is seen in the broader community. The predominant view of health in Australia is derived from the majority middle-class, Anglo-Saxon urban population. According to this view, for example, a person's health is still primarily judged according to their state of physical health. Furthermore, the emphasis of health treatment should be on modern, scientific health care and mainstream medicine, which relies on drug treatment or surgery. However, traditional practitioners, naturopaths and other alternative practitioners (for example, acupuncturists) are being increasingly used and some methods adopted by mainstream medical practitioners as options or alternatives. **Alternative medicine** and practices are therefore gaining more respect from the dominant culture as people's values and attitudes change about what good health means and what is involved in achieving good health.

Alternative medicine refers to various medical methods and practices that are not recognised as being conventional or traditional approaches to medicine.

Perceiving health as a social construct allows us to consider the broad social and cultural factors that impact on an individual's behaviour. When we view health as a social construct it allows us to:

- explain why certain people choose to behave in particular ways
- understand how social norms are established in cultural subgroups
- realise how our concept of health can take on different meanings in particular social contexts.



Figure 1.10: The increasing acceptance of alternative medicine has influenced people's ideas about what is involved in good health.

Impact of the media, peers and family

The media, our peers and our family have a particularly significant impact on the perceptions we develop about health. These three groups exert a strong influence on the ideas that people form about what constitutes good health and the value they place upon various aspects of health.

The media

The media are a factor that impact on an individual's social construct of health. Some of the main forms of media include television, radio, magazines, movies, newspapers and the internet.

The media play a significant role in disseminating health-related information. For example, news stories on binge drinking, television advertisements about skin cancer or feature articles in magazines on obsessive compulsive disorder all seek to raise awareness and increase people's understanding of these health issues.

Stories in the media also influence people's perceptions through the depth of information they provide, the way this information is presented and the frequency of this presentation. A continued focus on a particular health issue can draw the public's attention to that particular topic, possibly at the expense of other areas of concern. It can also affect people's perception of the risk that they will experience a particular health problem, its likely severity and the future prevalence of this problem within the community. For example, media coverage relating to HIV/AIDS has contributed to a heightened knowledge and awareness of this particular virus in comparison to other sexually transmitted infections such as chlamydia or hepatitis B, which receive less coverage but are far more prevalent in the community.



How can the media influence our perceptions of health?

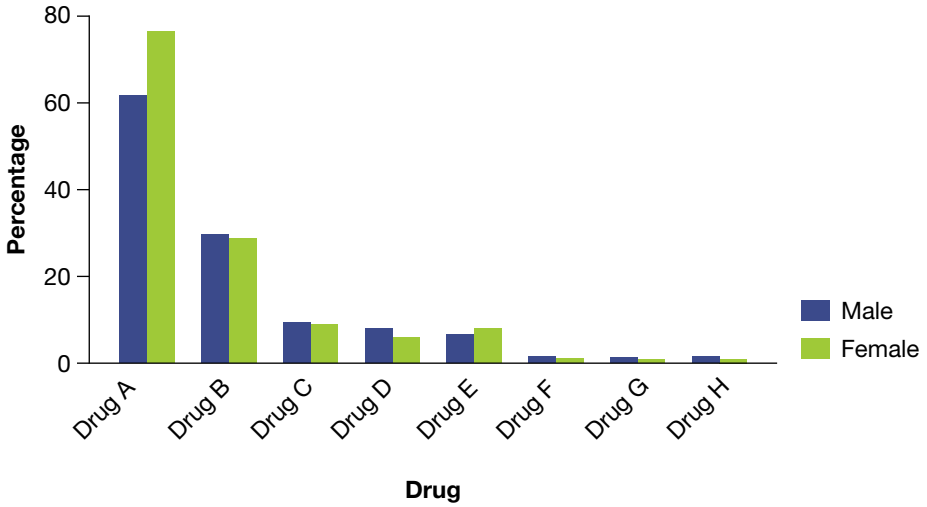


Figure 1.11: Percentage of 12–17-year-old secondary students who indicated they had taken some type of drug in the last four weeks

1. The graph in figure 1.11 is taken from the National Drug Strategy's *Australian secondary students' use of tobacco, alcohol and over-the-counter and illicit substances in 2011* report. It shows the percentage of 12–17-year-old secondary students who indicated they had taken some type of drug in the last four weeks. Look at the percentages shown in each column and predict which drug relates to each letter A–H. (Answers are given on page 54.)
2. As a class, examine how closely your perceptions of drug use by young people matched the statistics gathered in the survey. Discuss reasons for any differences

that may have occurred. In this discussion highlight factors that influence our perceptions of drug use and determine the degree to which these perceptions are socially constructed.

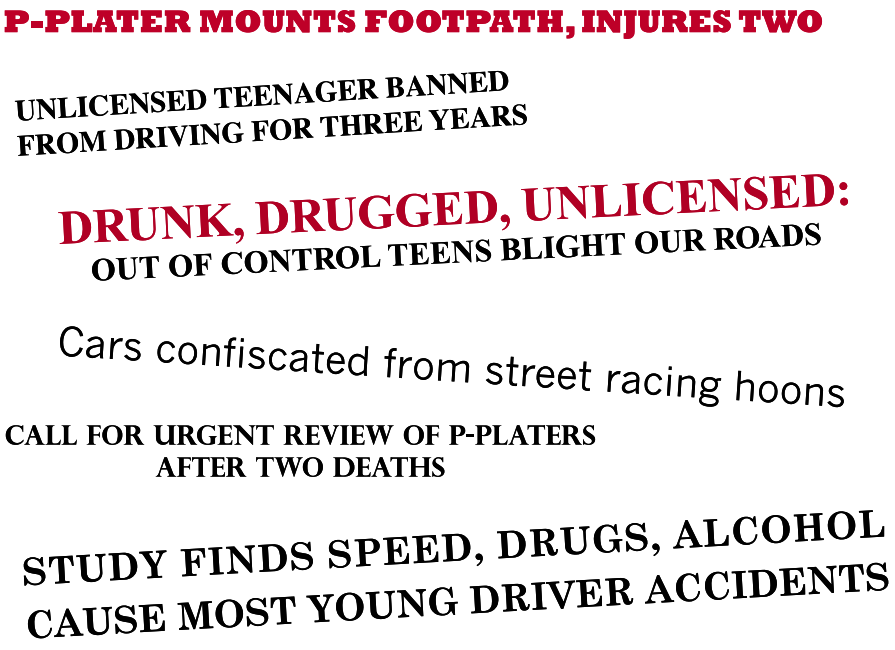


Figure 1.12: Sustained media coverage of particular health issues can lead to increased public awareness and prompt government action.

The media are influential in shaping attitudes, values and behaviours relating to what good health looks like and means. Misleading messages in the media about health can contribute to misconceptions or distorted perceptions of health. For example, magazines, television, movies and other forms of media are full of images of tanned, attractive, slim women and men with athletic, muscular physiques. The constant portrayal of these body shapes as essential elements of good health has a significant effect on people's assessment of their level of health, while also exercising considerable influence on what they do in an effort to look this way.

Sustained media coverage of a particular health issue can lead to such attention and heightened public concern that it can influence government policy, priorities and health expenditure. For example, frequent front page stories about road crashes involving young people have been a critical factor in increasing community awareness and intensifying concerns about the over-representation of young people in accident statistics. Discussion provoked by this media coverage has contributed to the introduction of laws relating to zero blood alcohol levels, reduced engine capacity and passenger restrictions for learner and P-plate drivers, while also contributing to ongoing debate about further changes that could reduce the number of young people involved in crashes.

SNAPSHOT

An open letter to advertisers, media decision makers and teenagers

To whom it may concern,

My name is Stella Lycos, 16 years old. I have some issues of great concern to me that I would like to discuss with you.

My friends and I are currently being negatively affected by the advertising industry. Every day of every year images, slogans, brands and other forms of advertisement are being constantly thrown at us, preached to us, and marketed to us. In primary school we were briefly talked to about body image and self-esteem and how to prepare ourselves for high school and in turn, life. Sitting in that classroom I listened but I did not feel one bit concerned. I thought that self-esteem and body image was going to be about

as concerning and relevant as filling out tax return forms.

Now that I am in high school, I have begun to realise that the way women and girls are portrayed in media and advertising has a greater link with body image and self-esteem issues than I ever imagined. It's easy to think that you can choose what you listen to and see and just ignore what you wish. But when we are constantly bombarded with messages that are telling us that we are too fat, too thin, not toned enough, don't have the right clothes and should probably be out partying while keeping up good grades and becoming the thriving young women that we were meant to be; it's hard.

The Australian Psychological Society told the Senate Committee Inquiry into the sexualisation of children in 2008, 'the values implicit in sexualised images are that physical appearance and beauty are intrinsic to self-esteem and social worth, and that sexual attractiveness is a part of childhood experience . . . Girls learn to see and think of their bodies as objects of others' desire, to be looked at and evaluated for its appearance.' I can say from personal experience that all these years of constant advertising images and messages about what girls and women look like are deeply affecting me and my peers. I am a human being, not an object to be used or altered to fit in to society. But sometimes it's hard to see my body for what it is and instead see it for what it's not. I know that it's not my own original thoughts telling me that I am not good enough; it's what has been taught to me. Feeling content and fulfilled in a nation that is riddled with graphic advertisements aimed at young people seems to no longer be an option.

At my school, bullying isn't tolerated. But my friends and I are getting bullied every day and for the most of it, it's not from other teenagers. We are getting bullied by media and advertisers. Being told over and over again that we are inadequate has serious damage on our minds, maybe even permanent damage. Teenagers are particularly vulnerable and influenced by advertisement. I am lucky to have a supportive down to earth family and a group of friends who don't care what I look like but I know and I promise you that I still find myself thinking negatively about myself and I know my friends do too. I simply cannot escape the idea that I am not adequate in today's society. No one wants to feel inadequate. So who is going to stand up against these big corporate bullies?

I have been learning about the way media and advertising are regulated, and I have been really disappointed in what I have found out. At the moment the rules which tell companies how they can advertise are inadequate and the system is weak. A voluntary code with no pre-checking of ads and a lack of ASB power to remove advertisements means that advertisers pretty much get away with doing whatever they like. It's not fair to expect me and my friends to stand up and defend our bodies and minds against these huge companies.

I for one can say from personal experience that all these images and messages have had a great effect on me and my peers. It is from these seeds of expectations that low self-esteem, mental illness and eating disorders can sprout.

When it comes to the internet and social media, things feel even worse. Companies are using social media to get their messages across to us 24/7. They bring the images and ideas which we are already exposed to everywhere, into our own homes, and often the images which come this way are much more explicit and intense than what we would be shown in a magazine, on TV or in an outdoor advertisement. I don't want a censored world full of rules and laws prohibiting us to speak freely or be individuals, but I do want a better environment for me and my friends to grow up in.

I'd like to ask you to speak up about these issues on behalf of me and others like me. We need the system to change and we need people like you to help bring about that change for us. I know that there have been other groups that have written reports into these issues but if you ever want to find out first-hand about what it's like to be a teenager in this media environment me and my friends would be more than happy to make ourselves available to talk to you.

Kind regards

Stella Lycos

Source: The Age, 21 July 2013.

APPLICATION

How significant is the media's influence on perceptions of health?

Read the snapshot 'An open letter to advertisers, media decision makers and teenagers' and then complete the following activities.

1. Summarise the main arguments expressed in the letter about the impact of the media on young people's perceptions about body image and body weight.
2. Discuss why the young person is concerned about the messages conveyed through the media about health.
3. Analyse the degree to which you feel a person's attitudes and ideas about body weight and body image are socially constructed.
4. The magazine *Indigo* was launched in 2007 by a group of women concerned about the unrealistic body images and stereotypes promoted in girls' and women's magazines. Its aim is to be the 'fun, body friendly alternative to other magazines on the market, without the airbrushed images, stick thin celebrities and sex articles' while tackling issues relevant to its 10–14-year-old female audience, such as 'puberty, bullying, self-esteem and body image, while keeping the feel of *Indigo* completely positive'.
   (a) Use the ***Indigo*** weblink in your eBookPLUS to find out more about the techniques the magazine uses to convey positive health messages to young girls.
   (b) Explain how the magazine might influence girls' perceptions of health.

eBook*plus*



Figure 1.13: Young people's health attitudes and behaviours can be significantly influenced by peers.

Peers

The group with whom we associate at school and outside of school markedly influences our attitudes about health and the health behaviours we adopt. Along with our family, our peers are the group most likely to influence our ideas, promote certain behaviours and provide support in terms of our health.

When group members share similar ideas about what good health means and place comparable value on the importance of good health it is easier for the individual to behave in ways that will enhance their health and well-being. For example, when young people recognise that positive mental health is an important component of their general well-being, they are more likely to support individuals who are experiencing emotional difficulties and encourage them to talk openly about their feelings and seek support. However, when mental health problems are perceived as a sign of weakness, an attempt to get attention, or not a significant problem it becomes harder for the individual to recognise or acknowledge that they are experiencing difficulties or ask for help.

Young people's behaviour can be significantly influenced by their peers. Social pressures, along with the desire to fit in, may contribute to decisions being made that are likely to negatively affect their health. For example, decisions to experiment with drugs such as tobacco and alcohol, take risks when driving, participate in sexual activity or spend time sunbaking are more likely to be made by young people when these behaviours are common among their peers. However, when a peer group recognises these behaviours are unhealthy and liable to cause significant immediate or future harm, they are likely to discourage others from engaging in these activities.

Family

Families have a significant influence in the lives of most young people. From our earliest years, our parents are our role models, so the ideas they communicate about what health means and the values they convey about the importance of good health have a strong effect on the perceptions that we develop. Their ideas relating to health also contribute significantly to their health behaviours and the efforts they make to promote behaviours that can positively impact on our own level of health, therefore further influencing the ideas that we form. For example, a belief that participation in sport and physical activity is important for good health is likely to see parents encourage their children to be active and support their involvement in regular physical activity. The values and attitudes instilled in us by our parents play an important part in the development of our own perceptions of health.

Socioeconomic disadvantage refers to significant limitations to opportunity that can be experienced as a result of factors relating to social and economic circumstances, such as lower education, poorer education, unemployment, limited access to services, inadequate housing or lack of social networks.

The living conditions of families, along with other socioeconomic factors such as income, education and employment, also have a bearing on our ideas about health. People living in **socioeconomic disadvantage** generally live shorter lives and suffer more illness and a lower quality of life than those who are well off. Poverty and unemployment can lead to stress, tension, conflict and a sense of hopelessness, all of which contribute further to poor health. The effect of living in situations where life expectancy is lower, sickness is experienced more frequently and expectations about health are poorer is likely to impact on the ideas young people develop about health and the level of control they believe they are able to exert over it. Poor economic circumstances can also limit the amount of money available to be spent on health-related expenses, therefore affecting the priority given to health and the importance with which it is viewed.



Figure 1.14: Families play an important role in our perceptions of health.

Living with a family member who is chronically unwell may also negatively impact on perceptions about health, particularly when a young person is required to take on the role of carer. The ongoing experience of living with someone who suffers poor health as a result of a physical disability, chronic health condition or mental illness has a significant influence on a person's ideas about what good health looks like. Furthermore, the stress and fatigue associated with the responsibility of caring for someone, along with possible social isolation, can have a detrimental impact on the judgements that carers might make about their own health and the expectations they have about being able to improve their health at some point in the future.



INQUIRY

Health as social constructs

Think about the following groups of people. For each group, explain what might influence the way they perceive health. Draw a mind map to summarise the influences for each group.

(a) People in rural and remote areas
(b) People from the lowest socioeconomic groups
(c) Refugees who have just been granted Australian citizenship
(d) Women
(e) Aboriginal and Torres Strait Islander peoples



HEALTH BEHAVIOURS OF YOUNG PEOPLE

The health of young people is a topic frequently discussed in the media. Stories often report increasing rates of obesity, escalating consumption of junk food, declining levels of physical activity in favour of television and computer-based activity, regular episodes of binge drinking, a rise in the use of illicit drugs such as ecstasy and ice, increased promiscuity, growing incidence of mental health problems and an over-representation in motor vehicle accidents. Such stories contribute to a perception that young people are in a poor state of health. How accurate are these perceptions? What has current research found about the health status of young Australians and their health-related behaviour?

The positive health status of young people

Research into the health status, health outcomes and factors influencing the health and well-being of young Australians has been regularly undertaken by the Australian Institute of Health and Welfare (AIHW). The findings of their most recent research have been published in a report titled *Young Australians: their health and wellbeing* 2011. According to this report the health of young Australians (defined in the report as those aged between 12 and 24 years of age) has continued to improve over time and the majority of young people are currently faring well in terms of their health and well-being. Evidence of this good state of health can be found in a decline in mortality in young people between 1987 and 2007, largely as a result of reductions in deaths caused by injury, suicide and transport accidents. Reductions in morbidity from **chronic** diseases such as asthma have also contributed to improvements in young people's health. Further evidence of the positive health status of young people was found in the decline in risk behaviours such as smoking and the use of illicit drugs, along with an increase in protective behaviours such as the regular use of contraception by sexually active young people. These positive behavioural changes have the potential to protect and improve the future health of young Australians.

Chronic means persisting over a long time, such as a long-term disease or illness.

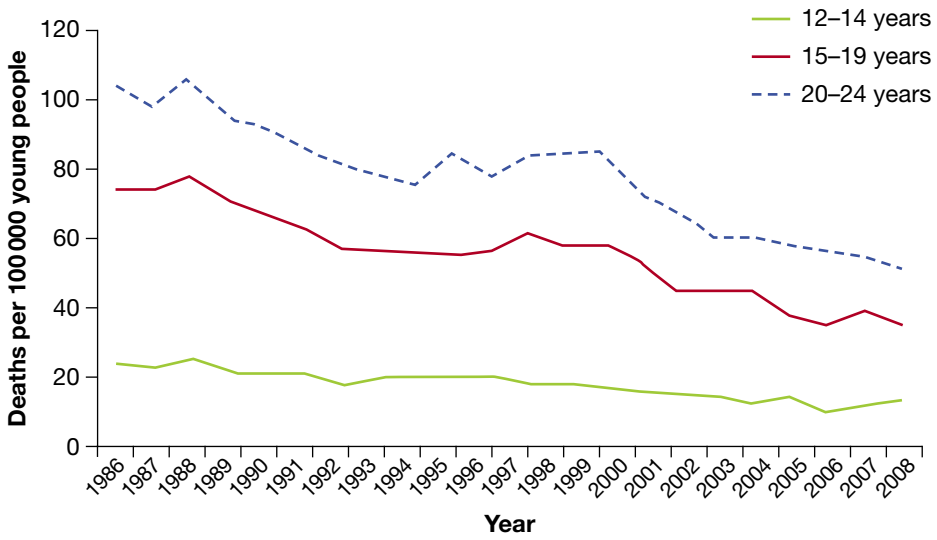


Figure 1.15: The continual decline in death rates for 12–24-year-olds is evidence of the positive state of health experienced by most young people.
Source: Young Australians: their health and wellbeing 2011, chapter 6, figure 6.1, p. 21.

INQUIRY

Analysing mortality rates of young people

1. Referring to information in the text on the previous page, propose reasons for the decline in mortality rates of young people over the last 20 years as shown in figure 1.15.
2. As a class, discuss strategies and initiatives that were implemented during this time that may have contributed to the fall in death rates.
3. Explain reasons for the significant difference in the death rates of the different age groups shown in the graph.

The findings of these statistics are substantiated by positive assessments by most young people of their own state of health. According to the *Australian Health Survey* 2011–12 (Australian Bureau of Statistics) around 64 per cent of Australians aged between 15 and 24 years old rated their own health as being either excellent or very good, with another 27.5 per cent assessing their health as good. These positive perceptions of their health, supported by the data showing the high level of health currently experienced by many young people in Australia, contrast markedly with some commonly held beliefs of adolescent health.

Table 1.2: Self assessed health status of young people aged 15–24 years, by sex and age group, 2011–12 (per cent)

	15–17 years		18–24 years		15–24 years		
Health status	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**	**Persons**
Excellent or very good	71.8	68.6	62.2	53.9	67	61.3	64.2
Good	23.3	23.2	28.1	35.5	25.7	29.3	27.5
Fair or poor	4.9	8.3	9.7	10.6	7.3	9.4	8.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Australian Health Survey: Updated results, 2011–2012, ABS.

APPLICATION

Survey of perceptions about young people's health

1. Survey four different people, including at least two adults, about their perceptions of young people's health status. Use the following questions and add your own questions to determine people's views. Record their responses and write a summary report of the four people's views.

   Survey questions:

   - Do you think that the health of young people is good? Explain reasons for your answer.
   - Do you think young males are as healthy as young females? Why/why not?
   - Name aspects of young people's health that you feel have improved in recent years.
   - Name aspects of young people's health that you feel have declined in recent years.

2. Use the ***Young Australians: their health and wellbeing*** weblink in your eBookPLUS.

   (a) Download the report profile *Young Australians: their health and wellbeing 2011* and read the summary of the report's key findings.

   (b) Compare the summary report of your own survey with the key findings from the report on the health and well-being of young Australians.

(c) Identify inaccuracies that people have about young people's health status and behaviours and use data from the report to challenge these inaccuracies.

3. Search recent newspapers and magazines for articles that you think give a negative impression of young people's health. Assess their accuracy and write responses that challenge negative perceptions.

Despite the generally positive picture painted of the health status of young people, the *Young Australians: their health and wellbeing* 2011 report did find particular groups of young people were not doing as well as others in terms of their health and well-being. Significant differences were evident in the health of young Indigenous Australians, young people in regional and remote areas and young people experiencing socioeconomic disadvantage compared to the general population. The perceptions of their own health that Indigenous young people and those living in areas of lowest socioeconomic status held also tended to be lower than those of other groups. The poorer levels of health experienced by these groups, coupled with their own negative perceptions of their health, are likely to contribute to poorer long-term health outcomes for these young people and a growing sense of disempowerment relating to their health and well-being. Without the implementation of specific intervention strategies to address these differences it is likely that in the future these inequities will continue to grow and widen.



INQUIRY

Comparing the health of Indigenous and non-Indigenous young people



Use the ***Young Australians: their health and wellbeing*** weblink in your eBookPLUS to research differences in the health status of Indigenous and non-Indigenous Australians. (Look at Part VII, chapter 42.)

1. Create graphs to illustrate the differences evident in:
   (i) death rates
   (ii) mental health
   (iii) injuries
   (iv) STIs
   (v) tobacco use
   (vi) physical activity levels.
2. Write a report describing the current health status of Indigenous young people. Include in your report a discussion on the key factors that contribute to the differences evident between Indigenous and non-Indigenous young people.

Significant differences in all measures of health continue to be evident between Indigenous and non-Indigenous young people. Mortality rates are markedly different, with the report *Young Australians: their health and wellbeing* 2011 finding the death rate of young Aboriginal and Torres Strait Islander peoples in 2003–07 to be about 2.5 times higher than that of young non-Indigenous Australians. Life expectancy, which is commonly used as an objective general measure of a population's health, is much lower for Aboriginal and Torres Strait Islanders than the general population. Estimates predict that the young Indigenous people born in the period 2005–07 will live around 10–12 years less than the rest of the population. (67 years of age for an Indigenous male compared to 79 years for a non-Indigenous male and 73 years of age for an Indigenous female compared to 83 years for a non-Indigenous female). Aboriginal and Torres Strait Islander peoples are also more likely to experience chronic

illnesses and health problems that reduce their quality of life. They suffer higher rates of diabetes and mental and behavioural disorders requiring hospitalisation and are more likely to experience preventable health conditions that are uncommon within the general population such as rheumatic heart disease, skin infections and trachoma. They are also more likely to suffer ear disease that contributes to hearing loss and impairment. The report also found young Indigenous people were more likely to experience risk factors associated with poor health such as low levels of fruit and vegetable consumption, obesity, tobacco and illicit drug use, alcohol misuse physical inactivity, incarceration and lower levels of education achievement. For most Indigenous people these health disadvantages start at a young age and remain throughout their life, resulting in ongoing negative effects on their level of health. In addition to these objective measures, young Indigenous Australians aged 15–24 years were less likely than their non-Indigenous peers to perceive their health was excellent or very good.

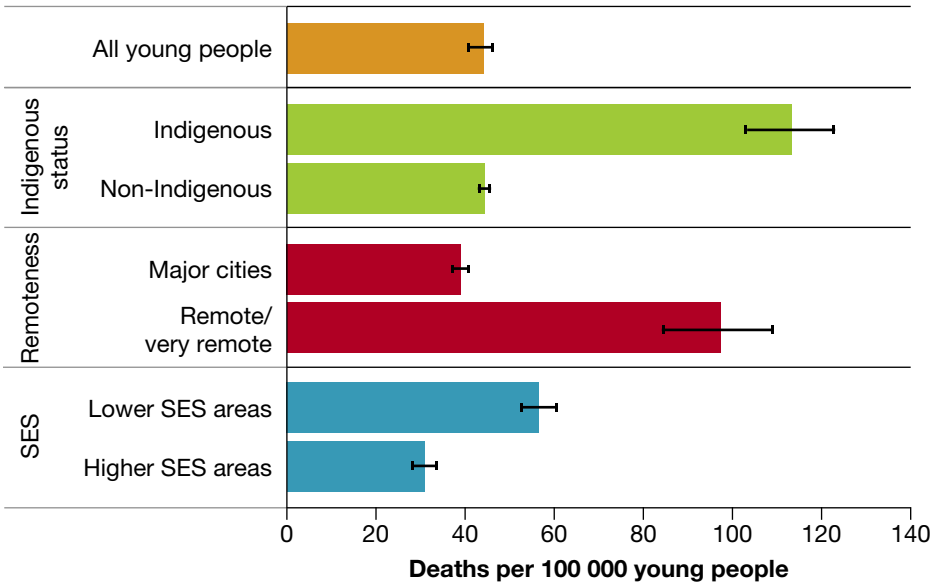


Figure 1.16: Deaths among young people aged 15–24 among selected population groups 2005–2007
Source: AIHW Young Australians: their health and wellbeing 2011, AIHW, fig 6.3, p. 22.

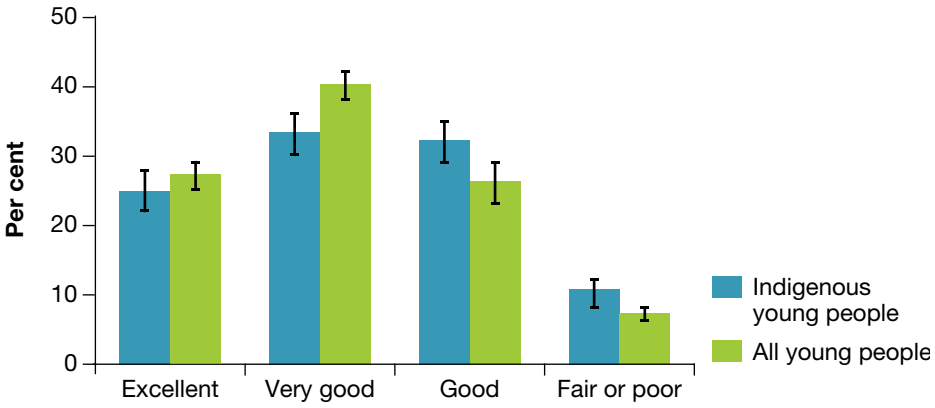


Figure 1.17: Self-assessed health status of Indigenous and non-Indigenous Australians aged 15–24 years, 2007–08
Source: Young Australians: their health and wellbeing 2011, AIHW, fig. 42.2, p. 179.

Young Australians living in remote and very remote communities were identified as another group experiencing poorer levels of health in comparison to others.

Young people in remote areas had significantly higher death rates, with mortality rates being 2.5 times higher in remote and very remote areas compared to major cities. Injuries, particularly those resulting from transport

accidents and suicide, were the leading cause of this high mortality rate. These same injuries, along with assaults, were largely responsible for higher hospital admission rates among young people living in remote areas. Differences were also found in the likelihood of young people living in remote areas to engage in certain risky health behaviours, with fruit consumption and physical activity levels being lower and teenage birth rates higher than those in major cities.

The *Young Australians: their health and wellbeing* 2011 report also found that the health and well-being of young people differed significantly among young people of various socioeconomic groups. Young people from low socioeconomic groups were more likely to experience poor levels of health compared to others. Death rates in this group were nearly twice as high as the least disadvantaged areas. Injury rates were also higher among those living in areas with significant levels of disadvantage. They were more likely to be overweight and obese and also twice as likely to smoke as those in the highest socioeconomic areas.

In addition to identifying specific population groups who were not faring as well as others in terms of their health, the *Young Australians: their health and wellbeing* 2011 report also highlighted specific health conditions of concern for young people due to their continued or increasing prevalence, particularly for the above mentioned population groups. The report noted a significant increase in the incidence of insulin-dependent (Type 1) **diabetes mellitus** among young people, with a 41 per cent increase in new cases in a six-year period. Given the long-term health problems linked with poorly managed diabetes, such as increased risk of coronary heart disease, peripheral vascular disease, stroke, kidney failure, blindness and amputation of limbs, the rising incidence of diabetes represents an area of concern in relation to young people's future health.

Diabetes mellitus is a chronic condition affecting the body's ability to take glucose from the bloodstream to use it for energy. Type 1 diabetes involves the body not being able to produce insulin or producing only minimal amounts.

The mental health status of young people is an area of ongoing concern, with **mental health disorders** continuing to be the greatest contributor to the burden of disease for young Australians Anxiety, depression and substance use disorders were the most common mental health problems experienced by young people. Nearly one in ten young people reported that they experience high or very high levels of distress, with females being twice as likely to report feeling high or very high levels of distress. These very high levels of psychological distress had a significant impact on young people's perception of their own health, with more than 19 per cent of those who reported feeling this way assessing their health as only fair and another six per cent judging it as poor, compared to five per cent of those who reported low psychological distress.

Mental health disorders are a group of mental illnesses in which a person experiences disturbances of mood or thought that lead to difficulties functioning normally. These disorders include depression, anxiety disorders and schizophrenia.

The report also highlighted injuries, particularly those sustained from motor vehicle accidents and intentional self-harm, as another area of ongoing concern in relation to young people's health due to the fact that they are largely preventable. While there has been a significant decline in the number of injury-related deaths, particularly among young males, the proportion of young people killed as a result of road accidents and suicide remains high. The report found injuries and poisoning continue to be the leading cause of ill health, hospitalisation and death among young people. Injuries were responsible for two-thirds of premature deaths by young people, particularly males, who were three times more likely to die as a result of an injury than females. Furthermore injuries leave many young people with serious disabilities and long-term conditions that significantly affect their future health and

well-being, along with the health of others such as parents, who may need to resume a care-giving role due to the injuries sustained.

The fact that further improvements are still required in some areas of young people's health was also highlighted by the increasing rates of sexually transmitted infections, particularly **chlamydia**, with the number of notified cases of chlamydia increasing nearly fivefold. A decline was also found in the dental health of young people with a fall in the number of 12-year-olds who were decay free.

Chlamydia is a sexually transmitted bacterial infection that can be passed on through unprotected sex and can cause infertility.

The increasing prevalence of these health conditions has a significant impact on young people's quality of life and is likely to negatively affect their long-term health as well as their successful involvement in education, employment and the community in general.



APPLICATION

Examining health issues of concern for young people

eBookplus

1. Research the prevalence of mental health disorders among young people. Use one of the following reports for your research (use the relevant weblinks for these in your eBookPLUS). Summarise your findings in note form.
   - ***Young Australians: their health and wellbeing 2011***
   - ***New South Wales school students health behaviours survey 2011***
2. Suggest reasons why a significant number of young people are reporting that they experience high levels of distress.
3. Identify health risk behaviours that could be linked to mental health disorders. Predict possible health concerns that could arise as a result of these multiple health risk behaviours.
4. Discuss why injuries are the leading cause of ill health and death among young people.

Protective behaviours and risk behaviours

Adolescence is the time when young people begin to move from being dependent children to independent adults. Along the way they face a range of challenges and start to make decisions about particular health behaviours that play an important role in determining their immediate and longer term health. These health behaviours can be seen as being either **protective behaviours**, because they are likely to enhance good health (such as eating adequate amounts of fruit and vegetables), or **risk behaviours** because they have been found to contribute to the development of health problems or poorer levels of health (for example, smoking). The health and social behaviours that are adopted or reinforced during this time often continue into adulthood, so it is important to identify the prevalence of particular behaviours and analyse the trends that are apparent. Behaviours that are likely to have the biggest impact on a young person's current and future health include those related to:

Protective behaviours are those health behaviours that are likely to enhance a person's level of health.

Risk behaviours are those health behaviours that have been found to contribute to the development of health problems or poorer levels of health.

- physical activity
- eating habits
- substance use (including tobacco, alcohol and other drugs)
- sexual activity
- help-seeking behaviours
- social connectedness
- risk taking

INQUIRY

Protective behaviours and risk behaviours

Brainstorm your ideas for each of the following and draw two mind maps that summarise your ideas.

(a) Protective behaviours for health issues relevant to young people

(b) Risk behaviours for health issues relevant to young people

Compare your mind maps with those of other class members and discuss your findings.

Behaviours relating to physical activity

A certain level of physical activity is necessary to help achieve and maintain good levels of health. The recommendations outlined in *Australia's Physical Activity and Sedentary Behaviour Guidelines for Young People (13–17 years)* advise that adolescents should:

- partake in at least 60 minutes of moderate to vigorous physical activity every day
- limit the time they spend on the computer, watching television or playing video games to two hours (unless it is for educational purposes)
- engage in activities that strengthen muscles and bones at least three days a week.

Following these recommendations and participating daily in physical activity offers both immediate and long-term benefits to the health and well-being of young people. People who participate in less physical activity than recommended have a greater chance of suffering diseases, such as heart disease, stroke, **type 2 diabetes**, some forms of cancer, **osteoporosis**, back pain and depression that increase their risk of ill health and premature death.

Type 2 diabetes is the most common type of diabetes and is characterised by too little insulin being made or an inability to use insulin effectively.

Osteoporosis is a musculoskeletal condition in which there is deterioration in the bone structure, leading to an increased risk of bone fracture.

The *NSW schools physical activity and nutrition survey (SPANS)* 2010 found that there had been a significant decline in the physical activity level of high school students, with the exception of year 10 girls. Less than two-thirds of surveyed students in years 8 and 10 met the recommended Australian physical activity guidelines during summer and this number dropped to just over 50 per cent during winter.



Figure 1.18: Regular physical activity is a key protective behaviour for young people's health.

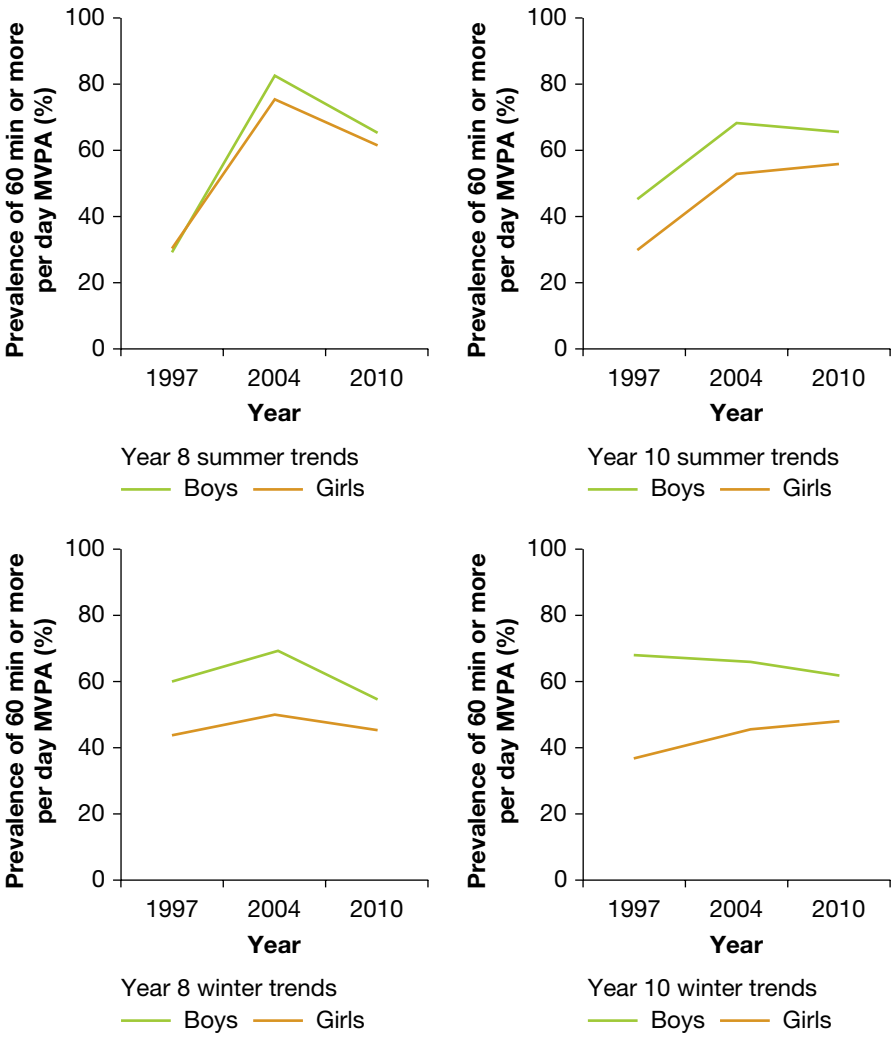


Figure 1.19: Trends in number of young people participating in moderate-to-vigorous physical activity each day
Source: NSW schools physical activity and nutrition survey (SPANS) 2010, p. 133.

INQUIRY

Trends in relation to young people's participation in physical activity

eBookplus

1. Research trends in relation to physical activity patterns of young people reported in the *New South Wales schools physical activity and nutrition survey* (SPANS) 2010. Using the **NSW SPANS** weblink in your eBookPLUS, download and read section 8 (Physical activity among years 6, 8 and 10).
2. Share your findings with the class. Comment on whether these results surprised you and if so, why.
3. Discuss in groups whether these findings match commonly held perceptions about how physically active young people are.

Another finding of the SPANS research relating to physical activity was the significant proportion of young people who spent prolonged periods of time engaged in small screen recreation (SSR); that is watching television and DVDs, using computers for fun and playing e-games. According to the survey's findings, over 60 per cent of secondary school students exceeded the recommended guideline of two hours of SSR on weekdays, with this figure increasing to 80 per cent on weekends (see figure 1.20). Research has suggested that patterns of **sedentary** behaviour in childhood are likely to continue in

Sedentary refers to a lack of regular physical activity and spending a lot of time sitting or resting.

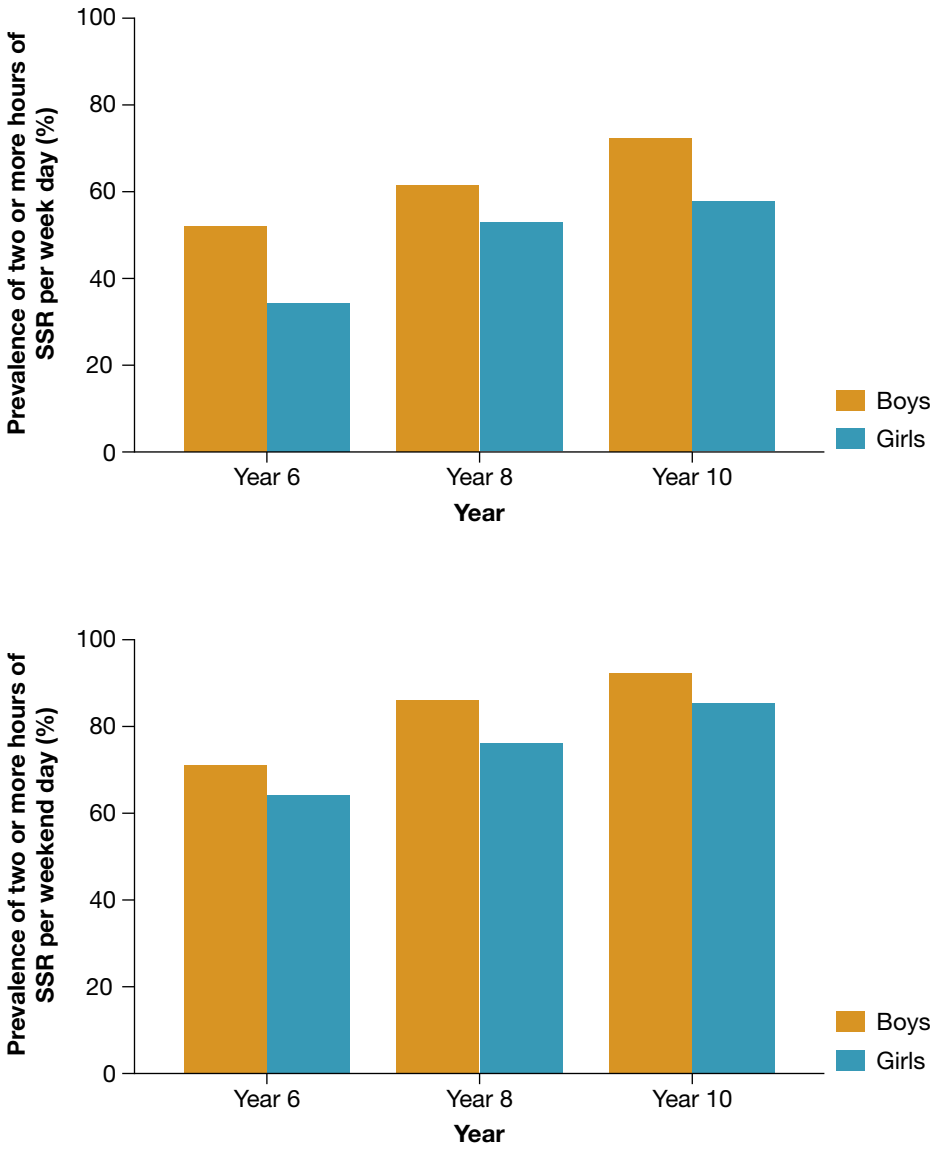


Figure 1.20: Percentage of male and female students in years 6, 8 and 10 engaging in more than two hours of small screen recreation (SSR) a day

later life, thereby increasing risk of factors such as lower levels of fitness that contribute to **cardiovascular disease**.

Cardiovascular disease refers to disease that affects the heart or blood vessels.

Heart disease, also called cardiovascular disease, is the term used for diseases of the heart and blood vessels. Common heart diseases include coronary heart disease (diseases of the blood vessels supplying the heart muscle), cerebrovascular disease (diseases of the blood vessels supplying the brain) and peripheral arterial disease (diseases of the blood vessels supplying the arms and legs).

Behaviours relating to healthy eating

The development of healthy patterns of eating helps to ensure an adequate intake of all nutrients essential for good health and protects against a range of chronic preventable diseases that are prevalent among Australians, including **heart disease**, type 2 diabetes, some cancers and obesity. Consuming plenty of fruit and vegetables each day is an important part of having a balanced, nutritious diet. The Australian Dietary Guidelines recommend that people aged 14–18 years consume 5–5½ servings of vegetables and 2 servings of fruits each day. Findings from the 2010 SPANS report on the dietary habits of high school students were positive in regards to their intake of fruit, with approximately 75 per cent of year 8 and 10 students reporting that they consumed two or more pieces of fruit daily. However the proportion of young people who satisfied the recommendations in relation to vegetable consumption was much lower,

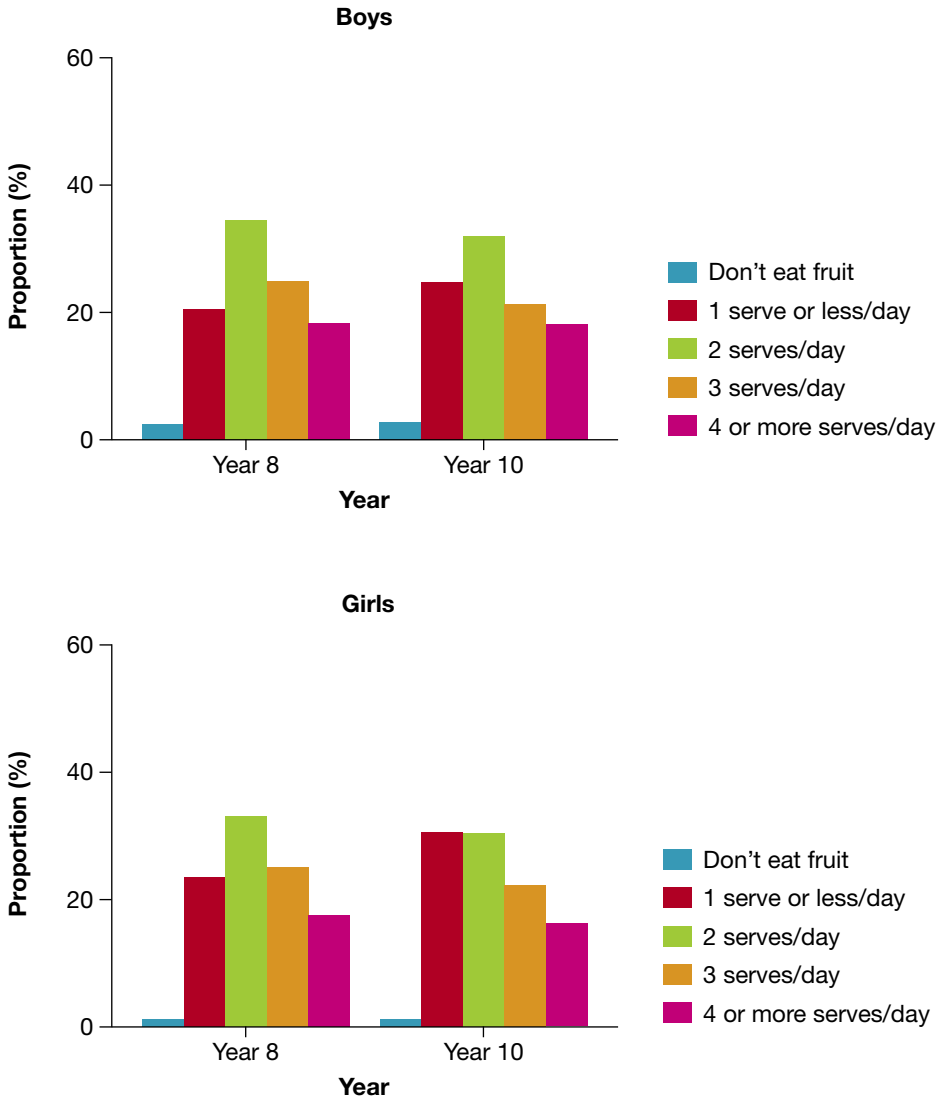


Figure 1.21: Usual consumption of fruit among year 8 and 10 students

with only eight per cent of high school students eating the recommended five serves of vegetables.

Reducing the intake of foods containing high levels of saturated fat, added salt and added sugar is another key component of healthy eating. Processed snack foods, take away meals, soft drinks and sports and energy drinks generally contain high amounts of saturated fats, salt and/or sugar, meaning their consumption should be limited so they are not eaten daily. According to the SPANS 2010 report a variety of 'extra' snack foods such as chips, biscuits, cakes, muesli bars, chocolate, ice cream and ice blocks were regularly consumed by students, with approximately one-third of surveyed students consuming them as often as three to six times a week. Nearly 10 per cent of students also reported consuming soft drinks on a daily basis.

The food choices made by young people are likely to be strongly influenced by a number of food behaviours such as skipping meals, eating dinner while watching television and consuming food and drinks purchased away from home. Research has identified the maintenance of healthy weight to be closely linked to the regular consumption of breakfast and not sitting down to dinner in front of the television.

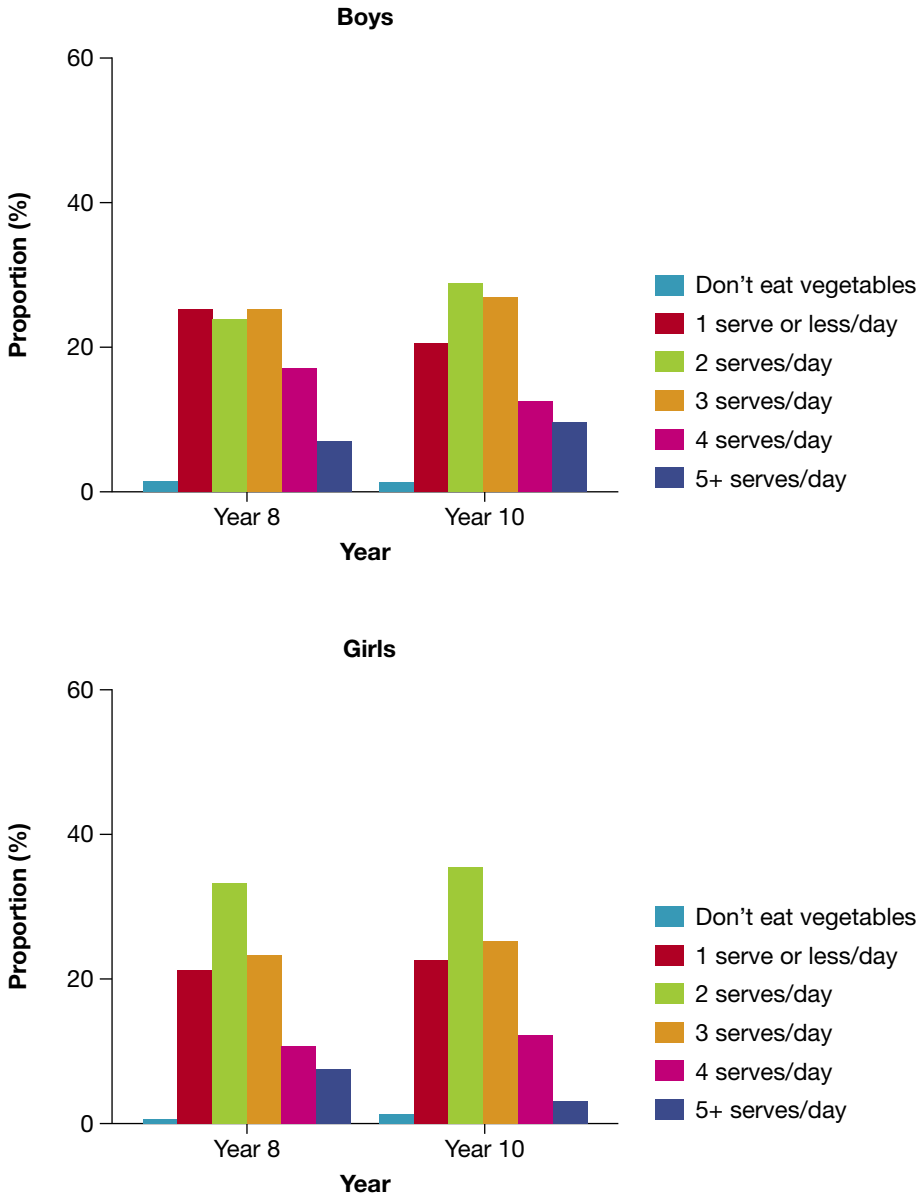


Figure 1.22: Usual consumption of vegetables among year 8 to 10 students

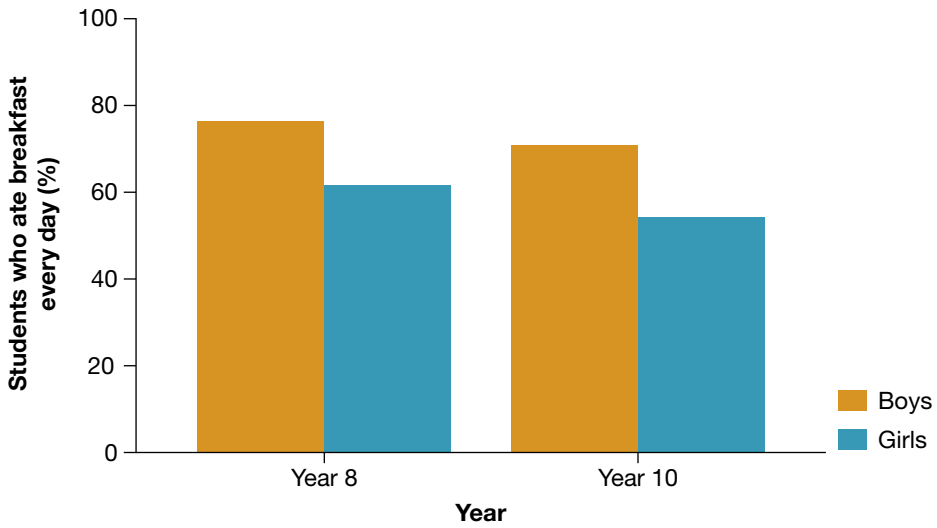


Figure 1.23: Percentage of students who ate breakfast every day, by school year

Findings in the 2010 NSW SPANS report indicated that a significant proportion of young people, particularly girls, did not eat breakfast, with 70 per cent of boys and only 54 per cent of year 10 girls regularly consuming breakfast. The same survey found that approximately a quarter of students ate their dinner in front of the TV on most days.

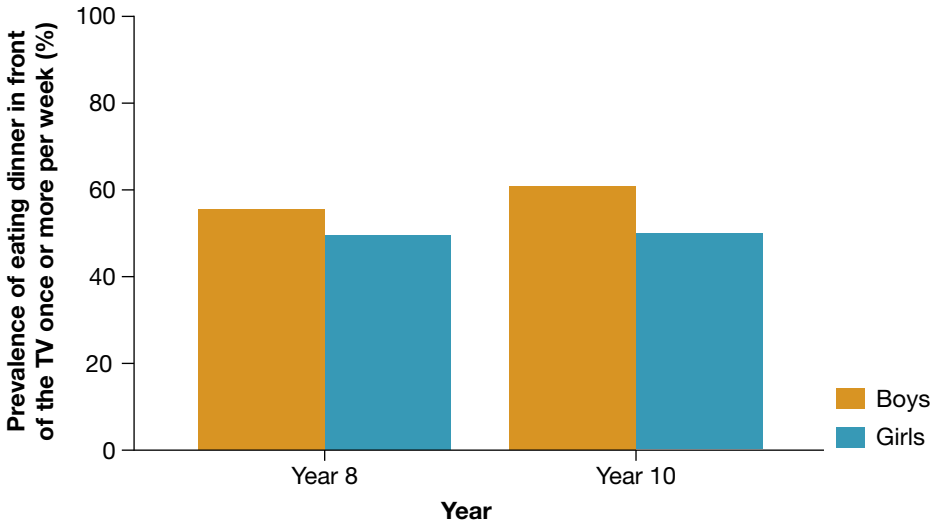


Figure 1.24: Percentage of students who ate dinner in front of TV at least once a week, by school year



INQUIRY

Skipping meals

Examine figures 1.23 and 1.24 and answer the following questions.

1. Summarise the trends that are evident in relation to eating breakfast and eating dinner in front of the television.
2. Suggest possible reasons for the following findings.
   (a) Students were less likely to eat breakfast as they got older.
   (b) Boys were more likely to eat breakfast than girls.
   (c) Boys were more likely to eat dinner in front of the television than girls.
3. Research has suggested that skipping meals and eating in front of the TV are risk factors for becoming overweight or obese. Explain why these eating behaviours could be linked to this health problem.
4. Identify other health issues that could be linked to these two eating behaviours.

Behaviours relating to body weight

Problems associated with body weight, particularly being overweight and obese, contribute to a wide range of immediate and future health problems for young people. In the short term, being overweight or obese is likely to negatively affect a young person's social and emotional well-being, particularly their self-image and sense of confidence, while also increasing their risk of developing cardiovascular diseases and type 2 diabetes. Ongoing problems with excess weight further increase the likelihood that young people will develop these health conditions during adulthood, along with certain cancers, gallstones, disordered sleeping and osteoarthritis.

Body mass index (BMI) is the most common method of determining whether a person's weight fits into a healthy range. It is calculated by dividing their weight in kilograms by their height in metres squared.

Underweight is defined as a body mass index less than 18.5.

Overweight is defined as a body mass index of 25 or over.

Obese is defined as a body mass index of 30 or over.

Data on the number of young people in Australia who are overweight and obese are generally based on measuring a person's **body mass index (BMI)**. BMI is determined by dividing a person's weight in kilograms by their height in square metres (BMI = kg/m^2). The resulting measurements are then used to classify people as **underweight**, an acceptable weight, **overweight** or **obese**.

Numerous studies have found a significant number of young people are overweight or obese. The 2010 SPANS survey found approximately 18 per cent of high-school-aged boys were overweight and six per cent were obese, while nearly 16 per cent of their female peers were overweight and four per cent were obese. While these figures represented reversal of the trends from previous SPANS surveys with no significant change in the number of females who were overweight or obese and a slight decrease among males, the prevalence of overweight and obesity among NSW secondary students remains high.

A lack of regular physical activity, participation in sedentary activities, poor dietary habits and the use of passive transport options are generally seen as the behaviours contributing significantly to the increasing risk of young people being overweight or obese. According to research, being overweight during childhood or adolescence is a health risk behaviour as it places a young person at greater risk of obesity during adulthood.

The *NSW school students health behaviours survey 2011* also used questions to ascertain how young people perceived their own body weight, then compared their responses with their calculated BMI. This comparison revealed significant differences in subjective and objective measures of body weight. Boys (14.9 per cent) were more likely than girls (5.1 per cent) to see themselves as too thin or about the right weight when they were found to be overweight. Girls were more likely to perceive themselves as overweight when their BMI was calculated as healthy or underweight (4.9 per cent males compared to 16.5 per cent females). These inaccurate perceptions of body weight can often be associated with poor **body image** and a sense of dissatisfaction with their physical appearance. Disordered eating habits such as skipping meals and limiting food intake, and other unhealthy behaviours such as smoking and excessive exercise can result from these negative perceptions. These types of behaviour place the immediate and long-term health and well-being of young people at risk.

Body image refers to the attitude or feelings we have about our body and the way we look or the way we think others see us. A person's body image can be positive or negative.



INQUIRY

Health issues relating to body weight

eBookplus

1. Research the prevalence of and trends in relation to overweight and obesity among young people. Information can be obtained from chapter 4 of SPANS 2010. Use the **NSW SPANS** weblink in your eBookPLUS to download and read chapter 4 of the full report.
2. Explain health issues that young people who are overweight or obese could face:
   (a) during adolescence
   (b) during adulthood.
3. Discuss reasons why girls were more likely than boys to perceive themselves as overweight when they actually had a healthy body mass index (BMI).
4. Outline health issues that could arise from these inaccurate perceptions about body weight.

Behaviours relating to drug use

Adolescence is a time when young people may experiment with substances such as tobacco, alcohol and other illicit drugs. The use of all these drugs poses a risk to the health of young people, with their misuse likely to cause numerous immediate and long-term health problems for either themselves or the general community.

While rates of smoking in Australia have continued to decline, tobacco smoking remains the single most preventable cause of chronic ill health and death in Australia. It is a major risk factor for numerous cancers as well as cardiovascular disease, respiratory diseases such as bronchitis and emphysema, circulatory problems and pregnancy difficulties. Smoking is therefore a risk behaviour for young people because of the increased risk of developing these diseases later in life, as well as the likelihood of experiencing immediate health problems such as lower levels of fitness and higher rates of respiratory illnesses. Furthermore, the commencement of smoking at a young age increases the likelihood that a person will continue to smoke, smoke more heavily and have greater difficulty quitting.

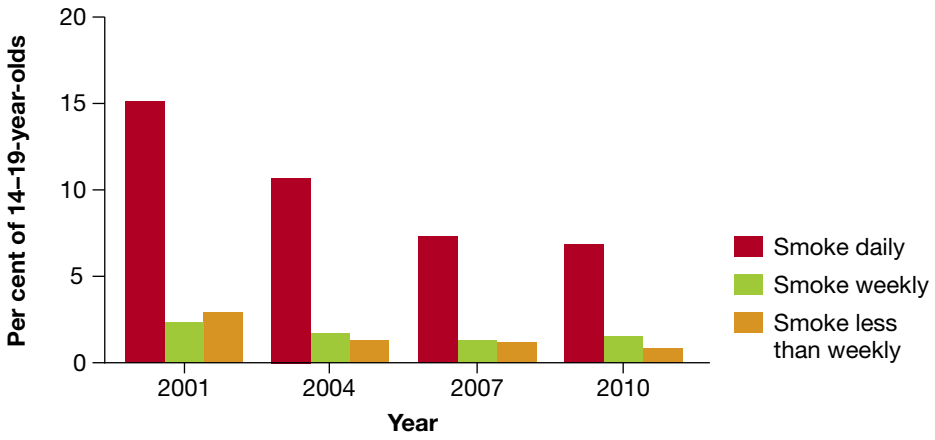


Figure 1.25: Comparison of tobacco smoking status of 14–19-year-olds between 2001 and 2010 (*Source: National Drug Strategy household survey* 2010.)

The National Drug Strategy household survey in 2010 found that just under seven per cent of 14–19-year-olds had smoked daily, with another 1.5 per cent smoking weekly. These reported rates indicate that smoking among young people has continued to decline in recent years (see figure 1.25). This reduction in the number of young people smoking suggests that the incidence of tobacco-related diseases is likely to decrease in the future.



INQUIRY

Perceptions about tobacco smoking by young people

1. Survey at least 10 different people (including at least five adults) and ask them to predict the percentage of 14–19-year-olds who currently smoke every day. Record the responses.
2. Compare the responses with the information provided by the graph in figure 1.25.

3. Discuss the accuracy of people's perceptions about tobacco smoking by young people. Suggest possible reasons for the perceptions that people have formed.
4. Propose ways to challenge inaccurate perceptions that exist about the prevalence of tobacco smoking by young people.



Figure 1.26: Binge drinking by young people contributes to a wide range of alcohol-related risks and harms.

Binge drinking refers to the consumption of excessive amounts of alcohol in a short period of time. It commonly involves drinking to get drunk.

Drinking excessive amounts of alcohol is a major cause of ill health and death, particularly for young people. Consuming large amounts of alcohol in a short period of time can cause alcohol poisoning that can severely impair brain function, resulting in coma and even leading to death. **Binge drinking** also causes increased confidence, a lowering of inhibitions and the impairment of decision making and motor skills, all of which combine to increase risk-taking behaviour, particularly by young people. Statistics show that they are the population group at greatest risk of alcohol-related injuries and deaths, which most commonly result from road crashes, violence, sexual assaults, falls, drowning and suicide. Along with these physical harms, risky drinking behaviour is also responsible for a range of emotional and social harms likely to impact on young people's health and well-being, such as guilt, embarrassment, relationship conflict and legal problems. In the longer term, excessive drinking contributes to liver diseases such as cirrhosis, cardiovascular disease, diabetes and some forms of cancer.

Data from the 2010 *National Drug Strategy household survey* found that the proportion of teenagers who reported drinking weekly was around 18 per cent, while 35 per cent of 14–19-year-olds stated that they had abstained from drinking. The number of non-drinkers represented a substantial increase from the previous survey in 2007 and suggested a positive trend in the drinking behaviours of young people. Among those who had consumed alcohol, around 14 per cent reported consuming an amount of alcohol at least weekly that placed them at risk of experiencing an alcohol-related injury. Young males were more likely than females to consume alcohol in quantities that placed them at risk and they tended to do this more frequently than females.

The *Australian secondary school students use of tobacco, alcohol, over-the-counter and illicit substances in 2011* report found higher levels of alcohol consumption among teenagers, with 25 per cent of 14–17-year-olds having drunk in the last week. However this figure also represented a fall from previous surveys. The survey also found that among those 16–17-year-old students who had consumed alcohol in the past week, 45 per cent

reported that they intended to get drunk most or every time they consumed alcohol. Only 26 per cent of all students reported having never consumed alcohol.

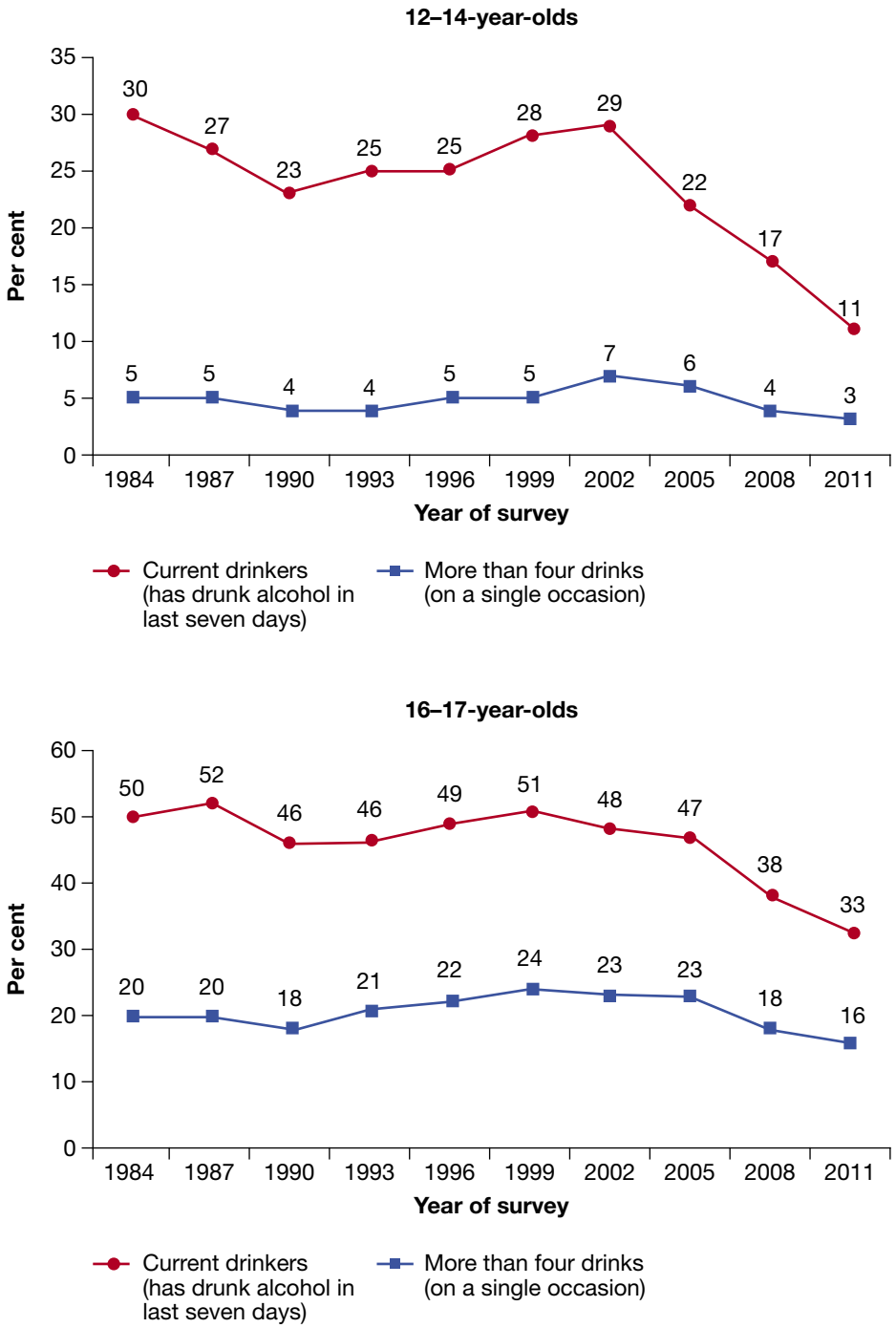


Figure 1.27: Trends in drinking behaviour by young people
Source: Australian secondary school students use of tobacco, alcohol, over-the-counter and illicit substances in 2011, Australian Government Department of Health and Ageing, fig 4.2 and table 4.3, pp. 52–3.

INQUIRY Alcohol consumption and young people

Examine the trends evident in figure 1.27 in the drinking behaviour of school-aged young people.

(a) Analyse the trends evident in these graphs.

(b) Propose reasons for the changes that are shown.

SNAPSHOT

A generation lost to the demon drink

By Richard Noone and Chelsea White

Children as young as 10 are seeking treatment for alcohol addiction, while five teens and young people die each week in incidents tied to binge drinking.

Recent studies have confirmed experts' fears that underage drinking is out of control.

One in five teenagers now regularly binge drinks by the time they turn 16, with the rate jumping to about 50 per cent by age 18.

A national survey of high school students has found parents have eclipsed friends and all other sources of supply for young people. One in three children aged 12 to 17 now turn to mum or dad to provide the rocket fuel they want to ignite a party.

Currently a legal loophole means parents who provide their children with alcohol escape any conviction or heavy fine.

Ben, 15, had his first alcoholic drink when he was in year 7.

'My mate bought a massive sports bottle with a little bit of Coke and the rest was Jim Beam from his mum,' he said yesterday.

Today Ben is often pressured by others to drink but is part of a Youth Off The Streets program that encourages him to stay away from bad influences.

Another program member Natalya — who started drinking at 13 — has ended up in hospital three times because of alcohol.

'You just drank until you got drunk really — you drink until you drop,' the 15-year-old said.

Ted Noffs Foundation CEO Wesley Noffs said his organisation was being approached to provide residential rehabilitation to minors as young as 10 and 11, while Odyssey House boss James Pitts said alcohol was blamed for a 33-year high in admissions.

'When I first started working in this industry 25 years ago I saw case files on 16-year-olds and I was sceptical you could even have a problem at that age,' Mr Noffs said. 'But 10- and 11-year-olds can really have serious drug and alcohol problems, we now know it's not just rhetoric. We are really not taking this problem seriously.'

A recent study done by Odyssey House, one of the country's biggest rehabilitation centres, found 90 per cent of residents named alcohol as their first drug of intoxication at age 12 or 13.

'These days young people are out there, they're not slinking around hiding. They are in your face, they're drinking in public places,' Mr Pitts said.

He said the short-term risks were obvious with about 264 people aged 15 to 24 dying every year in falls, crashes, fights and other alcohol-related incidents.

'The research indicates that the earlier people start to drink the greater likelihood they will develop problems later in life,' Mr Pitts said.

An Australian secondary school report last year found, while the overall number of students drinking was slightly down on previous years, those who did drink hit it harder and earlier.

A study by the National Centre for Education and Training on Addiction found so-called 'cool' parents, social networking, availability of supply and a shift in the traditional family structure fuelled a 'hedonistic culture' of alcohol abuse.

Paul Dillon studied change in attitudes and abuse in recent years in his role as director of Drug and Alcohol Research and Training Australia.

'For years when I was asked how and when to introduce alcohol to children, my response was "before someone else does and as early as you think appropriate",' Mr Dillon said. 'That message has changed dramatically.'

Source: The Daily Telegraph, 12 February 2011.

Teen drinking falls but concern over risk takers

By Amy Corderoy

The number of schoolchildren drinking alcohol has fallen dramatically over the past 30 years, a large study of NSW students has found.

But experts say the message about the dangerous effects of alcohol on developing brains is not filtering through fast enough, with drinking still extremely common and many young people engaging in seriously risky behaviour.

McCusker Centre for Action on Alcohol and Youth head Mike Daube said a two-tiered drinking culture was developing.

'We have some positive indications about this generation in terms of alcohol and tobacco use, but we should be really worried by this two-tier split, these determined drinkers who are vomiting and drinking to get drunk,' he said.

Minister for Mental Health and Healthy Lifestyles Kevin Humphries said the survey of nearly 8000 NSW children from government, independent and Catholic schools showed just under half drank alcohol in the past year. This compared to nearly three-quarters of the students surveyed in 1984.

'When it comes to reducing the rate of teenage drinking, we are certainly heading in the right direction,' said Mr Humphries, who will launch the report on Wednesday.

'However, many of the statistics contained within this report are nothing short of alarming.'

Of those who drank in the past week, one in 10 drank more than 16 drinks in the one session. One-third of the students, aged between 12 and 17, who drank in the past year had drunk so much they vomited. One in five had got in a car with someone they thought had been drinking.

Michael Thorn, chief executive of the Foundation for Alcohol Research and Education, said it was very concerning that more than two-thirds of children had drunk alcohol, when the group was not meant to be drinking at all. 'The impacts of alcohol on young people, particularly on their developing brain and their future development of alcohol-use disorder, are significant,' he said. 'We know that young people who do consume alcohol are more likely to consume alcohol at risky levels.'

The report also shows that the eating patterns of secondary students in NSW appear to be improving, with increases in the proportion who eat enough fruit and vegetables and drops in soft drink consumption.

However, the majority still do not meet the recommended daily intake guidelines.

Chief health officer Kerry Chant said the level of students meeting the physical exercise guidelines — just over one in 10 — had remained stubbornly low.

'Physical activity is a problem across all age groups, and I think that's a reflection that there are a lot of drivers in society towards sedentary behaviour,' she said. 'It's going to take a lot of effort from everyone.'

Source: Sydney Morning Herald, 28 August 2013.



APPLICATION

Drinking behaviour of young people

Read the two snapshot articles on patterns of drinking by young people and then complete the activities below.

1. Describe how the article 'A generation lost to the demon drink' portrays young people and their drinking behaviour. Compare this portrayal with the article 'Teen drinking falls but concern over risk takers' and note any significant differences.
2. Use current research to assess the accuracy of these depictions of young people's drinking behaviour.

Illicit drugs are drugs that are illegal to use, possess, produce or sell. The most commonly used illicit drugs include cannabis, ecstasy and amphetamines.

The use by young people of **illicit drugs** such as cannabis, amphetamines, ecstasy and heroin is another behaviour with obvious health risks. Serious injury and death can result from overdoses or the combination of excessive

consumption of illicit drugs and risk-taking behaviour by young people. Depending on the drug, the amount used, the frequency of use and the way it is consumed, other significant harms have also been linked with the use of these substances. In the case of cannabis, regular and heavy use has been associated with hallucinations, depression, anxiety, poor memory function, difficulties sleeping and respiratory disease. Similar psychological harms are also likely to result from the regular use of other illicit drugs. Furthermore, the use of illicit drugs can have detrimental effects on the emotional and social health of young people, particularly if they develop a dependence on the drug. Family conflict, relationship breakdown, loss of motivation, involvement in criminal behaviour, troubles with the police and disengagement from school can all result from the use of illicit drugs and cause harm to the overall well-being of young people.

Results from the 2010 *National Drug Strategy household survey* indicate that 25 per cent of those aged between 14 and 19 years had used an illicit drug at some time in their lives, with 4.9 per cent reporting they had used an illicit drug in the previous week. Cannabis was the most commonly used illicit drug, with nearly 16 per cent of teenagers reporting they had used cannabis in the last 12 months. As shown in table 1.3, rates of cannabis use had been steadily declining over the past 15 years, but in 2010 there was an increase in the number of young people who had used cannabis. Recent use of ecstasy, on the other hand, fell by nearly 50 per cent, with the drop in female use being particularly marked.

Table 1.3: Trends in rates of recent cannabis use by young people[(a)]

	Year (percentage)			
Gender	**2001**	**2004**	**2007**	**2010**
Males	26.6	18.4	13.1	15.9
Females	22.6	17.4	12.7	15.5

(a) Recent use = used in last 12 months

Source: Adapted from *2010 National Drug Strategy household survey report*, drug statistics series no. 25, table 6.1, p. 103.

Table 1.4: Trends in recent ecstasy use by young people[(a)]

	Year (percentage)			
Gender	**2001**	**2004**	**2007**	**2010**
Males	5.7	3.9	4.0	3.1
Females	4.3	4.7	6.0	2.5

(a) Recent use = use in last 12 months

Source: Adapted from *2010 National Drug Strategy household survey report*, AIHW, drug statistics series no. 25, table 7.1, p. 117.



INQUIRY

Trends in cannabis and ecstasy use by young people

1. Look at the information in tables 1.3 and 1.4 on cannabis and ecstasy use by young people and comment on what it shows. Does the pattern of cannabis and ecstasy use by young people surprise you? Why or why not?
2. Give reasons why rates of cannabis and ecstasy use by young people may have changed in recent years.

INQUIRY

Trends in illicit drug use by young people

1. Use the internet to research the findings of the 2001, 2004, 2007 and 2010 National Drug Strategy household surveys in relation to the prevalence of use of *one* of the following drugs:
   (a) amphetamines
   (b) cocaine
   (c) heroin.
2. Investigate the percentage of young people who indicated they had used the drug in the previous 12 months.
3. Present your findings in a table similar to tables 1.3 and 1.4 and discuss possible reasons for the trends identified.

Behaviours relating to sexual activity



Figure 1.28: Young people who choose to be sexually active need to carefully consider the use of contraception to look after their own sexual health as well as their partner's sexual health.

A **dental dam** is a rectangular piece of latex that acts as a barrier between the mouth and genital area.

Adolescence is a time of heightened sexual awareness, an intensified interest in sexuality and emerging feelings of attraction towards others. At this time, some young people may choose to enter into close, intimate relationships and begin participating in sexual activity. Being sexually active can lead to a number of short-term harms and long-term consequences for the health and well-being of young people.

Engaging in unsafe sex increases the risk of contracting sexually transmitted infections (STIs), a number of which are increasing in prevalence in young people, notably chlamydia and gonorrhoea. Participating in unsafe sexual activity can also result in an unwanted or unplanned pregnancy. Studies have shown that teenage pregnancies are linked with a range of negative health and social outcomes that impact significantly on both young mothers and their babies. These include increased risk of premature birth, lower birth weight, difficulties finishing school and a lack of financial resources.

Experiences of unwanted sexual activity also lead to consequences that can last a lifetime. Along with the risk of physical harms such as STIs, pregnancy and injury, sexual assault can also result in the victim feeling a range of emotions including anger, shame, guilt, fear, mistrust, betrayal, loneliness and disempowerment. Left unresolved, these emotions can lead to poor mental and social health, which can then impact on other areas of health.

Young people who are sexually active need to look after their physical health by using protective behaviours that reduce or eliminate the possibility of an unwanted pregnancy and of being infected with an STI. These include participating in safer, non-penetrative sexual behaviours such as cuddling, kissing and mutual masturbation, and using a condom when participating in any form of penetrative sex. **Dental dams** can also be used when engaging in activities such as oral sex, which can also transmit STIs.

In terms of caring for their emotional health, it is important that young people endeavour to make sexual choices and develop strategies that will safeguard their reputation, minimise their chances of being used or exploited and prevent sexual assault.

The *Fourth national survey of Australian secondary students and sexual health 2008* examined the sexual behaviour of young people. The survey examined the differing attitudes and behaviour of males and females in sexual relationships, such as their attitudes towards the use of contraception and their participation in sexual behaviour while under the influence of drugs. Results showed that the majority of young people in the surveyed groups (years 10 and 12 students) were sexually active in some way. The proportion of students who had engaged in sexual intercourse had increased since the previous survey in 2002, with 27 per cent of year 10 students and 56 per cent of year 12 reporting they had participated in sexual intercourse. A number reported having participated in oral sex (33 per cent of year 10 and 58 per cent of year 12). Around 45 per cent of sexually active students reported having more than one sexual partner in the past 12 months, and this number had increased significantly since the previous survey in 2002. There was a significant difference between the genders in the students' relationship to their last sexual partner, with young men being more likely to have sex with someone they had not met before than young women (21 per cent compared to 8 per cent). Participating in casual sexual encounters and having multiple partners are risk behaviours that increase the possibility of contracting an STI.

Table 1.5: Reported participation in sexual activity of years 10 and 12 students

		Year 10		Year 12		Total	
		2002	2008	2002	2008	2002	2008
Deep kissing	Males	75.9	69.4	84.3	85.8	79.4	75.9
	Females	77.2	71.1	86.6	90.9	81.2	80.1
	Total	76.6	70.5	85.6	89.2	80.4	78.6
Sexual touching	Males	63.5	55.2	74.1	71.3	67.9	61.6
	Females	59.6	55.8	74.9	80.6	66.1	67.0
	Total	61.3	55.6	74.6	77.6	66.9	65.1
Oral sex	Males	39.5	32.4	55.7	48.4	46.3	38.8
	Females	35.6	34.3	57.5	63.1	44.9	47.4
	Total	37.3	33.6	56.7	58.4	45.5	44.3
Sex without a condom	Males	11.1	14.1	28.7	30.0	28.7	20.4
	Females	12.2	18.1	35.5	46.2	22.1	31.0
	Total	11.7	16.6	32.6	41.1	20.5	27.3
Sex with a condom	Males	26.0	26.5	46.8	45.5	34.8	34.1
	Females	23.0	28.0	43.7	60.3	31.8	42.8
	Total	24.3	27.4	45	55.6	33.1	39.7

Source: A. Smith, P. Agius, A. Mitchell, C. Barrett & M. Pitts, *Fourth national survey of Australian secondary students and sexual health,* Australian Research Centre in Sex, Health & Society, La Trobe University, 2008, p. 26.

A significant number of young people reported being under the influence of drugs when they participated in sexual activity, with 25 per cent being

drunk or high the last time they had sex. Seventeen per cent of young people reported that being affected by drugs contributed to their involvement in an unwanted sexual experience.

The inconsistent use of contraception by sexually active young people is another behaviour that places their health at risk. The *Fourth national survey of Australian secondary students and sexual health 2008* found that almost all sexually active students used some form of contraception during their last sexual encounter; 68 per cent of them used a condom during their most recent sexual encounter (a similar finding to the 2002 survey) and half of them used the contraceptive pill (an increase of 13 per cent from 2002). Being unprepared and not expecting sex (39 per cent), trusting a partner (31 per cent) and knowing a partner's sexual history (27 per cent) were the reasons most commonly given for not using a condom. While the survey found a decrease in the number of young people using the withdrawal method as a form of contraception, the finding that it is still practised by approximately 10 per cent of young people is concerning.

Table 1.6: Type of contraception used by years 10 and 12 students during their last sexual encounter

		Year 10		Year 12		Total	
		2002	2008	2002	2008	2002	2008
Condom	Males	75.1	78.6	68.7	68.9	71.4	73.2
	Females	69.2	73.7	51.1	60.6	58.6	65.1
	Total	71.9	75.4	59.0	62.8	64.4	67.6
The pill	Males	22.3	31.3	37.1	48.8	30.7	41.0
	Females	27.6	39.7	51.7	61.2	41.7	53.7
	Total	25.2	36.7	45.2	57.9	36.8	49.8
IUD	Males	0.7	3.5	0.9	0.0	0.8	1.6
	Females	0.0	1.7	0.1	1.2	0.0	1.3
	Total	0.3	2.3	0.5	0.8	0.4	1.4
Diaphragm	Males	1.3	1.1	0.8	0.0	1.0	0.5
	Females	0.0	0.0	0.0	0.0	0.0	0.0
	Total	0.6	0.4	0.4	0.0	0.5	0.2
The morning-after pill	Males	7.0	4.9	3.0	3.5	4.7	4.1
	Females	1.8	4.0	4.5	11.9	3.4	9.1
	Total	4.2	4.3	3.9	9.6	3.9	7.6
Withdrawal	Males	8.4	10.7	10.0	3.2	9.3	6.6
	Females	8.6	13.9	17.5	9.1	13.8	10.8
	Total	8.5	12.8	14.2	7.5	11.8	9.5
Rhythm method	Males	0.7	2.5	0.8	0.0	0.8	1.1
	Females	0.0	0.1	2.9	0.3	1.7	0.2
	Total	0.3	1.0	2.0	0.2	1.3	0.5
Other	Males	2.3	2.0	1.7	3.3	1.9	2.7
	Females	2.1	2.5	1.5	3.6	1.7	3.2
	Total	2.2	2.3	1.6	3.5	1.8	3.1

(continued)

Table 1.6: *(continued)*

		Year 10		Year 12		Total	
		2002	2008	2002	2008	2002	2008
No contraception used	Males	13.2	0.4	5.5	0.0	8.8	0.2
	Females	11.6	0.4	8.6	0.1	9.9	0.2
	Total	12.3	0.4	7.3	0.1	9.4	0.2

Source: A. Smith, P. Agius, A. Mitchell, C. Barrett & M. Pitts, *Fourth national survey of Australian secondary students and sexual health*, Australian Research Centre in Sex, Health & Society, La Trobe University, 2008, p. 42.

INQUIRY

Young people and sexual behaviour

1. Comment on the protective and risk behaviours evident in tables 1.5 and 1.6. Discuss health issues that could arise from these risk behaviours.
2. Identify other risk behaviours that increase the likelihood young people will experience harms to their health and well-being if they are sexually active.

Human papillomavirus (HPV) is a common sexually transmitted infection in both males and females. While a majority of HPV infections clear within a year, a small proportion lead to abnormalities in the cells which can, over years, progress to cervical cancer.

Connectedness refers to the sense of belonging or attachment an individual feels towards people and places they are frequently in contact with.

Another behaviour that can protect the health of young women is being vaccinated against two high risk strains of **Human papillomaviruses (HPV)**, which cause 70 per cent of cervical cancers in women. A free national HPV vaccination program was introduced for 12–13-year-old girls in 2007, with the program extended to include males in 2013. According to the *Fourth national survey of Australian secondary students and sexual health 2008* a large majority of young women (86 per cent) reported that they had been vaccinated for cervical cancer.

Behaviours relating to establishing social networks and support

Having a strong sense of **connectedness** to family, peers, school and the community has been shown to positively affect the health and well-being of young people. Connectedness refers to the sense of belonging or attachment an individual feels towards people and places they are frequently in contact with. Research has shown connectedness to be a significant protective factor for good mental health, as it is crucial in establishing a positive sense of identity, enhancing **resilience**, creating a sense of purpose and forming networks that can provide support and advice. These social networks make people feel cared for, loved and valued. Supportive relationships can also encourage healthier behaviour patterns. Groups of young people who find it difficult to live in their community with their sense of identity



Figure 1.29: Developing a strong sense of connection to peers and other groups is an important protective behaviour.

Resilience is the capacity of individuals to deal with adversity and challenges in ways that make it possible for them to lead healthy and fulfilling lives.

intact or who feel they do not 'fit in', such as same-sex attracted youth or some ethnic groups, can experience feelings of loneliness, sadness and alienation. Young people who are unable to develop or maintain meaningful positive relationships can feel isolated, have limited avenues of support at times of need and experience higher rates of depression. Participating in peer activities such as sporting teams or church groups, regularly attending school and choosing to be involved in voluntary work are all examples of behaviours that can enhance young people's sense of belonging and help create social networks, thereby protecting their health and well-being.

The 2007 *National survey of mental health and wellbeing* reported that 95 per cent of young people had at least one family member in whom they could confide, indicating support was available for them when they experienced tough times. The 2010 *General social survey* also found 92 per cent of young people had at least one friend in whom they could confide. This strong social support is likely to have positive effects on young people's mental health and assist them to better cope with change and stressful events.

The Australian Bureau of Statistics 2010 *General Social Survey* found that a number of young people were actively participating in their communities by either involving themselves in a social group or undertaking some form of voluntary work. According to the study, nearly two-thirds of young people participated in a social group, with sport or physical recreation groups or religious organisations being those with which they were most frequently involved. A further 27 per cent of young people were involved in some form of volunteer work, most commonly for the same types of groups. Participation in social and volunteer activities helps to improve the physical, emotional and social health of young people as it assists to:

- develop a sense of connection
- increase self-confidence
- enhance personal skills such as problem solving and communication



Figure 1.30: Undertaking voluntary work can help young people establish a strong sense of connection to their community.

- provide opportunities for young people to meet others
- support young people to be active and enjoy themselves.

Behaviours relating to safety

Despite a steady decline in the number of fatal crashes in recent years, road crashes continue to be the leading cause of death and injury for young people. Statistics in the *Young Australians: their health and wellbeing* 2011 report showed that road traffic accidents continue to be the most common cause of injury related death in 15–24-year-olds (35 per cent). Particular concern has been expressed about the over-representation of young people in injury and trauma figures for motor vehicle accidents. Analysis of 2011 road crash statistics compiled by the NSW Transport Centre for Road Safety showed that 21 per cent of all drivers and motorcyclists involved in fatal crashes were young people aged 17–25 years, even though this group accounted for only 14 per cent of licence holders. While the reasons for the over-representation of young drivers in crash statistics are complex and inter-related, risk-taking behaviour by young people is a significant contributing factor.

Young drivers often put their health and the health of others at risk by speeding when driving. These dangers are compounded by their lack of experience at identifying potential traffic hazards and knowing how to react appropriately when these situations arise. Research has found speeding continues to be the major cause of fatalities and injuries in vehicle accidents for all age groups. In 2011, 30 per cent of the young male drivers involved in fatalities in New South Wales were speeding, In contrast only 5 per cent of speeding drivers who were involved in a fatal crash were females. Of all the crashes (fatal, injury or no injury) that occurred in 2011 where speed was involved, 73 per cent of the drivers were found to be males aged 17–25, compared to only 27 per cent young females.



Figure 1.31: Cyclists who wear helmets are decreasing their chance of head injury in the event of an accident.

Drinking alcohol and driving is another health risk behaviour common among young drivers. Consuming alcohol reduces a driver's coordination and decision-making skills, while increasing their confidence and decreasing their inhibitions. This combination of factors significantly impairs driving ability. In 2011 alcohol was a factor in 21 per cent of the fatalities that occurred in New South Wales involving drivers aged between 17 and 25 years, while a further 24 per cent of young drivers involved in crashes where injuries occurred had consumed alcohol.

Driving while fatigued also impairs a driver's skill. Research suggests that many young people do not get enough sleep and insufficient sleep is likely to interfere with their functioning when behind the wheel. Twenty-nine per cent of people aged between 17 and 25 years who were involved in fatalities during 2011 were fatigued at the time of the crash. Other behaviours such as talking on mobiles, listening to music or interacting with passengers can also distract young drivers and negatively affect their driving.

The sense that some young people have of being 'bulletproof' or invincible can lead them to discount the importance of using protective equipment. Wearing helmets when cycling, the use of safety equipment at work and wearing seatbelts are examples of health protective behaviours that can decrease the chance of injury and death in the event of an accident, or significantly reduce the severity of injuries that result from accidents.

APPLICATION

Motor vehicle injuries and young people

eBookplus

1. Use the **Centre for Road Safety** weblink in your eBookPLUS to download the latest statistical statement on road crashes in NSW. Examine this data to investigate:
   (a) fatality and injury rates for young drivers compared to the general population
   (b) risk behaviours that contribute to crashes (for example, speed)
   (c) gender differences in risky behaviour by young drivers.
2. Present your findings as a Prezi presentation.

Behaviours relating to accessing help

Having the knowledge, skills and services available to provide appropriate health information and quality support when needed is yet another protective behaviour associated with positive health. Education is important in the provision of accurate knowledge and increased awareness of health issues. Having a greater understanding of protective and risk behaviours in relation to health assists in decision making and provides young people with a sense of empowerment over their lives, both of which serve to protect their health and well-being. Furthermore, having health services available that are appropriate to the needs of young people and being able to access these services when required is crucial to the diagnosis and provision of early intervention.

Research has highlighted the importance of health education, with accurate knowledge and appropriate attitudes frequently associated with the adoption and maintenance of health protective behaviours.

Various studies have shown young people's knowledge of issues that are particularly relevant to their health can be inconsistent or poor. For example, the *Fourth national survey of Australian secondary students and sexual health* 2008 found young people's knowledge of specific sexually transmitted infected and their effects on health was poor, with less than half of students in the survey knowing that chlamydia, the most common STI in young people, could affect both men and women. A similar percentage were unaware that genital herpes had no cure, so once infected a person would always have the virus.

Studies have also shown a reluctance or inability among young people to access help when needed for particular health issues. The *National survey of mental health and wellbeing* 2007 identified a reluctance by young people to seek help when experiencing problems with their mental health. According to the survey, over 85 per cent of young males and nearly 70 per cent of young females with a mental health disorder did not use any services. This reluctance to use services was highest in people aged 16–24, making young people least likely of any age group to seek help.

Research has found the major barriers to seeking help were feelings of embarrassment and shame about being identified with a mental illness or seeking help about it, along with problems recognising the symptoms. Concerns about confidentiality and trust and a preference to manage the problem on their own were also found to be significant barriers to young people's ability to seek help.

The effect of multiple protective or risk behaviours

Research has shown that certain health behaviours are often associated with each other and that these behaviours increase the health risks that young people face. For example, the *Fourth national survey of Australian secondary students and sexual health 2008* found that one-quarter of all the young people surveyed were drunk or affected by illegal drugs the last time they were sexually active. The survey's finding that unwanted sex was most commonly associated with excessive drinking highlights the correlation between multiple risk factors and increasing risk of health harm.

The presence of multiple health risk behaviours increases the level of harm that young people are likely to experience, both in relation to their health and their overall social and emotional well-being. *Young Australians: their health and wellbeing* 2011 reported that young people in the juvenile justice system commonly engaged in health risk behaviours such as drug and alcohol use, smoking and unsafe sex practices. They therefore tended to experience higher rates of blood-borne viruses, sexually transmitted infections, mental illness, substance abuse issues and incidence of self harm. These findings highlight the negative health and social outcomes that can result from combined risk behaviours.

The combined interaction of health protective behaviours can contribute to reducing the health risks experienced by young people. Strong family cohesion has been linked with numerous other positive health behaviours that are likely to have significant immediate and long-term health benefits. For example, research has highlighted a range of positive health behaviours associated with families regularly eating meals together. These include a strong sense of family connection, higher intake of lean meat, fruit, vegetables and dairy foods, decreased consumption of high-fat and high-sugar foods, lower incidence of eating disorders, and a reduced likelihood of drug use. Findings such as this suggest that the more health protective behaviours present in a young person's life, the greater the benefit to their overall level of health.

SNAPSHOT

Young men in crisis: mental health study

By Clifford Fram

Young Australian men are in crisis, with half feeling stressed and nearly one in 10 having thoughts about suicide, according to new research.

Mental health experts are alarmed by the extent of the unhappiness, but they are optimistic about finding an appropriate internet-based method of helping the tech-savvy generation.

The research, which explores the impact of technology on mental health and wellbeing, shows distressed 16-to-25-year-old men are likely to find health information on the internet as many listen to music and play games online.

The results suggest the current mental health system is failing young men, say the organisers. They believe improved mental health will reduce the number of suicides, vehicle accidents and fights, which are the biggest killers of young men in Australia.

'For the last 20 years we have known our young men are not faring well,' says Young and Well Cooperative Research Centre CEO Associate Professor Jane Burns, whose organisation partnered with Movember and beyondblue for the study.

'Technology presents our best prospect yet,' she says. 'We must partner with young men to create services that are more relevant to them.' The research shows distressed young men are likely to use the internet late at night.

'We must make sure we provide the right type of service at the right time, and that includes being available after 11 o'clock at night.

'There is a real sense of young men having to go through a rite of passage and they will eventually grow out of it.

'But there is a group who end up being the drug, accident and suicide statistics that we are nervous and concerned about.

'There are also those whose issues are never addressed, who end up having issues with drugs and alcohol in their 40s, and who end up being suicide stats in our older generation.

'Let's work out what we need to do to ensure that when young men are in distress they know how to get support.

'That might not be going to speak to a professional. That may be getting support in an online space they are comfortable with.' Beyondblue CEO Kate Carnell says the research provides invaluable insight into the online habits of young men, particularly those who need support.

'This will pave the way for better engagement with at-risk young men.'

Source: The Australian, 22 July 2013.



APPLICATION

Mental health—protection and risk

Read the snapshot 'Young men in crisis: mental health study' and then answer the questions below.

1. Analyse the various protective and risk behaviours that impact on the mental health of young men.
2. Outline the future health problems that researchers are concerned young men may face.
3. Explain why the interaction of various risk behaviours relating to mental health increases the potential harm to future health.



INQUIRY

Increasing or decreasing the risks faced

Choose a health issue relevant to young people; for example, sexually transmitted infections, injury or mental health problems. Discuss how risk behaviours or protective behaviours can interact to affect the level of risk young people face in relation to this health issue.

SUMMARY

- Health is diverse and means different things to different people.
- In the past health was defined as being free from disease or illness. However, the World Health Organization now defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.
- At an individual level, health depends on the interaction of four dimensions — physical, social, mental or emotional and spiritual aspects.
- Health is continually changing; that is, it is dynamic. Health is also relative, meaning that people consider their health in relation to the health of others and in relation to their own circumstances.
- People develop perceptions about their own state of health and the health of others. These perceptions are social constructs, meaning that how we see health is based on our own experiences and the social, economic and cultural conditions that we live in.

- The perceptions of health we develop affect our own personal health attitudes, beliefs and behaviours. They influence our expectations about people's ability to achieve good health. Government policy, priorities and expenditure are also influenced by perceptions of health.
- The media, peers and families all influence how health is perceived and the values, attitudes and beliefs we develop about the importance of health. They also influence our health knowledge, skills and behaviours.
- The health of most young Australians is generally good. However, young Indigenous Australians, young people living in regional and remote areas and young people who suffer socioeconomic disadvantage have poorer levels of health in comparison to their peers.
- The high incidence of mental health disorders, injuries and communicable diseases such as chlamydia and hepatitis C among young people are also areas of concern.
- The behaviours that young people adopt in relation to physical activity, healthy eating, substance use, sexual activity, help seeking, social connectedness and risk taking are likely to have a protective or harmful effect on their current and future health.
- Health protective and health risk behaviours can interact to decrease or increase the level of risk that a young person is likely to face in relation to their current and future level of health.

QUESTIONS

Revision

1. Use examples to **discuss** how and why people's health is constantly changing. (P3) (5 marks)
2. **Outline** factors that have a significant influence on people's perception of their health. Provide examples to illustrate how the various factors can affect the perceptions people form. (P1) (4 marks)
3. **Compare** how two distinctly different social groups (e.g. young people and the elderly) are likely to perceive health. Discuss the possible implications these differing perceptions may have on their health behaviours. (P1) (6 marks)
4. Health is now seen as a social construct. **Explain** what this means, using examples to support this explanation. (P3) (5 marks)
5. **Outline** how the media can influence people's perceptions about health. (P1) (3 marks)
6. **Identify** measures of health that provide indicators of the positive health status of young people. (P16) (3 marks)
7. **Outline** areas of concern relating to the current health of young people and discuss reasons for these areas being identified as concerns. (P2) (5 marks)
8. Critically **analyse** how a range of risk and protective behaviours are likely to impact on young people's immediate and future health and well-being. (P2) (8 marks)
9. Using examples, **explain** why the interaction of multiple risk factors contributes to poorer levels of health. (P3) (4 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

Answers to Application questions, page 21:
A: analgesics; B: alcohol;
C: tobacco; D: cannabis;
E: inhalants;
F: amphetamines; G: ecstasy;
H: steroids.

CHAPTER 2
What influences the health of individuals?



OUTCOMES

On completion of this chapter, you will be able to:

- describe how an individual's health is determined by a range of factors (P3)
- evaluate aspects of health over which individuals can exert some control (P4)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

OVERVIEW

THE DETERMINANTS OF HEALTH
Individual factors
Sociocultural factors
Socioeconomic factors
Environmental factors

THE DEGREE OF CONTROL INDIVIDUALS CAN EXERT OVER THEIR HEALTH
Modifiable and non-modifiable health determinants
Changing influence of determinants through different life stages

HEALTH AS A SOCIAL CONSTRUCT
The interrelationship of determinants
Challenging the notion that health is solely an individual's responsibility

Our ability to achieve and maintain good health is influenced by more than just the decisions we make about particular health behaviours and the lifestyle that we choose to lead. The differences between the health status of various groups of young people we learned about in chapter 1 highlight that our health is influenced and determined by a range of factors. These factors, or determinants as they are commonly called, include factors relating to culture, the societies in which we live, economics and environmental conditions, along with factors relating to the individual. These factors rarely impact on individuals and communities in isolation. Rather, they are often linked, meaning that a range of determinants interact to have a positive or negative impact on health. Many of these determinants are outside the control of the individual, making it difficult for people from particular groups within Australian society to exercise a high degree of control over their health and instigate changes to bring about improvements.

In this chapter we learn about the various determinants of health in order to understand how they work together to influence the health and well-being of people. We also look at the degree to which these determinants can be modified to assess how much control individuals are likely to have over their health, both now and in the future. This assessment allows us to investigate differences between the health of particular individuals and population groups in Australia and explore reasons for these inequities.



THE DETERMINANTS OF HEALTH

It is now widely accepted that a person's health is determined by more than just biology and the lifestyle choices that each person makes. Research has shown that the health of individuals and communities is affected by a broad range of factors relating to the community, environment and social context in which people live, along with the health behaviours that individuals adopt. The factors recognised as major influences on our health and well-being are generally referred to as determinants of health. The National Health Performance Framework defines **health determinants** as 'those factors that have a positive or negative influence on health at an individual or population level'. The key determinants of health are:

- individual factors, such as knowledge, skills, attitudes and genetics
- sociocultural factors; for example, family, peers, media, religion, culture
- socioeconomic factors, including employment, education and income
- environmental factors; for example, geographical location, access to health services and technology.

Health determinants are the individual, socioeconomic, sociocultural and environmental factors that can have a positive or negative influence on the health of individuals or populations.

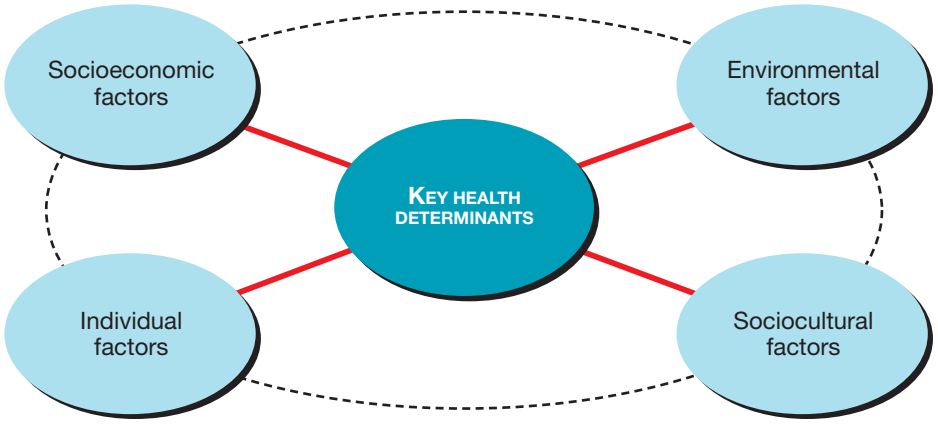


Figure 2.1: A number of key determinants have a significant influence on the health of individuals and populations. These determinants are often interrelated.

While each of these factors is going to be discussed individually in the following section, it is important to understand that they do not impact on people's health as isolated factors. Rather each determinant can be expected to have an influence on another. For example, living in an area with a high level of air pollution (environmental factor) is likely to be linked to a person's income (socioeconomic factor). Our health status is therefore the result of a complex interaction between the various health determinants.

Individual factors

Individual factors are those factors unique to each person that can determine their level of health.

Individual factors are those factors unique to each person that can determine their level of health. They include:

- the knowledge we have about health and the skills we possess that enable us to act in ways to promote better health
- the attitudes and values that we place on health and the importance of leading a healthy lifestyle
- genetic factors that increase the likelihood we may experience particular health problems.

Knowledge and skills

The knowledge and understandings that we develop about protective and risk health behaviours, and about products and people available to support good health have an important influence on our ability to act in ways that contribute to good health. When we compare the health levels of highly educated and poorly educated people in Australia, those who are poorly educated are more likely to have serious chronic illness. They are also more likely to perceive their health as fair or poor.

Health literacy is the ability to understand and interpret health information and use it to promote and maintain good health.

Our knowledge about health comes from a variety of sources — parents, siblings, peers, teachers, the internet and the media all play a part in conveying information about health. Previous experience can also contribute to what we know and understand about particular health problems. Having knowledge does not mean that people are able or willing to make healthy choices. However, **health literacy** enables people to gain access to, understand and use information in ways that can promote or maintain good health. It also helps them to assess the accuracy and reliability of information they may find.



Figure 2.2: Health literacy provides people with greater access to health information and assists them to understand and use this information to make healthier choices.

School lessons for optimism with new mental health classes

By Bruce McDougall

MENTAL health classes will be given to thousands of high school students across the state in a bid to counter soaring rates of depression and mental illness among adolescents.

The Black Dog Institute will start rolling out a $500,000 mental health program for year 9 and year 10 students in 800 government and non-government schools from the middle of the year.

Under the program teachers will be trained to deliver messages on key mental health issues including mood disorders, at-risk personality types, recognising symptoms, the benefits of therapy and how to build resilience.

Data shows the number of children in public schools with mental health disorders, including depression and serious behavioural disorders, has almost doubled to 8000 over the past eight years.

Principals campaigning for more counsellors to handle disturbed children in schools report more mental health issues are emerging in younger students — some exhibiting violent and challenging behaviours and a lack of remorse.

The Black Dog Institute will train 1500 high school teachers nationally over the next three years to deliver the innovative HeadStrong program that uses 'engaging and humorous' cartoon images to convey messages to students, supported by classroom activities.

Institute executive director Professor Helen Christensen said yesterday the program was an important initiative that provided a creative way of thinking, talking and teaching about mood disorders.

'One in five Australians will experience a mood disorder in their lifetime and up to 75 per cent of mental health issues emerge during the turbulent adolescent years,' Prof Christensen said.

'This resource is designed to target the needs of young people, with the visual format of the materials making it accessible to students of all intellectual abilities, as well as those from a low literacy or non-English speaking background.'

Developed with grant monies from the NIB foundation charity in line with the NSW Personal Development, Health and Physical Education stage five syllabus, the program will be expanded to Queensland during the second half of 2012 and to the rest of Australia by 2014.

The NSW Department of Education and Communities will work with the Black Dog Institute to integrate HeadStrong into school programs.

NIB foundation chairman Terry Lawler said a NSW trial had received 'overwhelmingly positive feedback'.

'By providing students with an increased knowledge of mood disorders . . . the aim is to help reduce the impact on young people,' he said.

Source: The Daily Telegraph, 7 March 2012.



INQUIRY

Developing knowledge and skills to improve health

Read the snapshot 'School lessons for optimism with new mental health classes', then answer the following questions.

1. Identify the knowledge and skills that the mental health program HeadStrong aims to develop in young people.
2. Discuss how increasing knowledge and improving skills could support young people's mental health and reduce the incidence of depression.

The acquisition of skills related to decision making, problem solving, communicating, interacting and moving may also contribute to improved health. For example, having a wide range of movement skills provides people with



Figure 2.3: Having good movement skills enables people to participate confidently in a range of physical activities.

Self-efficacy is our belief in our ability to be able to carry out a particular task.

the confidence to participate in sport and physical activity and try new things. Similarly, being able to effectively negotiate with others and resolve conflict can help maintain positive relationships. As with knowledge, having these skills does not ensure that people will always act in healthy ways. However, it does empower people and makes it easier for healthier choices to be made.

Attitudes

There is a strong link between knowledge and attitudes, with a person's level of knowledge likely to influence the attitudes they develop and the way they behave. For example, someone who has a detailed understanding of the illnesses associated with tobacco smoking is more likely to be against smoking and not smoke themselves. The attitudes we hold are influenced by families, peers, education, the media, our culture and the communities in which we live. Our sense of **self-efficacy** also has an influence on our attitudes and whether we feel capable of making lifestyle changes that may improve our health.

People's attitudes towards certain health behaviours, their willingness to seek help to address health concerns and the value they place on positive health all play a part in determining someone's health. Research into the factors that affect young people's willingness to seek help for mental health issues has identified a number of key barriers to accessing help. These include feelings of embarrassment, a preference for managing problems without help, and concerns about trusting people who are potential sources of help. On the other hand, those who held positive attitudes towards health professionals are more likely to seek help. Knowledge about the type of help available and where this help could be found also served to encourage help-seeking behaviour.



INQUIRY

Young people's attitudes towards health

1. Consider the attitudes of young people in relation to *one* of the following health behaviours:
   (a) using condoms when sexually active
   (b) using a mobile phone while driving
   (c) seeking help to cope with personal problems
   (d) drinking alcohol.

2. Discuss the possible health outcomes of different attitudes regarding the health behaviour.
3. Identify factors that can have a positive or negative influence on the attitudes young people develop about the health behaviour. Explain how each of these factors influences young people's behaviours, attitudes and beliefs.

Changing circumstances, such as parental separation, or living through particular experiences (for example, a car crash) may also see our attitudes change, leading to corresponding changes in the way we behave.



Figure 2.4: Attitudes towards seeking professional help can affect a person's level of health.

Genetics

Genetics refers to characteristics, features or hereditary diseases that are genetically linked and are passed on within a family.

Our potential to achieve a certain level of health may be significantly influenced by **genetics**. A number of genetic disorders, such as muscular dystrophy and cystic fibrosis, lead to chronic ill health and decreased life expectancy. These diseases are caused by genetic information passed on by parents at conception. Other disorders such as Down syndrome, which can affect physical development and intellectual functioning, are the result of chromosomal abnormalities that occur during pregnancy.

Genetics can also play an important role in a person's susceptibility to certain diseases or health problems. People with fair coloured skin, which is a genetically inherited trait, are at greater risk of developing skin cancer as their skin burns more easily and more quickly following exposure to the sun. Research has identified that diseases such as breast cancer, asthma, heart disease and diabetes have a genetic link, making those with a family history of these diseases more susceptible to developing the disease themselves.

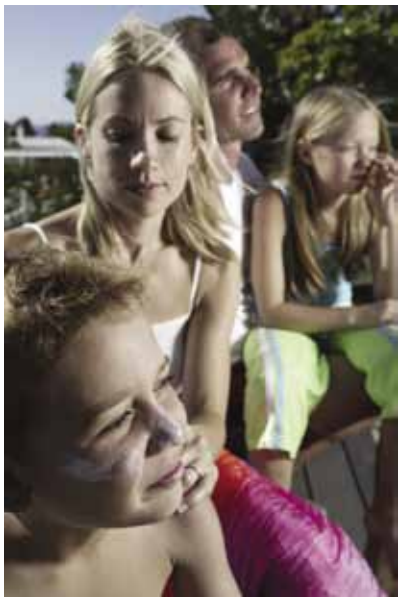


Figure 2.5: Our skin type is inherited from our parents, making certain groups more predisposed to skin cancer.

The genetic information that is passed on by our parents can also positively influence our health. The genes we inherit provide us with potential in terms of intellectual capacity, physical abilities and life expectancy. For example, hereditary factors have an effect on how fast we can run, how coordinated we are and how well suited we are for particular sports. Hereditary factors therefore have an influence on our sporting abilities and likelihood of successful participation.

However, while genetics influence our health potential, there is no degree of certainty that we will inherit all of the health conditions of our parents or grandparents. Many genetic disorders are complex and do not follow a clear-cut pattern of inheritance. Lifestyle and environment also play a part, meaning that if people make positive adjustments to how they live they can reduce their risk of ill health and maximise their potential. Similarly, even though we may have inherited superior genes for both physical and

intellectual growth and development, a poor physical and sociocultural environment can negatively affect our level of health. This reduces our potential.

Sociocultural factors

Sociocultural factors relate to the society in which people live and the cultural practices and expectations that exist within these communities.

All individuals belong to a variety of social groups within the community in which they live. These groups and the culture that exists within them and society in general can be important determinants of health because of the influence they have on people's values, attitudes and behaviours related to health.

Our families, peer group, the media, religion and cultural background are the **sociocultural factors** that exert the biggest influence on our level of health. Each of these sociocultural factors plays a significant role in shaping our values, determining our knowledge and affecting our health behaviours through the expectations they create, the health behaviours they encourage and the cultural practices they support. Assumptions relating to how certain groups should look, think and behave (for example, males and females) can create pressure to conform that leads to risk taking. Those who are unwilling or unable to meet these expectations can feel a sense of alienation that is detrimental to well-being.



Figure 2.6: Masculinity can be associated with the ability to control a powerful car driven at high speed. This can encourage risk taking by young males.

Family

Research has shown that a person's family and their home environment can significantly influence their health and well-being. Families are responsible for ensuring physical needs such as safe housing, food, clothing and medical requirements are met while also providing emotional support such as love and care. Research has shown that being a part of a cohesive family acts to protect the health of children and young people, and helps them cope better when they experience stressors or tough times in their life (*Young Australians: their health and wellbeing* 2011). Children living in situations of violence, abuse or neglect are at risk of immediate physical injury and emotional distress and are likely to suffer adverse consequences on their long-term physical, emotional and social well-being.



Figure 2.7: Families play an important part in modelling good health practices.

Families play an important part in promoting good health and positively influencing members of the family to behave in ways that protect their health. For example, when, what and how much food is served and eaten are all behaviours that develop within the family unit. Families that serve three daily meals containing a wide variety of nutritious foods in the appropriate amounts not only ensure that nutritional requirements for healthy growth and development are met, but also instil in children the importance of healthy eating. Family expectations

about the type of behaviour that is appropriate and acceptable are also an important factor. Research has found that children living in households where someone smokes are more likely to take up smoking themselves, particularly when their smoking is condoned or accepted by their parents.

Families are also an important source of information and support when people experience health-related problems. In addition to providing someone to talk to and seek advice from, families can also facilitate access to medical professionals and health services. Research indicates that people who lack social support from their family have higher rates of illness and death than those who are able to use their families as a source of knowledge and assistance.

SNAPSHOT

Fitness is a family affair

By Ilsa Cunningham

The end of school holidays means there's less time for tearing about on bikes, playing at the beach and racing around at the park.

After a day at school, it could be easier for kids to return home and flop down in front of the TV or computer than do something active.

With almost one quarter of Australian children overweight, according to the government's Healthy Weight 2008 report, it's important that kids get sufficient exercise to live a happy, healthy life.

According to Wollongong personal trainer and exercise physiologist Rob Battocchio, kids need a minimum of one hour of exercise each day, but preferably 90 minutes.

Exercise doesn't have to be a drag, there are plenty of ways in which to make it an enjoyable pastime.

If parents lead by example and introduce it as a fun activity, this helps ensure the exercise continues.

Battocchio says it's important to develop good habits early and incorporate exercise within the daily routine.

'Actively encourage outdoor pursuits, like going to the park with a frisbee, or cycling,' he says.

'Introduce exercise as a regular part of your lifestyle, not something that they have to do in a controlled manner. It's a part of recreation and fun.'

It's no good preaching about exercise if you don't practise it. If a parent doesn't make time to exercise, then why should their child?

That means being a good role model, and getting active with the kids, or demonstrating incidental physical activity like walking to work or the shops, and taking the stairs instead of the lift.

A good way for a child to get some incidental exercise is to walk or cycle to school. Parents concerned at the safety risk could organise a group of neighbourhood kids to walk or cycle together.

If it's after-school exercise you're looking for, pick a team sport. There are plenty to choose from, and they're also a good way to socialise.

'Exercise is not about just the health benefits. Studies prove exercise is beneficial to being mentally acute and aware for studying, and students perform better in school-related tasks,' Battocchio says.

Exercise also teaches kids discipline and time management, which are useful life skills.

Getting teenagers to exercise might be difficult if it's not normally part of their daily routine. To overcome that, Battocchio suggests negotiating with your teen about physical activities they may enjoy.

Source: Illawarra Mercury, 18 February 2009, p. 27.



INQUIRY

The influence of families on health

Read the snapshot 'Fitness is a family affair' and answer the following questions.

1. Explain how parents can have a positive influence on their child's level of physical activity.
2. The snapshot stresses the importance of parents being good role models. Choose another health issue and describe ways that parents can be good role models in relation to that health issue.

Peers

Peers have a powerful influence on the decisions people make relating to health and the type of behaviours they undertake. This influence may be beneficial to their level of health or can have a negative impact. Young people can be particularly influenced by the values, attitudes and behaviour of their peers as they seek to establish their identity and feel a sense of belonging. When peer groups share common interests and similar values it can be easier to make healthy choices. For example, being part of a peer group that enjoys being active and supports the participation of people regardless of their level of ability will help people feel comfortable and encourage them to join in sporting or recreational activities.

Figure 2.8: Peers can support and encourage individuals to make healthier choices.



Making healthy choices can be more difficult when the peer group is not supportive or when the values held by those in the group differ from those held by the individual. For example, it can be difficult to maintain a decision not to drink alcohol if you attend a party where everyone else is drinking and you are continually offered a drink or questioned about why you are not drinking.



INQUIRY

Exploring the influence of family and peers

Consider the following lifestyle behaviours that can positively or negatively affect your health:

- participating in regular physical activity
- tobacco use
- eating a healthy diet
- using sun protection
- safe driving behaviour.

Explain how your family and peers have influenced your knowledge, values and attitudes in relation to each lifestyle behaviour. Determine the group that you believe has the greatest influence on your attitudes and behaviour and justify your choice. Discuss your findings with a classmate.

Media

The powerful influence that the media can have on a person's opinions, beliefs and habits makes it an important socio-cultural determinant of health. Electronic media such as television, movies and the internet, along with written forms of media such as newspapers and magazines, all play a significant role in disseminating information relating to health. For example, advertisements about skin cancer or stories on domestic violence seek to raise awareness and



Figure 2.9: Media images can have a significant influence on people's health values, attitudes and behaviours.

enhance people's understanding of health-related issues. It is crucial that any health-related information presented in the media is accurate, fair and balanced, as bias or inaccuracies can lead to misconceptions and confusion that can endanger someone's health.

The choices relating to health that individuals make are significantly influenced by values and attitudes promoted through the media. Research has shown that media images glamorising drug use can have a significant influence on people's attitudes towards that drug and the likelihood they will use the drug. For example, images in movies that associate smoking with positive personal qualities such as popularity, success, being cool or being masculine have been shown to contribute to positive perceptions of smoking by young people. The frequency of smoking in movies can contribute to a perception that smoking is a common, acceptable behaviour within society. Such a belief is contrary to current statistics from the *National Drug Strategy household survey* that showed more than 80 per cent of Australians were not regular smokers.



Figure 2.10: A person's own body image can be influenced by media representations of an 'ideal' body shape.

Images conveyed through the media can also have a significant impact on the expectations that society forms and the risk behaviours that arise from these expectations. Images of males driving powerful vehicles at high speed, such as in car chase scenes, or images of New Year's Eve revellers celebrating with all night drinking sessions can encourage behaviours that may lead to immediate and long-term health harms and reinforce a belief that this behaviour is acceptable and not a major concern. Similarly, the constant portrayal of images of women who are tanned, attractive and slim, and of men who are tall, tanned and muscular can contribute to beliefs about what is the ideal body shape. Pressure to conform to these stereotypes can have a considerable influence on people's self-image, their feelings about their appearance and the health behaviours they adopt in an effort to match these expectations.

The media can also assist to shift society's attitudes about particular health behaviours. Health promotion campaigns on television and radio, such as those about unsafe driving behaviours or binge drinking, are frequently used to not only raise awareness, but also to challenge people's beliefs about what is acceptable behaviour in an effort to improve health and reduce rates of mortality and morbidity.

Under the sway of social media

By Cosima Marriner

The more time teenage girls spend on social media — caught in a world of competition for likes on Facebook, posting weight-loss progress selfies on Instagram — the more likely they are to be dissatisfied with their bodies and have low self-esteem.

New Flinders University researchers interviewed more than 1000 high school girls and found conversations about appearance were 'intensified' on social media, and were more influential because they involved peers.

The girls who were first interviewed in years 8 and 9 were asked about their social media habits and self-esteem, then again when they were in years 10 and 11. By then 90 per cent had a Facebook account, with an average of 475 friends and were uploading pictures of themselves to the internet. The time they spent on social media had blown out from 1 hour 45 minutes a day to 2½ hours.

Even though 80 per cent of the girls surveyed were classified as normal weight, 46 per cent said they were dissatisfied with how much they weighed. 'Time spent on social network sites was related to lower self-esteem, body-esteem, sense of identity and higher depression,' Amy Slater from Flinders University's school of psychology said.

Social commentator Melinda Tankard Reist said young girls seeking affirmation via social media were 'setting themselves up for negative mental health outcomes'.

'They feel they have to be on display,' she said. 'We live in a culture that rewards exhibitionism [and] everyone is judged on their physical appearance.'

Professionals say social media has a more powerful influence on teenage girls than traditional media because it is so pervasive and interactive. Dr Slater said comments from peers are of the utmost importance. 'A lot of the commentary is very appearance focused. [Even] a positive comment about appearance can still have a negative impact on how you feel about yourself by putting over-emphasis on appearance,' she said.

When even Kevin Rudd posts selfies on Instagram, principal of the Ascham girls school Helen Wright said it was understandable young people thought that was expected of them. 'They are copying so much of what they see around them [but] if people are always looking at themselves through the eyes of others, it's going to lead to a situation where they value themselves less,' she said.

Dr Wright advises parents not to let their children have internet access in the bedroom, to limit their time on social media, and to educate them about the posterity of images and comments they post online.

Ms Tankard Reist said the Australia's Next Top Selfie competition was a prime example of the way social media prioritises looks. To win a VIP pass to the final of the new season of *Australia's Next Top Model* and feature in Cosmopolitan magazine, girls as young as 13 are invited to post a selfie on Instagram with the hashtag antmselfie.

More than 37 000 girls have entered, with their shots streamed live on the show's website.

Source: Sydney Morning Herald, 21 July 2013.



INQUIRY

The media's impact on health

Read the snapshot 'Under the sway of social media' and then answer the following questions.

1. Identify ways in which:
   (a) young girls put themselves on display to others when using social media
   (b) peers are able to express their opinion on social media about a person's appearance.
2. The article states that young girls feel they have to be on display when using social media. Outline factors that may contribute to this expectation.
3. Outline the health issues that were linked to regular use of social networking sites by young females.

4. According to the article 'social media has a more powerful influence on teenage girls than traditional media'. Discuss whether you agree with this finding, giving reasons for your opinion.
5. Using examples, discuss ways in which the media can have a positive and negative influence on young people's level of health. Present your ideas as a mind map.

Religion

Religious beliefs are another sociocultural factor that can influence people's health decisions and behaviours and therefore affect their level of health. Beliefs relating to food, sexual activity and drug use are examples of areas where people's religious faith can affect their lifestyle and choices. According to some religions people should not engage in sexual activity prior to marriage, so risks associated with sexual behaviour, such as sexually transmitted infections or unplanned or unwanted pregnancies, don't exist for those who practise these faiths. Certain religions, such as Islam, Seventh Day Adventism and Buddhism, forbid or discourage the consumption of alcohol, meaning that the risk of suffering health problems related to alcohol is reduced for people who adhere to these beliefs. Religious beliefs and practices around food can also restrict the eating of certain types of food, influence the way it is prepared, or affect eating patterns. The teachings of Seventh Day Adventists, which emphasise diet and health, require people of this faith to follow dietary restrictions that are believed to conform to Biblical guidelines. A vegetarian diet is recommended and followers are encouraged to eat wholegrain products rather than refined foods, limit fat consumption and drink large amounts of water. Adherence to these beliefs is likely to benefit physical health by reducing health risks associated with unhealthy eating such as obesity, cardiovascular disease, type II diabetes and some forms of cancer.

Having a strong religious faith can also benefit a person's spiritual health and well-being by adding meaning to their life, creating a sense of hope and optimism and providing support during times of adversity.

Culture

A variety of different cultures exist within society: cultures related to gender (such as male culture), age (for example, youth culture), location (for example, beach culture) and ethnicity are some examples of the cultures present in our society. Each of these cultural groups holds particular values, beliefs and assumptions that strongly influence the behaviour of its members and can significantly determine their level of health.

A person's ethnic origins and place of birth can have both a positive and negative influence on their health status. According to *Australia's health 2012* the death and hospitalisation rates for people born overseas who migrated to Australia are generally lower than rates for people who are Australian born. Rates of disability and lifestyle-related risk factors are also lower. Diet is a major contributing factor, with many migrant groups eating the traditional foods of their culture, which often consist of highly nutritious, fresh foods. Most Asian diets, for example, consist of low-fat foods such as rice, lean meats and vegetables which are likely to support good health.

Language difficulties and cultural beliefs can create barriers that have a negative effect on health. Unfamiliarity with the Australian health-care

system, a lack of fluency in English or cultural insensitivities can prevent or hinder migrants from accessing appropriate health care. Difficulties finding work due to limited experience, language difficulties or a lack of contacts can also see ethnicity linked to low socioeconomic status for some people who have migrated to Australia. This socioeconomic disadvantage tends to make it harder to achieve an optimal level of health. The health of some newly arrived migrants may be further affected by the hardships and trauma they have experienced prior to resettling in Australia. For example, many refugees may experience ongoing mental health issues as a result of violence and conflict they have witnessed or endured.

Attitudes and beliefs about physical activity can restrict the level of participation in physical activity, particularly by women and girls. The 2010 SPANS survey found students from Asian backgrounds and girls from Middle Eastern backgrounds were less active than students from English-speaking backgrounds.

SNAPSHOT

Culture and women's participation in sport

Ethnicity has been shown to be a determinant of the level of participation in sporting opportunities, especially in terms of restricting involvement for women and girls. An Australian Bureau of Statistics survey in 2002 found that women born in non–English-speaking countries have significantly lower rates of participation in sports and physical recreational activities (46.3 per cent) than women born in Australia (63.6 per cent) or born in countries where English was the predominantly spoken language (66.5 per cent). Research has found that women, particularly those from non-English-speaking backgrounds, often face a number of barriers to participating in physical activity. These include:

- a lack of information about how to access programs
- poor access to female-only facilities
- lack of knowledge or empathy on the part of sporting organisations and recreation providers in relation to different cultures and their requirements
- lack of programs that take into account the needs of all family members (e.g. both women and younger children)
- lack of knowledge of the benefits of physical activity
- reluctance of many women to join existing sport and recreation programs, along with a desire to participate within their own cultural group
- a perception that sport is too aggressive and competitive
- lack of proficiency and lack of confidence in the use of English
- the prohibitive cost of sport and recreation programs
- the lack of female role models within ethnic communities who can encourage others to get involved in sport and recreation activities
- lack of access to transport to venues.

These barriers add further to obstacles such as harassment, social stereotyping, lack of time or perceived lack of time, reduced leisure time owing to family responsibilities and lack of skills or perceived lack of skills that negatively impact on the participation of women and girls in sport and physical activity.

Source: About time! Women in sport and recreation in Australia, Commonwealth of Australia 2006, pp. 28–9, 51–2.



INQUIRY

Women, cultural background and physical activity

Read the snapshot 'Culture and women's participation in sport', then answer the following questions.

1. Describe how cultural background can influence women's participation in physical activity. Would it have the same degree of influence on the participation of men? Explain why or why not.
2. Predict what the health implications or consequences of limited participation in physical activity might be for the women mentioned in the snapshot if this situation remains the same.
3. The snapshot highlights a range of barriers that women often face to participating in physical activity. These include a lack of knowledge, prohibitive costs, poor access to venues, lack of skill and a perception that sport is overly aggressive and competitive. Analyse how the barriers identified in the snapshot interact with cultural background to create particular barriers to participation in physical activity for women from non-English-speaking backgrounds.
4. Discuss two other ways that cultural background can positively or negatively impact on health.

Being of Aboriginal or Torres Strait Islander descent also has a significant influence on health. Indigenous people experience much poorer health than other Australians. They have a much lower life expectancy, die at much younger ages and are more likely to have a lower quality of life as a result of experiencing ill health. Numerous factors relating to the living and social conditions of Indigenous people, along with significant levels of socioeconomic disadvantage and a reduced sense of control over their own lives, may help explain the poor health of Indigenous Australians.

Young people's attitudes and beliefs can be a significant determinant in the health risks they are likely to experience. As discussed in chapter 1, injuries are the leading cause of hospitalisation and death of people aged 15–24 years, with transport accidents and intentional self-harm responsible for many of these deaths. A desire to be independent, challenge themselves, experiment, have fun and fit in, along with feelings of invincibility may see young people engage in numerous high risk behaviours, that increase the likelihood they will be injured, such as binge drinking, speeding and travelling in overloaded cars. Many of these things are considered to be rites of passage from childhood to adulthood by some parts of society, leading to assumptions about how young people will behave. These assumptions can contribute to the attitudes that young people develop and can place direct or indirect pressure on them to conform to these expectations.

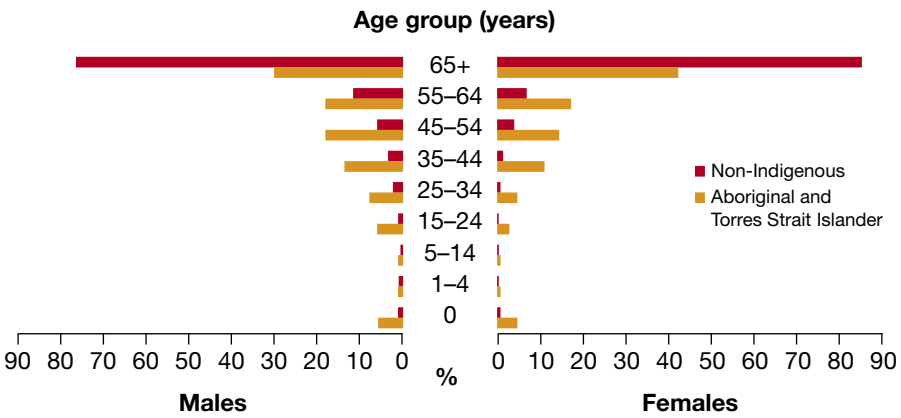


Figure 2.11: Age distribution of deaths among Indigenous and non-Indigenous people, 2006–10

SNAPSHOT

More than a million people drink just to feel normal

By Anthony Gough

A new report into alcohol consumption has found 4 million Australians drink out of habit, about 1.4 million of them drinking to 'feel normal'.

The Roy Morgan survey, conducted for the Salvation Army, also showed 2.4 million people, and one-third of 18- to 24-year-olds, drink specifically to get drunk.

The Salvation Army state drug and alcohol services co-ordinator, Kathryn Wright, said the findings were alarming and showed a culture saturated by alcohol. Of the 1.4 million who say they drink just to feel normal, 'whether that's socially normal or biologically normal, either way it's very concerning,' she said. 'The very act of getting drunk has health implications every time someone does it.'

The survey found the main reason for drinking was social: 61 per cent said they often drank to be sociable, to celebrate or because the people they were with were drinking.

'It's so ingrained in our culture that drinking is the way that you celebrate, it's the way that you commiserate, it's the way that you socialise, that it sort of crosses a boundary that drunkenness in some instances is very socially acceptable,' Ms Wright said.

The Roy Morgan survey was conducted as part of the Salvation Army's annual research into alcohol awareness, which has taken place since 2002. Since then, alcohol consumption overall has declined gradually, mostly among men.

But the report showed almost 10 per cent of men drink every day, and 36 per cent consumed more than the recommended amount of alcohol in a single session in the previous month.

The director of addiction medicine at St Vincent's Hospital, Dr Jon Currie, said National Health and Medical Research Council guidelines recommended two standard drinks, or less, per day for adults of both genders, with no more than four standard drinks in any one session.

'Above that, the risks start to rise fairly dramatically,' he said.

Source: Sydney Morning Herald, 14 September 2010.



INQUIRY

Attitudes towards alcohol in Australia

1. Outline the key findings of the Salvation Army's research into Australians' attitudes towards alcohol.
2. Identify examples of celebrations where drinking alcohol is often seen as an essential to the occasion (e.g. New Year's Eve).
3. According to the Salvation Army spokesperson, the research findings show 'a culture saturated by alcohol'. Do you agree with this finding? Give reasons for your answer.
4. Discuss in groups:
   (a) sociocultural factors that may contribute to the belief that drinking alcohol is an important part of celebrations
   (b) how this belief might impact on people's health.

Socioeconomic factors

The World Health Organization defines social determinants as 'the conditions in which people are born, grow, live, work and age'. Furthermore they stated that these determinants, which are significantly influenced by the distribution of money, power and resources, are largely responsible for the health inequities that exist within and between countries. A person's socioeconomic status has a significant influence on the likelihood that they will be exposed to health risk factors,

with those who are socioeconomically disadvantaged likely to face the greatest number of risks and therefore find it more difficult to experience good health.

Analysis of health statistics collected by the Australian Institute of Health and Welfare has consistently found differences in rates of mortality, morbidity and life expectancy between those in the higher and lower socioeconomic groups within Australia. It appears that as people move down the social class hierarchy, their vulnerability to ill health increases. They live shorter lives, suffer more illnesses and have more risk factors for ill health present in their lives (see table 2.1).

Table 2.1: Proportion of population with selected health risk factors and long-term conditions by socioeconomic position, 2011–12 (per cent)

	Quintile of socioeconomic disadvantage	
	Most disadvantaged (1st quintile)	**Least disadvantaged (5th quintile)**
Selected health risk factors		
Current daily smoker	23.8	10.2
Alcohol consumption — exceeded lifetime risk guidelines	16.7	22.0
Sedentary/low exercise level	75.7	59.3
Overweight/obese BMI	67.2	58.9
Inadequate fruit or vegetable consumption	96.2	93.3
Selected long-term conditions		
Asthma	12.1	8.9
Diabetes mellitus	5.4	2.6
Heart, stroke and vascular diseases	6.2	3.4
Arthritis	17.2	12.3
Mental and behavioural problems	16.9	11.5

Source: Data from selected tables in *Australian Health Survey: First Results, 2011–12*, Australian Bureau of Statistics, cat. no. 4364.0.55.001.



INQUIRY

Socioeconomic determinants of health

Examine table 2.1, then answer the following questions.

1. Compare the health risk behaviours and health conditions of people in the least and most socioeconomically disadvantaged groups and identify areas of significant difference.
2. Consider reasons relating to socioeconomic factors (for example, employment, income, education) for the differences that you find.

Education, income and employment are the key socioeconomic factors where disadvantage (either in one area or a combination of areas) is likely to negatively influence a person's level of health.

Education

A person's level of education has a significant impact on their health. Education enables people to gain greater knowledge of health issues and increase their understanding of health protective and risk factors that can contribute to these issues. Research has shown that people with higher levels of education are less likely to smoke, be inactive and suffer obesity. Education also provides opportunities for people to develop skills that can assist them to assess health information and products, and access appropriate health services when required.

In addition to enhancing people's knowledge and skills, education also serves to develop within the individual a sense of **empowerment** over their

Empowerment for individuals means that they are aware of the choices they have, they can make decisions without relying on others or expecting others to make decisions for them and they can act in various situations in daily life to protect themselves and promote their health.

lives. This in turn increases the likelihood they will take action to improve their health.

Research has shown that engagement in education influences a person's health. Having a high level of literacy and numeracy helps people in their day-to-day living, while also enhancing their employment or post-schooling opportunities once they finish. Engagement in school also contributes to a sense of connectedness or belonging and provides young people with access to support if needed. On the other hand, school failure or leaving at an early age can make it more difficult to obtain employment, while also contributing to a sense of alienation and disconnection from society. Low levels of education, along with significant health problems such as mental health problems and substance abuse are commonly found in people who are imprisoned, highlighting the role that attaining an adequate level of education can play in supporting health.



Figure 2.12: Engagement in school acts as a protective factor for young people's health.

Employment

Being able to secure satisfying, meaningful and regular employment has a positive influence on our health. Reports on the health of Australians have estimated that mortality rates are significantly higher for unemployed Australians than for those who are employed. Employment provides opportunities to be active, interact with others and feel a sense of control over our lives, as well as ensuring a degree of financial security. Unemployment has been linked to a loss of confidence, limited social contact, and feelings of depression and disempowerment, all of which significantly affect a person's emotional and social health. Rates of self-harm, attempted suicide and suicide have been found to be higher in people unable to find work, particularly following extended periods of unemployment, while higher incidence of cardiovascular disease and lung cancer have also been linked with unemployment.

The type of occupation a person has can also determine their health. Jobs involving manual labour, such as trades or transport jobs, have higher rates of injury and death than clerical, managerial or professional occupations. The latter group, however, may be less physically active at work as their job involves large amounts of time sitting doing computer-based work. Employment in certain jobs is likely to result in exposure to high levels of pollution or increase the risk of coming into contact with harmful substances such as asbestos, chemicals or radiation.



Figure 2.13: Workplace injuries are more likely to occur in occupations involving physical labour and high risk environments.

Income

Those who have higher incomes have more money available to spend on health-related products and services, such as sporting or recreational activities, better quality food, private health insurance and alternative health services that can support good health. They have the freedom to choose from a greater range of options and the confidence of knowing they can afford whatever is needed to look after their health. This knowledge is likely to decrease stress and contribute to a sense of greater control over their life, which enhances psychological well-being.

Poverty, on the other hand, increases people's exposure to risk behaviours likely to harm their health while also restricting their access to health services and reducing their capacity to modify their lifestyle. It also decreases the likelihood that people who are the most disadvantaged will live in safe, secure housing that is of an adequate standard. Those experiencing financial hardship tend to live in overcrowded conditions in communities with high population density, fewer transport and recreational facilities and less support services available. These living conditions add to the health risks faced by low income groups and further restrict their opportunities to seek help with health problems.

SNAPSHOT

What does it cost to be healthy?

By Rosalyn Page

Is prevention cheaper than cure? Are regular dental check-ups more expensive than fillings and root canal? Rosalyn Page investigates the economics of maintaining good health.

You can't put a price on your health — or can you? The federal Department of Health and Ageing (DHA) once valued a healthy life at $1 million — and that was in 2002. Every year lost to illness, they estimated, costs the community about $60 000.

Each year, Australians spend more money in order to be healthy. The Australian Institute of Health and Welfare (AIHW) revealed in 2006 that a staggering $86.9 billion was spent on health — or rather, illness — which is about $4226 per person. The figure has been steadily rising; 10 years ago, average health expenditure was $2146 per person . . .

But just how much is it likely to cost you, as an individual, to stay healthy? If you followed all the recommendations from all the health experts, how much would you spend?

If you visit the GP twice a year, you're looking at about $60 if your doctor doesn't bulk bill. If you have six-monthly dental check-ups, you'll pay about $320

and Cancer Council sunscreen to prevent skin cancer will set you back about $60 a year.

An eye examination is covered by Medicare if the optometrist bulk bills and childhood immunisations are covered by Medicare; a week's worth of healthy food is about $290 a person (according to US estimates) and gym membership is about $25 a week.



In total, that's $16 880 a year to cover your basic health guidelines — you'll pay more for medications, spectacles, private health insurance, specialists' fees, preventative health treatments and organic food. This could add upwards of $2000 to your overall health bill.

The cost of seeing a doctor

The Australian Medical Association (AMA) recommends that people have a family doctor and see him or her when necessary (the regularity depends on your age and state of health). Women need a Pap smear every two years, which is free if your doctor bulk bills, but there are no recommendations specific to men's sexual health. (The jury is out on whether men should have preventative checks for prostate cancer.)

If you visit a doctor who bulk bills, the cost will be covered by Medicare. The AMA recommends $60 as a 'fair and reasonable' fee for a standard GP consultation, although individual GP fees may differ. The Medicare rebate for a standard GP consultation is $32.80.

The cost of health cover

Last June, *Choice* magazine reported that hospital and ancillary cover costs from $600 to $1000 a year for singles and $2000 to $2500 for families. Many variables, such as which state you live in, excess, Lifetime Health Cover surcharge and co-payment can affect the premium. According to the DHA, half the benefits paid by private health insurance funds go to dental, followed by optometry, physiotherapy and chiropractic services.

But is it worth it? As an example, consider that a sports-related injury such as knee reconstruction could cost up to $8000. Medicare will cover 75 per cent of the scheduled fee as a private patient in either a public or private hospital. Private health insurance will cover most of the remaining 25 per cent, but there may be additional costs — gap costs — that have to be paid by the individual. An annual outlay of $1000 on private health insurance could save almost $2000 for one procedure.

The cost of eating well

A poor diet is bad for your health but does eating well cost more? Researchers at the University of Washington confirmed last year that healthy food is more expensive than junk; nutritious food costs a hefty $40 for 8400 kilojoules, which is roughly the daily requirement for a man maintaining a healthy weight, while 'bad' food costs about $4.

Australian Certified Organic magazine reported in 2003 that organically grown crops were more nutritious than non-organic ones because of the lower water content, higher soil quality and stricter pest control. Last October, an EU-funded Quality Low Input Food study found that organic fruit and vegetables contained 20 to 40 per cent more antioxidants and greater vitamin C, iron and zinc.

However, organic food will cost you more — two or even three times as much, says *Choice*. For example, organic chicken is typically twice the price of regular chicken and a dozen organic eggs costs $8 to $9, while cage eggs cost about $4.

The cost of exercise

Fitness Australia CEO Lauretta Stace says at least 10 per cent of the population exercise through a gym or training program, and the figure is rising. The cost of gym memberships varies but Stace believes it ranges from about $30 a fortnight to $60. But your gym membership could be contributing to personal and national savings on health costs. The AIHW reported in the 1999 *National physical activity survey* that lack of

(continued)

exercise is responsible for 7 per cent of the total burden of disease, contributing to obesity, cardiovascular disease, cancer and diabetes.

The cost of good teeth

Dental advice is simple: brush twice a day, floss regularly and visit the dentist twice yearly for a check-up. *Choice* estimates that a regular check-up costs about $124. Procedures such as fluoride are about $30 and X-rays $35 on average. That could easily add up to $500 per year for maintaining your teeth.

But if this seems high, consider that the average cost for root canal is $400 and fillings start at $100. Ignoring basic dental hygiene can also mean an increased risk of diabetes, cardiovascular disease and oral cancer.

The cost of good skin

The Cancer Council Australia reports that skin cancer costs the health system some $300 million every year — the highest cost of all cancers. It recommends that people, particularly those over 40, should check all areas of their skin themselves every three months for changes in shape, colour or size of pigment or a new lesion. You can do a lot to prevent skin cancer by staying out of the sun and using sunscreen. The Cancer Council sunscreen (SPF 30+) is $60 for 2.5 litres.

The cost of immunisations

Common vaccines don't cost the individual directly. The federal government's Immunise Australia Program spent $283 million during 2005–06 for protection against 13 diseases including hepatitis B, diphtheria, tetanus and whooping cough. The program also offers a free flu vaccination for over-65s and it recently added a free cervical cancer vaccine for women aged up to 26. In the current financial year, it's estimated that $443 million will be spent on immunisations.

The cost of eye health

You only need an eye check every two years, unless a condition is diagnosed, and Medicare will pay the full cost for a bulk-billed eye test every two years. If the optometrist doesn't bulk bill, the Optometrists Association of Australia (OAA) advises that the cost will usually not be more than 15 per cent of the consultation fee or $20, whichever the lesser amount. The OAA estimates the total cost of vision disorders in Australia was $9.85 billion in 2004. If you need glasses, you'll have to pay for the frame and lenses. That cost depends on the technology and just how fashionable you want those spectacles to be.

Source: The Sun-Herald, 'Sunday Life' magazine, 27 January 2008, pp. 18–19.



INQUIRY

The costs associated with maintaining good health

Read the snapshot 'What does it cost to be healthy?', then answer the following questions.

1. Discuss how income can determine a person's ability to maintain good health.
2. Identify groups of Australians that are likely to experience the greatest difficulty affording the costs of health care outlined in the article.
3. Explain the likely impact of low or limited income on the overall health and well-being of the groups identified in question 2.

eBookplus

4. Use the **Cost of dental care** weblink in your eBookPLUS to research how socioeconomic factors affect people's ability to access regular dental care. Outline key differences between people in higher and lower income groups.
5. The costs given in this article are now out of date. Conduct research to update as many of the costs as possible, particularly any changes as a result of the 2014 federal budget. Use a table format to record your findings and compare the costs.
6. Propose strategies that could be considered to reduce the financial burden associated with health care.

Medicare is Australia's government-funded health scheme that subsidises the cost of medical services for all Australians.

Social exclusion occurs when someone is denied resources, rights and services and is unable to participate in normal relationships and activities that are available to the majority of people in society.

The high cost of certain health-care services means that the quality of care received by people varies according to their socioeconomic status. The **Medicare** system was designed to ensure that all Australians receive a certain level of health care. However, not all services are covered under the scheme (for example, dental care) and waiting lists for procedures considered non-essential are long. In addition, there is a proposed co-payment that may be brought in after 1 July 2015. This may make it difficult for people on low incomes to receive treatment or see them waiting for extended periods to access the required treatment through the limited public health services available. Having to endure ongoing pain can lead to significant emotional distress, a reduced capacity to go about daily life, increased levels of stress for family and restrictions on social life, as well as physical discomfort, all of which significantly influence health.



Figure 2.14: The high cost of services not covered by Medicare can make it difficult for some people to receive treatment when needed.

It is not simply poverty that is likely to harm a person's health. Being poor is often associated with negative stereotypes and images. For example, people who are homeless, long-term unemployed or suffering drug dependency issues are frequently labelled and looked at disapprovingly. The negative connotations that go along with being poor can also result in prejudice, discrimination and **social exclusion** that also work to influence a person's health.

When discussing socioeconomic factors, the areas of education, income and employment should be considered in combination as they are all closely linked. An individual's employment status is a major determinant of their income, while a person's level of education plays a key role in their chances of gaining regular and rewarding employment. The Australian Institute of Health and Welfare's *Young Australians: their health and wellbeing* 2011 report highlights that people from poorer socioeconomic circumstances 'often experience multiple forms of disadvantage, compounding the adverse effects on their health and wellbeing'. Furthermore data generally show that socioeconomic status tends to remain similar across generations, meaning that 'many young people share the same level of disadvantage or advantage as their parents'.

Environmental factors

Environmental factors are those things present in the environment in which people live and work that can affect their health in a positive or negative way.

Environmental factors are those things present in the environment in which people live and work that can affect their health in a positive or negative way. These factors may relate to aspects of the geographic location in which people live, such as the design of the built environment, the quality of the air, food and water available, and the climatic conditions they commonly experience. Clean air, a regular supply of safe drinking water and the con-

sumption of properly handled and prepared foods can all promote improved individual and public health, while well-designed communities can assist to create safe, harmonious communities. On the other hand, poor building design, increasing levels of pollution and changes in climatic conditions all contribute to poor health by increasing the number of risk factors that people face and making it more difficult to choose healthier options. Access to quality health services and fast, reliable technology also influence a person's level of health by making it easier to obtain accurate information about health issues and seek treatment and support when necessary.

Geographic location

Rural areas are defined by the Australian Bureau of Statistics as having populations between 5000 and 99 000.

Remote areas have a population of less than 5000.

Studies into Australia's health have found that people who live in **rural** and **remote** parts of Australia have poorer health outcomes than people living in major cities. They have higher death rates and higher levels of health risk factors such as smoking, being physically inactive, drinking excessive amounts of alcohol and being overweight or obese. Differences that are apparent in the health status of people living in rural areas compared with those living in urban and regional areas are complex and likely to be closely linked to other determinants of health, including socioeconomic factors and sociocultural factors. However, a number of factors specific to rural and remote environments play significant roles in determining the health of people living in these areas.

People living in rural and remote areas often have to travel long distances for work, household-related purposes and socialising. This can place them at greater risk of injury due to the dangers involved in travelling on country roads, which include long distances, poor road quality and factors such as speed, fatigue from driving long distances and animals on the road. They are more likely to face harsh living and working conditions and experience severe climatic conditions such as extreme heat, drought and floods that have the potential to negatively affect both physical and emotional health. Injury, disease, emotional distress and financial hardship are some of the health risks that can result from experiencing these weather conditions. The remoteness of communities and the distances between people may make it harder to create or maintain social support networks. The sense of isolation and the difficulties finding emotional support when geographically isolated may contribute to poor mental health and depression.

Indigenous Australians make up a significant proportion of the population living in rural and remote areas. Current statistics estimate 15 per cent of people living in remote areas and 47 per cent in very remote areas are Indigenous. The poor level of health of the Indigenous population discussed earlier in the chapter is one factor behind the higher rates of illness and death in country areas. A number of issues relating to the geographic location of Aboriginal people who live in remote areas are likely to negatively affect their health. In particular the provision of safe, adequate housing that is supplied with electricity, clean running water and adequate sewerage systems remains problematic in some remote Indigenous communities. Disease outbreaks can occur when water becomes contaminated with harmful bacteria and viruses. Overcrowding and a lack of clean drinking water or adequate sanitation can accentuate health risks, particularly for babies and young children, and place people from these communities at risk of infectious



Figure 2.15: Living in rural and remote communities has the potential to negatively affect physical, emotional and social health.

diseases and poorer levels of health than other Australians.

Living in cities and large built-up areas may also affect a person's level of health. High levels of air pollution are far more likely in major cities where there are more motor vehicles and industrial complexes. Poor air quality resulting from the production and release of poisonous emissions from vehicles and heavy industry increases the risk of respiratory infections, asthma, bronchitis and cardiovascular conditions. Smoke from bushfires and household heating, as well as the burning of fossil fuels also decreases the air quality. People living in particular areas may face greater risks; for example, those living near major roads or industrial areas are likely to experience higher levels of air pollution, as well as more noise pollution and higher levels of traffic congestion.

Traffic congestion can contribute to high levels of stress as motorists become frustrated and angry. It also increases the likelihood of road crashes. Spending long periods of time driving to and from work also decreases the time people have available to be physically active or to be with their families.

Fluoridated tap water is the controlled addition of fluoride to public drinking water to reduce tooth decay.

People who live in cities and regional areas in most states and territories in Australia are more likely to be supplied with **fluoridated tap water**. The Australian Institute of Health and Welfare estimating that three-quarters of Australians receive mains water containing fluoride. Studies of oral health have highlighted the significant health benefits gained by drinking fluoridated tap water, notably a reduction in dental caries and the maintenance of healthy gums and teeth.

The **built environment** refers to buildings and spaces that are constructed within communities.

The **built environment** of major cities and regional areas may also determine a person's health. The built environment refers to buildings and spaces that are constructed within communities. These include houses, shopping centres, public buildings, roads, railways, footpaths and recreational areas such as parks. Careful planning and good design of the built environment can have a positive effect on a person's health. The construction of cycleways and footpaths, along with the provision of adequate lighting, playgrounds, parks and other recreational facilities encourages physical activity. Adequate public transport also promotes physical activity, while at the same time reducing the number of private vehicles on the road, thereby decreasing pollution levels, crashes and traffic congestion.



Figure 2.16: Traffic congestion in major cities not only contributes to air pollution, it also increases the time people spend being sedentary.

Inadequate or ill-conceived planning, however, can work to harm health by exposing people to dangers or discouraging behaviours that promote improved health. For example, the small size of newly released house blocks, along with the design of homes built on these blocks, is contributing to increasing rates of obesity because small backyard areas provide little space for children to play, while large indoor entertainment areas encourage passive activities such as playing computer games and watching giant-screen televisions. The location of industrial complexes has to be carefully considered to ensure residents are not harmed by increases in pollution, traffic volume and possible chemical leaks or accidents. The creation of high-density housing estates can encourage the spread of infectious diseases, while overcrowding can also contribute to disputes, tension and social unrest within the community.



Figure 2.17: Well-designed living spaces encourage physical activity and social interaction.

Access to health services

The ability to access appropriate health care at times of need is an important factor in maintaining good health. However, certain groups can find it difficult to access services and support when required. People who are geographically isolated have less access to health care and specialised treatment services. Those in remote areas particularly may rely on health care provided by the **Royal Flying Doctor Service** or other outreach services that visit communities on a rotational basis. They may also depend on medical support provided over the telephone or radio, particularly in emergencies. In these situations, people may be required to administer their own first aid or medical treatment under instruction, because of the time it takes for medical services to arrive.

The **Royal Flying Doctor Service** provides aeromedical emergency and general health care to people living in rural and remote areas of Australia.

INQUIRY

Health services provided by the Royal Flying Doctor Service

eBookplus

Use the **Royal Flying Doctor Service** weblink in your eBookPLUS to learn more about the health services provided by the Royal Flying Doctor Service to people in remote areas.

The range of health-care options in rural and remote areas is less than in urban areas. Access to preventative health services like screening programs and support groups is limited, and the lack of alternative health professionals, such as acupuncturists and chiropractors working in country areas, means that choices about health care can be restricted. Specialised treatment services are also limited, meaning that people may have to wait longer for health care or travel long distances to receive the necessary health care. Those with ongoing conditions may be required to be away from home for long periods of time while undergoing treatment, resulting in distress and financial hardship.

SNAPSHOT

Rural patients more likely to die from cancer than those in cities

By Sophie Scott

It seems little progress has been made over the past two decades in bridging the gap between rural and city cancer patients when it comes to treatment.

A study in the *Medical Journal of Australia* has found cancer patients in rural and remote communities continue to be at increased risk of death from the disease compared to their city counterparts.

The paper looked at cancer deaths from 2001 to 2010.

It found there was no improvement in the rates of regional and remote patients dying of cancer. In fact, for women, the disparity actually increased.

Dr Michael Coorey, from the Murdoch Children's Research Institute, says one of the reasons death rates have not improved is because of the lack of investments in policy on how to organise cancer services so they provide the most benefit to patients.

Possible solutions could include more support for regional and remote patients to travel to metropolitan centres, and more funding for associated accommodation.

Other important programs could include specialist outreach services such as tele-health, fly-in-fly-out services and increasing building capacity in regional cancer centres.

In 2010, the federal government announced an investment of $560 million over five years in regional cancer centres.

By comparing mortality rates in metropolitan areas to populations in regional and remote areas, the authors found 8878 excess cancer deaths in remote and regional areas.

Some of the causes of increasing cancer deaths in rural and remote Australia include a higher proportion of Indigenous people and greater economic disadvantage.

Authors say there is also a higher prevalence of cancer risk factors, such as smoking, sun exposure, obesity, less cancer screening, delays in seeking medical attention and disparity in receiving treatment.

Ian Kamerman, the president of the Rural Doctors Association, says the disparity is likely to continue unless more specialist cancer treatment and advice is made available in regional Australia.

'There has been an increase in numbers around the eastern seaboard but as you head further inland people have to travel further and … the problem is people choose not to have the best cancer treatments when they live in the bush because it takes them away from their home and their family and their carers for a long period of time,' he said.

Source: www.abc.net.au, 4 November 2013.



INQUIRY

Difficulties faced by those living in rural locations

Read the snapshot 'Rural patients more likely to die from cancer than those in cities', then answer the following questions.

1. In the period 2001–2010, state how many excess deaths from cancer occurred in remote and regional areas compared to metropolitan areas.
2. Describe the causes given for increasing cancer deaths in rural and remote areas.
3. Discuss why people who live in remote and regional areas may choose not to have the best cancer treatment available.
4. Explain the impact the federal government's investment in regional cancer centres might have on cancer deaths in remote and regional areas of Australia.

People living in major cities can also experience difficulties accessing health care, especially those who rely on the public health system. High demand, particularly in areas of population growth, can result in insufficient hospital beds being available or long periods waiting to be treated. For patients without private health insurance, the waiting lists for procedures considered non-essential (for example, knee replacements) may be lengthy, meaning they may experience ongoing pain and distress for some time before being operated on.

Access to technology

Increasing use of technology, such as computers, tablets, mobile phones and electronic games, has impacted significantly on people's health, particularly the health of young people. Studies have found that a large proportion of young people spend significant amounts of time involved in small screen recreation; that is, playing computer games, social networking, using the internet and watching TV, DVDs and videos. This regular use of technology often comes at the expense of physical activity. Excessive TV watching and small screen recreation tends to reduce the time available for physical activity and increase the time spent being sedentary. These prolonged periods of being inactive are associated with an increased risk of overweight and obesity.



INQUIRY

Technology and my health

The National Physical Activity Guidelines advise that no more than two hours a day should be spent using electronic media for entertainment. Calculate the amount of time you usually spend each day using small screen recreation and compare this to the guidelines. Use the results of this comparison to discuss the impact that your use of technology during leisure time could have on your health.

Advances in technology have helped address some problems associated with living in rural and remote areas, particularly the distance involved in accessing health services and the scarcity of health resources available. The increasing use of computers and the internet has provided people in rural and remote areas with greater access to accurate health information that can support improvements in their knowledge and awareness of health issues. It has also helped medical professionals working in remote locations keep up to date with the latest research and advances, without having to leave their practice to attend training and professional development.

Email and the internet have reduced people's sense of isolation by allowing them to keep in touch via webcam and videoconferencing. This technology also allows doctors in remote locations to quickly and easily communicate with patients and consult with health-care providers in different locations, thereby reducing the time and travel needed to access health care. The development of scanners and digital imaging technology has reduced the time people are required to spend away from their work and family. Images are sent to remote locations for interpretation, instead of the person having to stay in larger cities and towns while they are diagnosed.

SNAPSHOT

Telehealth trial declared a success

By Brad Howarth

Ease-of-use is emerging as the critical factor for the uptake of telehealth consulting in Australia.

A six-month trial implementation of telehealth at the Royal Children's Hospital in Melbourne has been declared a success, with more than 150 patients seen and countless hours saved for families and clinicians.

The director of neurology at the Royal Children's Hospital Professor Andrew Kornberg said previous telehealth attempts, including trial consultations via Skype, had not worked, as connection dropouts and scheduling difficulties led doctors to stop using it after just one or two bad experiences. The new system uses GoToMeeting, a web-based videoconferencing service from Citrix Online.

'We're trying to make it seamless for families and doctors, and make it as business as usual,' Prof Kornberg said. 'So rather than just rolling it out and saying "here's telehealth", what we're doing is ironing out all the issues, all the glitches in the system, to make it easy for everyone.'

This included making it easier for families to book consultations and for specialists and GPs to coordinate their schedules.

The program kicked off in January and the hospital is now conducting three to four half-day telehealth clinics every week, treating six to eight patients per session.

Ten departments are now using telehealth, including neurology, allergy and dermatology, and uptake is accelerating. It is also being used for emergency consultations.

Prof Kornberg said that while telehealth would not eliminate face-to-face consultation, it was reducing its frequency, and was also proving crucial in assisting the hospital in keeping up with growing demand for outpatient services. Previously doctors would drive hundreds of kilometres to conduct clinics in regional areas.

'We can't continue to see an extra 10 to 20 per cent each year with a finite number of rooms,' Prof Kornberg said. 'It has opened an opportunity for us to build capacity by really using telehealth as just another waiting room and clinic room.'

Prof Kornberg said the technology was used for both consultation with patients in their homes via the internet, and at the office of a GP. He had also conducted multidisciplinary sessions with multiple specialists.

He said one of the key advantages of the chosen technology over services such as Skype was the ability to share computer screens alongside the video stream, enabling doctors to show images from computerised tomography (CT) scans and magnetic resonance imaging (MRI) scans.

'I can bring up an image and go through it with the family by sharing my screen and showing their results, their images, and I can talk through them,' Prof Kornberg said.

He said the connections achieved with a dedicated system were also more consistent than those achieved with Skype, and were easier to manage through the hospital's firewall. While restricted bandwidth to some patients' homes had made simultaneous use of audio and video problematic, Prof Kornberg said Citrix also provided access to an accompanying toll-free telephone number.

Dr Richard Bills is one GP who has made use of the system for treating allergy suffers at his practice in Woodend, 70 km northwest of Melbourne.

(continued)

'We've really enjoyed the opportunity that the videoconferencing has provided to save people having to travel down to Melbourne to access services,' Dr Bills said.

'There are terribly long waiting lists for the Royal Children's Hospital for a lot of outpatient appointments, and yet a lot of that can be managed by cooperative videoconferencing with the GPs and the specialists. And it is proving a very efficient way to reduce those waiting times.'

Prof Kornberg said his goal was to make telehealth a 'business-as-usual' tool within the hospital.

'We see it as a longer-term strategy of building capacity or having better relationships with community providers and families, and that's why we want it to proceed,' he said. 'So one day I would say there would be 100 clinics a week run in this way.'

Source: Sydney Morning Herald, 24 July 2012.

INQUIRY

Using technology to improve health

Read the snapshot 'Telehealth trial declared a success', then answer the following questions.

1. Define what is meant by the term 'telehealth'.
2. Outline the benefits that the medical practitioners involved in the trial found in using telehealth as a means of providing health care.
3. Consider how technology could be used to promote better health among young people in regional areas. Propose strategies that could be used to:
   (a) address the lack of youth health services in many rural areas
   (b) reduce the sense of isolation that some young people may experience.



Figure 2.18: The internet allows people to access help in a confidential and anonymous way.

Improvements in mobile phone and broadband coverage have also provided people in rural and remote areas with greater access to health services and reduced the time taken to get medical help. The Royal Flying Doctor Service of Australia reports that the remote consultations it provides are now primarily conducted via phone and videoconferencing rather than radio. The portable nature of mobiles means that medical assistance can be accessed faster in emergency situations. It also provides people with a greater sense of privacy when discussing health concerns compared to talking over a radio that is located within the home, particularly when the issue is one that is sensitive or the person feels self-conscious talking about. The availability of free, private and confidential phone and web counselling services by support organisations such as Kids Helpline (see figure 2.18) provides young people with a comfortable and safe means of discussing issues affecting their health and accessing help.

A number of difficulties still exist that limit or prevent the effective use of technology to support people's health. Lack of infrastructure in rural and remote areas can restrict the access of people in the bush to fast and reliable technology. The cost involved in purchasing a mobile or personal computer and associated software and connection fees can be unaffordable for some people living in rural and remote communities, where levels of income are generally lower than in major cities. Computer illiteracy and reduced access to support services such as technical support and repairs can also limit the usefulness of technology for those who live in rural and remote communities.

Climate change

Global warming and the depletion of the ozone layer could potentially bring about further health concerns in the future. A love of outdoor activities, particularly those based around water, coupled with already high levels of UV radiation in Australia is likely to see increasing incidence of sunburn as **ozone depletion** brings about further increases in UV radiation. Research has also predicted that rises in temperatures in the future will be accompanied by an increasing number of deaths from heat-related illnesses, with anywhere between 8000 and 15 000 people per year predicted to die by 2100 (Woodruff et al. 2005).

Ozone depletion refers to the decline in the ozone layer present in the atmosphere that shields the Earth from harmful levels of ultraviolet radiation.

Tobacco smoke

Tobacco smoke is a form of environmental pollution that has a particular effect on people's health. Tobacco smoke can be inhaled from both the end of a burning cigarette and from the smoke exhaled by the person smoking. Commonly called passive smoking, the inhalation of this **environmental tobacco smoke** leads to numerous harmful health effects on people who are exposed to it, including increased risk of respiratory disease and cardiovascular disease, decreased lung function and increased incidence and severity of asthma attacks. Government legislation has banned smoking in most indoor buildings and areas such as pubs, restaurants, public transport and sporting venues, thereby reducing the risks people face from environmental tobacco smoke. However, smoking inside homes and cars can still place people at risk from passive smoking, with the health of babies and young children particularly affected.

Environmental tobacco smoke is the smoke that comes from the burning end of a cigarette and the smoke exhaled by smokers. It is also referred to as second-hand smoke and passive smoking.



Figure 2.19: Concerns about environmental tobacco smoke has led to smoking being banned in many public places.

While certain environmental factors such as cigarette smoking in the home can be modified by the individual, many of the environmental determinants of health are largely beyond the control of individual members of the community. Where and how people live is, in most cases, dictated by what people can afford, where they work or what facilities are provided for them in these places.



APPLICATION

Impact of the determinants on my health

Consider your current health status. Would you rate your health as excellent, very good, satisfactory, poor or very poor?

Use your rating to help you analyse the influence that the various determinants of health have on your level of health. Use a table like the one below and give examples to clearly illustrate the positive and negative influences that the determinants have. Write a summary of your findings and mention how the various determinants are linked.

Determinants of health		Examples of positive influence on my health	Examples of negative influence on my health
Individual factors	Knowledge and skills		
	Attitudes		
	Genetics		
Sociocultural factors	Family		
	Peers		
	Media		
	Religion		
	Culture		
Socioeconomic factors	Education		
	Employment		
	Income		
Environmental factors	Geographic location		
	Access to health services		
	Access to technology		



THE DEGREE OF CONTROL INDIVIDUALS CAN EXERT OVER THEIR HEALTH

Many of the health problems that are currently prevalent in Australia are linked to the decisions people make about their health and the lifestyle that they lead. However, a person's level of health is not solely determined by individual choices. Nor does everyone have the same opportunity to easily make and carry out decisions that will improve their health. A range of social, economic, environmental and individual factors, which are often interrelated, all exert a considerable influence over the health choices we make and our chances of being healthy. People with economic, social and educational resources are in a better position to take action to promote their health than those who do not have access to these resources. If we have power and status within our social situation, we feel a greater sense of control over our life so are more likely to take action to improve it. Therefore the degree of control that we are able to exert over our health depends on the degree to which we can control or modify these influences.

Inequality is the unequal distribution of illness or conditions throughout the population.

Not all Australians are able to exert the same degree of control over their health, which has resulted in **inequalities** arising in the health status of particular population groups. Those who experience considerable disadvantage, such as Aboriginal and Torres Strait Islanders, people from low socioeconomic

groups and people living in rural and remote areas, find it hardest to exert any influence over the things that determine health, therefore they are likely to face the greatest difficulties looking after their health.

Modifiable and non-modifiable health determinants

Health determinants can be classified as modifiable or non-modifiable, depending on the degree to which they can be changed, influenced or controlled by the individual.

Modifiable health determinants

Modifiable health determinants are those determinants that can be changed or controlled so they have a different level of influence on our health.

Modifiable health determinants are those determinants that can be changed or controlled so they have a different level of influence on our health. Our ability to modify particular determinants of health and change our health behaviours depends on the sense of control or empowerment we feel we have over our lives. Control over our health increases when we believe we can:

- acquire information
- make choices
- manage a situation that may be threatening
- use the skills we possess.

The mutual relationship between the individual and their social and economic circumstances is central to the control we are likely to exert over our health. Being in a position of *socioeconomic advantage* provides us access to physical and social resources such as education, money and health services that can make our life better. This access contributes to our sense of empowerment. People who feel in control of their lives are more likely to take control of their health. For some people, modifying the socioeconomic determinants that influence their health, such as education, employment and income, can be difficult. Their sense of empowerment and overall outlook on life can help them to overcome barriers created by their socioeconomic conditions and change their health behaviours.

One of the most important factors that allows us to take control of our health is our sense of *self-efficacy*. As explained, self-efficacy refers to our belief in our ability to bring about change. The stronger our self-efficacy, the greater our levels of perseverance and persistence and feelings of control. If we have low self-efficacy we are more likely to feel powerless and produce negative self-evaluations that can lead to lower self-esteem.

The *health knowledge and skills* that people possess is one area that can be modified to enable them to assert greater control over their health. Reliable and accurate information on issues such as how to prepare healthy meals, or ways to increase our level of activity is often available in places such as doctors' surgeries, local newspapers and on the internet.

Many health organisations offer information in the form of pamphlets, websites or public forums to enable people to improve their knowledge of particular health issues. For example, the Family Planning Association website contains a range of fact sheets on contraception, sexually transmitted infections and other sexual health matters. These organisations can also support the development of skills. For example, the Quitnow website offers information and suggestions on how to effectively quit smoking and provides various resources and access to services such as the Quitline and

online Quitcoach that support people who decide to give up. The provision of this information and support can allow people to gain a deeper understanding of issues that may affect their health and develop strategies to address these issues.



Figure 2.20: Acquiring knowledge and skills and choosing to accept help and support can assist people to modify their lifestyle and improve their health.

However, the degree to which people can improve their knowledge varies. Not everyone will have the literacy required to be able to understand the information available, or to determine which information is credible and reliable. Nor will everyone have the same level of access to this information. Groups who experience the most disadvantage, such as the long-term unemployed, homeless or some Indigenous people, are likely to find it most difficult to improve their health knowledge and skills due to their isolation from the community and their education level.



Figure 2.21: Health campaigns seek to challenge unsafe attitudes and behaviours in order to improve health.

People also need to possess an *interest or desire* to improve their health knowledge and skills in order for this to occur. Health is not always the central consideration when people make decisions; it is just one of a range of factors. For many people, the long-term consideration of health often takes a very distant second place to the immediate demands and pressures of daily survival. Others may be unaware of the risks present in their environment or the harms linked to their current lifestyle, so are not looking to learn more about their health and how it can be improved. A variety of barriers therefore exist that hamper people's ability to change their knowledge and skills.

People's *attitudes* to health are another determinant that may be modified. Different experiences and events during our lifetime, such as being diagnosed with skin cancer or losing a friend in a road crash, may lead to a

change in our health attitudes. Health promotion campaigns are a commonly used strategy that seek to change people's attitudes and challenge their beliefs. An example is the 'Plan B' campaign which aims to highlight the message that drink driving is unacceptable and reinforce the need for people who drink to make alternative arrangements to get home.



INQUIRY

Road safety



Use the **Get your hand off it** weblink in your eBookPLUS to explore a recent road safety campaign that aims to challenge drivers' attitudes to using a mobile phone while behind the wheel.

Read about the campaign and watch the Youtube clip.

1. Identify the aims of the Get your hand off it campaign.
2. Outline why this campaign was considered necessary by the Centre for Road Safety.
3. Discuss how the campaign sought to change attitudes towards the use of mobile phones while driving.
4. Do you think the campaign is likely to be effective? Give reasons for your opinion.

The likelihood that individuals will change their attitudes and thereby improve their health varies according to a number of factors. A person's self-efficacy has a significant influence on the likelihood of change occurring because it affects their beliefs about whether they are capable of behaving differently. For example, a person who thinks that they are hopeless at sport will find it difficult to change this attitude unless they believe that practice and participation will help them improve.

An individual is also more likely to change their attitudes when they can recognise there are significant benefits from doing so. The support of others, particularly those closest to us, is another crucial factor in the likelihood of changes in attitude occurring. For example, someone with a mental health problem who feels ashamed and embarrassed is more likely to change this attitude if others reassure them and show they are comfortable talking with them about their health.

A person's age may also affect their likelihood of changing attitudes. The need to feel that they 'fit in' or belong may make it difficult for young people to change their attitudes if these attitudes are markedly different from those of their peers. Attitudes and beliefs about health-related matters may also become more fixed as people age, making them reluctant to change their health behaviours.

Society's attitudes, which are strongly influenced by particular aspects of society such as the media, religious beliefs and cultural expectations, are outside our direct control. However, we do have control over the extent to which we are influenced by those around us, such as our families and peers, and the extent to which we conform to stereotypes or expectations. We are able to hold different beliefs to those commonly held by our peers or by the community and we can choose to behave differently from others. We may also choose to challenge particular views, behaviours or decisions in an effort to change prevailing attitudes that may be limiting good health. For example, we could lobby for cycle-only lanes to encourage bicycle use, or advocate for a ban on excessively thin models featuring in magazines and fashion shows.

Attempting to challenge the attitudes, values and behaviours of families is particularly difficult for children and young people as it is often not appropriate for them to challenge the health-related decisions of their parents. It is also unlikely that they would have the confidence, assertiveness and communication skills necessary to do so or a sufficient level of knowledge to recognise possible concerns associated with particular attitudes and behaviours. As we become older it may become easier to challenge particular attitudes or make our own choices, independent of the beliefs or decisions of our families.

Non-modifiable health determinants

Non-modifiable health determinants are determinants that cannot be changed or altered.

Non-modifiable health determinants are determinants that cannot be changed or altered. The only factors that might be seen as non-modifiable determinants of health are genetics or heredity and some environmental factors.

Genetics

The genetic material we receive from our parents can pass on certain health conditions, increase our susceptibility to particular illnesses or see us inherit characteristics that can affect our health. This genetic material cannot be altered, although tests for certain conditions such as Down syndrome can be performed prior to conception or during pregnancy. Progress in the treatment of particular genetic conditions has meant that people born with conditions that used to be life-threatening, such as haemophilia, can generally now lead healthy, normal lives. People with a family history of a particular illness such as breast cancer can also undergo monitoring, screening and surgery before any symptoms are detected in an effort to reduce the risk of cancer developing.

Environmental factors

Figure 2.22: Individuals have little control over the level of pollution present in their local environment.



Factors such as geographic location, access to health care, availability of technology and other environmental factors are also largely non-modifiable. People who live in rural and remote areas have little control over the limited health services that are available, the sparse infrastructure, the occupational health hazards that are present, the social isolation that exists or the natural disasters that occur.

Similarly, people living in areas surrounded by heavy industry or high volumes of traffic have little control over the levels of air pollution that may be present in their environment. While it is possible for individuals to take precautions to reduce some risks, such as staying indoors when high levels of pollution are present, these measures do not remove long-term risks.

Individuals may also seek to modify aspects of their environment by lobbying governments for increased expenditure for health services or tighter controls on factory emissions. This is more likely to occur when people have high levels of knowledge and feel empowered to initiate change. However, the fact that poor environmental conditions generally exist in areas of lower socioeconomic status means that people may not have sufficient knowledge, skills and self-efficacy to take effective political action.



INQUIRY

Modifying levels of physical activity

A study of Sydney suburbs was conducted in 2008 by researchers from the University of New South Wales and the New South Wales Department of Health. The study found that people living in Sydney's outer suburbs were:

- 30 to 50 per cent more at risk of being overweight than people living in the inner city, and
- 40 to 60 per cent less likely to be physically active than inner city residents.

The main factor in outer areas was the stronger tendency to use the car rather than walk as distances between facilities and services such as shopping centres were greater than in the inner city.

1. Using this information, propose reasons why people living in inner city areas are able to modify their behaviours relating to being active more easily than people in outer areas.
2. Outline the roles of governments and developers in assisting people to improve their health.



INQUIRY

Climate change and Indigenous health

eBookplus

Use the **Climate change** weblink in your eBookPLUS.

1. Read the information about the report by Dr Donna Green into the potential effects of climate change on the health of Indigenous people.
2. Identify the reasons why the effects of climate change are a serious concern for the Indigenous people in remote areas. What health problems might become more prevalent among Indigenous people?
3. Discuss whether Indigenous people are likely to have control over their health if the predictions by health experts prove to be correct.

Changing influence of determinants through different life stages

The level of influence that the various determinants have on our health will not always be the same. At different times in our lives certain determinants may have a greater or lesser influence on our health status and health decisions. This is evident in differences in the causes and rates of morbidity between different age groups. For babies and young children, their families and determinants related to them such as their geographic location and socioeconomic circumstances are likely to have the greatest influence. This is because parents are primarily responsible for looking after the health and well-being of their children, so the care they are able to provide and the decisions they make largely determine health during a child's early years.

As we get older and start interacting with others beyond our immediate family, other sociocultural influences such as the media can start to have a significant influence on our health. Even at a young age the media is able to exert a powerful influence over things such as children's eating habits and choices. Concerns that advertising of fast food contributes to increased consumption of these foods has prompted debate about whether restrictions should be placed on advertising these products during children's television programs.

Celebrities such as models, movie stars and singers feature heavily in types of media popular among young people, so their behaviour, attitudes and appearance can have a significant influence on the health-related values, decisions and behaviour of adolescents, although this influence may occur subconsciously. As we become older our skills and knowledge often increase,

assisting us to question the credibility and reliability of information and be more critical of media images. Life experiences may also see us increasingly question the information and messages communicated through the media, thus reducing the extent of its influence.



Figure 2.23: The media can have a powerful influence on the knowledge and attitudes that children develop.

Feeling a sense of belonging with their peers is important for a young person's identity and emotional well-being, so peers commonly have a strong influence on health during adolescence. Social pressures to behave in particular ways or to conform to certain expectations may lead some young people to experiment and take risks in relation to their health that can impact on their immediate and longer term well-being. For example, they may experiment with drugs, drive in a fast, dangerous manner, or participate in various sexual activities. Statistics regarding these behaviours show that as young people move into adulthood the incidence and frequency of these behaviours decreases, suggesting a decline in peer influence.

APPLICATION

Changing patterns of drug use at different life stages

eBookplus

Research changing patterns of drug use by using the **National Drug Strategy household survey** weblink in your eBookPLUS.

1. Investigate one of the following drugs:
   - tobacco
   - alcohol
   - ecstasy
   - cannabis

Look in the chapter containing information on the drug you select and locate the table that shows a comparison of the use of this drug by different age groups.

2. Identify the percentage of people in the different age groups who indicated they used this drug daily (tobacco and alcohol) or had used it recently (cannabis and ecstasy). Present your findings as a line graph. Create separate line graphs to show use by males, females and all people.
3. Discuss how:
   (a) use of this drug may have been influenced by the various determinants
   (b) changes in the influence of these determinants may account for the patterns of use that are shown in your graph.

Changes in attitudes, values and priorities may also play a role in the changing health decisions and behaviours evident in these statistics. These changes may come about for a number of reasons, including:

- biological changes to the brain. Adolescence is a stage of life when hormones become more powerful and the activity in the emotional parts of the brain increases. Negative emotions can impair the brain's ability to think rationally and logically, contributing to rash decisions and behaviour. Recent research has shown that full brain development does not occur until around the age of 25 years. The frontal lobe, which is the part of the brain responsible for planning, impulse control, reflection and decision making, is the final part to develop. This finding suggests that changes in attitudes and behaviour linked to risk taking are likely to be evident after this age.
- greater emotional maturity and a stronger personal identity. During adolescence young people seek to establish identity and independence. As they clarify their personal beliefs and develop a stronger sense of who they are, young people may feel more comfortable asserting beliefs that are different from **social norms**.
- greater personal responsibilities. In adulthood people tend to take on financial responsibilities such as loans, mortgages, rent or car ownership that can change the lifestyle patterns and decisions of young people. They may also become involved in long-term, committed relationships and start their own families, which may bring about changes to their behaviour in relation to things such as tobacco smoking and speeding.
- different social networks. The opportunity to mix with a variety of age groups and people from different backgrounds while working or studying may expose young people to different attitudes and values than those held by their peers and communities. This may also contribute to a change in their beliefs.

Social norms describe the behaviours, beliefs and values that are expected or seen as acceptable within different social groups.



Figure 2.24: Changing priorities and responsibilities, such as purchasing a home, can modify our health decisions and attitudes.

These various factors, either individually or in combination, may see

a person modify their attitudes and their behaviour as they move through adolescence into adulthood.

Genetics may have an influence on a person's health at any point in their lives, depending on what characteristics or condition has been passed on from the parents. Certain inherited health problems, such as cystic fibrosis, may become apparent early in a child's development and start having a negative effect on their health. Other health problems linked to genetics, such as breast cancer or schizophrenia, may not have an effect on a person's health until some point during their adult life, if at all.

Geographic location may be a more significant determinant of health as we become older, especially for those located in rural and remote areas. This is because health services and personnel may need to be used more frequently, however accessing the appropriate services, particularly those involving specialised treatment, may be difficult for those living outside metropolitan regions.

CASE STUDY

Control of the determinants of health

Paul is a year 12 student who lives with his parents on a property in a small rural community in New South Wales. His two older brothers have left home and moved to larger centres to find work. They used to help Paul's family run the property but several years of drought have meant that the farm is generating little income. The family has been struggling financially as a result. This has placed a great deal of stress and strain on all members of the family.

Last year, Paul's father had a minor heart attack. The doctors said stress, along with excessive weight and a family history of heart disease, were the reasons for his father's heart attack.

Paul now helps his father as much as he can on weekends and when he gets home from school. This means he has less time for schoolwork, but he knows his father can't do it on his own and he feels a strong sense of responsibility to support his family.

Paul has thought about quitting school and working full-time on the property. He has stopped playing football for the school and on weekends so that he has more time available to help. It also helps save money as the cost of travelling to games and paying registration fees was adding to the family's financial stress.

Since Paul quit football he has put on some weight. He also feels isolated as most of his mates are working rather than attending school, so he rarely gets to see them. His parents encourage him to catch up with his friends but Paul feels so tired that he can't be bothered.



APPLICATION

Determining how much control we have over our health

Read the case study above and answer the following questions.

1. Explain the impact of the various determinants on Paul's health.
2. Identify the determinants impacting on Paul's health that are:
   (a) modifiable
   (b) non-modifiable.
3. Use your lists from question 2 to assess the degree of control that Paul has over his health.

4. Propose actions that Paul could take that would allow him to gain greater control over his health.
5. Think five years ahead into the future. Discuss whether the determinants are likely to have the same level of influence on Paul's health. Give reasons for your responses.



HEALTH AS A SOCIAL CONSTRUCT

The **social construct** of health recognises that people have different views of health based on their social circumstances and ways of seeing, interpreting, interrelating and interacting with their environment.

It is clear that people's ability to achieve good health varies according to:
- factors present within their environments, and
- the positive or negative impacts that these factors have on health.

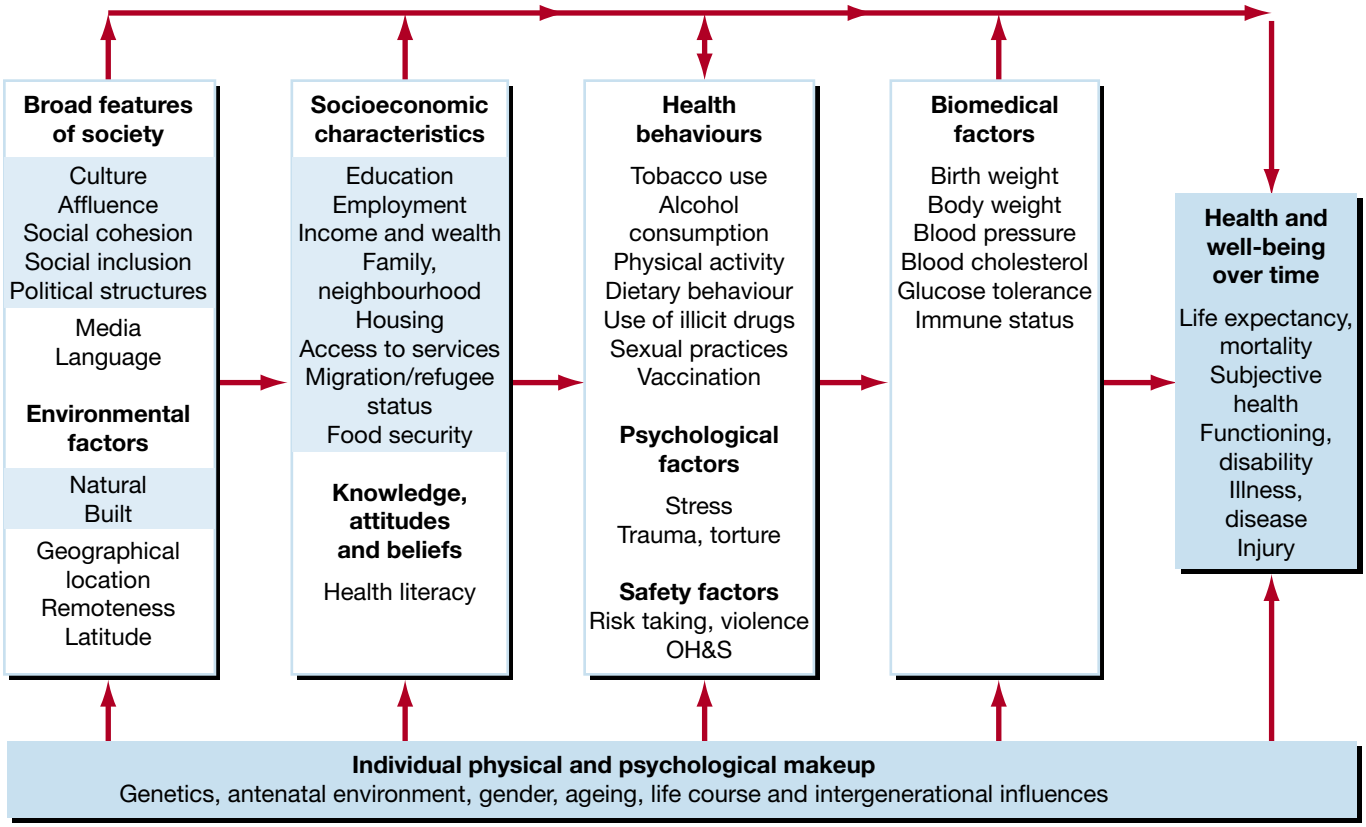
The recognition that individuals do not have complete control over their own health has contributed to the acceptance that health is a **social construct**. In other words, a person's health behaviours and health status are significantly determined by factors relating to the social, physical and cultural environment in which they live.

Recognising health as a social construct helps us to explain why some individuals or groups experience better or worse health than others. It also allows us to understand why improving the health status of particular groups within the community can be a complex and prolonged process.

The interrelationship of determinants

Viewing health as a social construct acknowledges that a variety of social, cultural, economic and environmental factors have a significant influence on an individual's health. It also recognises that these factors do not make their impact on individuals and communities as isolated factors, but in an interrelated way. The conceptual framework for determinants of health shown in figure 2.25 demonstrates the links between the determinants and the health of individuals and population groups. It also highlights the complexity of these relationships.

Evidence showing how various determinants of health relate to and influence other determinants can be seen in the data that is regularly collected on the health status of Australians. These statistics show that groups that commonly suffer poorer levels of health often experience a higher number of negative health determinants in their lives. For example, Aboriginal and Torres Strait Islander peoples, who suffer much more ill health than other Australians, are most likely to:
- be in the most disadvantaged socioeconomic group
- have poorer levels of educational achievement
- have higher rates of unemployment
- work in lower paid occupations, where they experience less secure employment and lower levels of job satisfaction
- live and work in the most hazardous environments where they are exposed to higher levels of risk
- have greater difficulties accessing appropriate health services, resources and support
- have lower rates of home ownership and live in households and communities that have inadequate housing, are overcrowded, have poorer transport and lower levels of social cohesion
- have a lower sense of control, power and opportunity
- have more risk factors for ill health such as smoking, alcohol consumption, obesity and high blood pressure present in their lives.



Note: Blue shading highlights social determinants of health.

Figure 2.25: A framework for the determinants of health

Understanding the relationship between the various health determinants highlights the difficulties individuals can face trying to exercise control over their own health. It demonstrates the role that governments and communities need to play in addressing the broad range of social, cultural and economic factors that impact on people's health. It also emphasises the importance of collaborative and targeted approaches being taken by government agencies, non-government organisations and local communities in order to bring about significant and sustainable changes.

Challenging the notion that health is solely an individual's responsibility

Some people hold the view that health is solely an individual's responsibility. An example of the type of understandings and assumptions that underpin this individual view of health and the implications of viewing health in this way are set out in figure 2.26.

An individual view of health has limitations in explaining people's health status and addressing health concerns. We should now understand that bringing about improvements in a person's health requires more than simply teaching or encouraging them to make better health choices. Poor health is not just a matter of not knowing any better. Inaction in changing our lifestyle is not simply a problem of lack of control, willpower, motivation or laziness on the part of the individual. Having sufficient health knowledge and having the support to change their health behaviours does not mean a person will

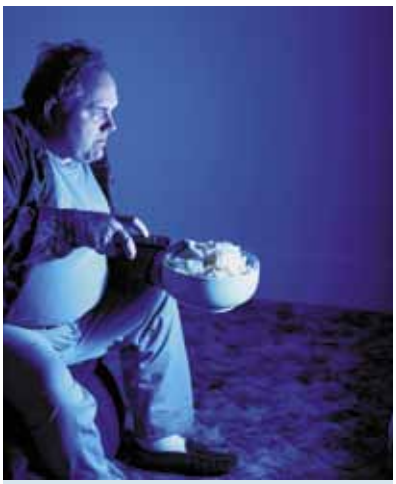
automatically or actively choose behaviours that promote better health because they know it will be good for them. Biological, social, economic and environmental factors can present considerable barriers to an individual's health and the likelihood that good health decisions will be easy decisions for them to make. Viewing health as a social construct helps explain:

- why certain groups behave in particular ways
- why certain groups do not have the same opportunity to achieve good personal health as others
- how behaviour can be associated with social and cultural meanings
- what the priorities of certain groups are in terms of health and well-being.

Health researchers seeking a clear understanding of the factors influencing the health behaviours of a person or group often categorise influences as predisposing, enabling or reinforcing factors. Using the example of an overweight person:

- *predisposing* factors that increase the likelihood of the behaviour might be that a parent is overweight, the family is sedentary rather than active and food choices are poor
- *enabling* factors that support the behaviour occurring might include the close availability of fast food outlets, the prevalence of junk food advertising or the shortage of suitable space in the environment for exercising
- *reinforcing* factors that help the behaviour to continue might be the absence of suitable role models to encourage healthy eating or exercising, a lack of cooking skills and the general prevalence of obesity in the community.

Figure 2.26: Factors underpinning an individual view of health and the implications of this view of health



Understandings

- the ultimate decision in regard to health behaviour is left to the individual
- we can all make rational decisions in order to determine our lifestyle and health status.

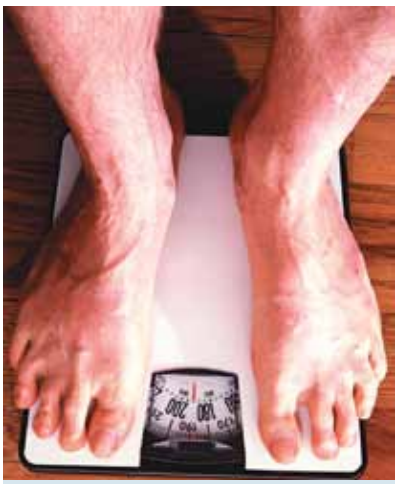
Example: Excess weight that is the result of overeating and lack of exercise is self-inflicted. If we want to control our weight, it is up to us.



Assumptions

- if we have the ability and knowledge, we can make rational choices about our own health
- it is up to us to take control over social forces and their influence on us.

Example: If we are overweight because of overeating and lack of exercise, we need to take control and exercise self-discipline with our own health.



Implications

- the individual is blamed and made a victim by wrongly assuming that they knew what to do in the first place
- value-laden notions of 'goodness' or 'badness' are encouraged.

Example: You need to be slim to be healthy. If you are overweight, it is unhealthy. It is your fault and you are irresponsible.

INQUIRY

How can the determinants of health explain different levels of health within the community?

1. Listed below are a series of characters. Copy the information about each character onto a separate card and display all these character cards in a straight line in the middle of a whiteboard or sheet of butcher's paper. Write the words 'excellent health' at one end of the whiteboard and 'very poor health' at the opposite end.
   - A 35-year-old female with a family history of breast cancer. She works as a doctor in a large inner city hospital.
   - A 26-year-old male refugee from Sudan who has recently received citizenship in Australia. He worked as a farmhand in his home country.
   - An 18-year-old male living at home with his mother and four younger brothers. He left school in year 10 and is currently unemployed.
   - A 50-year-old Aboriginal male who works as a professor at a large university.
   - A 25-year-old female who is a professional triathlete.
   - A 60-year-old farmer running a large cattle property with his two sons. The property is 200 kilometres from the nearest rural town.
   - A 30-year-old Muslim woman. She and her husband run a small business in the metropolitan area. They have three young children.
   - A 40-year-old Aboriginal male living in a remote Indigenous community. He works as a stockman on a nearby cattle property when work is available.
   - A 20-year-old male in his second year of university. His family lives in the country, but he moved to the city to study. He shares a house with three other young people and works part-time to pay his living expenses.
2. Read each of the following statements, then consider which characters would be able to answer 'yes' and which characters would answer 'no'. Every time a character answers 'yes', move their character card forward on the continuum towards 'excellent health'. Every time a character would answer 'no' move their card back on the continuum towards 'very poor health'. When unsure, the character card should not move.
   - You can afford the cost of private health insurance.
   - You have a range of medical facilities easily available to you.
   - There are a range of facilities where you can be physically active in your local area.
   - You have a support network of family and friends who encourage you to be healthy.
   - You are likely to have good knowledge about the benefits of maintaining good health.
   - You are able to talk confidently to a medical professional about health concerns and understand information they give you.
   - You can afford regular dental checkups and to fix any associated dental problems.
   - You are able to access health information and support easily on the internet.
   - You are likely to see good health as important and understand strategies that can support or improve your own health.
   - You are encouraged to be physically active and you feel confident doing so.
3. When all questions have been considered, examine where the various characters have ended up.
4. Based on the activity, discuss as a class which individuals and groups have better or worse health than others. Explain how the determinants of health are likely to positively or negatively influence the health of various characters.

Enjoying a good standard of health is a fundamental right of all Australians. This makes health more than just an individual responsibility. Governments and the communities in which we live both have a major responsibility to provide people with the opportunity to achieve the highest standard of health possible.

For individuals to change their health decisions and behaviours, the social and environmental forces that impact on these decisions and behaviours must firstly change. Addressing social, economic and environmental factors that contribute to poor health requires action from all levels of government. This action needs to involve a range of sectors working together, including health, housing, employment, education and community services. It is only through this type of collective approach that the key social, economic and environmental determinants that affect health are likely to improve.

SUMMARY

- The major factors that influence an individual's health can be referred to as the determinants of health. These determinants include a number of individual, socioeconomic, sociocultural and environmental factors.
- An individual's health status can be positively or negatively affected to varying degrees by these determinants acting in various combinations.
- Individual factors that have a significant influence on health include genetics, knowledge and attitudes.
- Sociocultural factors such as family, peers, media, culture and religion can exert an influence on people's values, attitudes and knowledge about health, which can affect their lifestyle behaviours and health decisions.
- Differences in people's level of income, education and employment can lead to significant differences in the opportunities, choices and risks that affect their health. Groups in society that experience the greatest disadvantage are likely to experience the poorest levels of health.
- Geographic location can have an impact on a person's health by affecting their opportunities to make healthy choices, the risks they are exposed to and their access to adequate standards of housing, food and water. It can also influence their ability to quickly and easily access appropriate health care. Technology has helped overcome some barriers caused by geographic isolation.
- We may have little or no control over some of these determinants; for example, genetics and some environmental factors.
- Most health determinants are modifiable, that is, people can make changes to some factors that influence them to improve their health status. A person's level of self-efficacy, empowerment and attitude can contribute to the degree of control they exercise over their health
- The influence that various determinants can have on our health changes throughout our lifetime. This may lead to improvements in health or may contribute to the health risks people face.
- An individual view of health suggests that the individual is solely responsible for their health behaviour. This has limitations for changing individual motivations and behaviour as it blames the 'victim' rather than explaining the social and environmental determinants involved.

- Viewing health as a social construct enables us to recognise the inter-relationship between the various determinants of health, and understand why some individuals and groups have better or worse health than others.

QUESTIONS

Revision

1. 'People's social and economic circumstances and environmental factors strongly affect their health.' **Evaluate** this statement. Does it provide a good explanation of how health is determined? (P3) (4 marks)
2. Table 2.1 on page 70 shows that people in the most socioeconomically disadvantaged groups were more likely to smoke, eat less fruit and vegetables and be inactive than those in less socioeconomically disadvantaged groups. **Discuss** why these risk behaviours are more likely to be prevalent among people living in poor socioeconomic circumstances. (P3, P16) (5 marks)
3. Using relevant examples, **explain** how sociocultural factors such as family, peers, media, religion and cultural background can have a positive or negative influence on a person's level of health. (P3) (5 marks)
4. **Outline** how living in geographically remote areas can affect a person's level of health. (P3) (3 marks)
5. Using relevant examples, **discuss** the interrelationship of the various determinants of health. **Explain** the possible impact this interaction could have upon people's ability to effectively manage their own health. (P3, P4) (6 marks)
6. **Identify** aspects of health that an individual is able to exert some control over. **Explain** how this can be done. (P4) (4 marks)
7. A person who is overweight is told by people that it is their own fault because they lack willpower and are too lazy to exercise. Challenge these comments by **analysing** the determinants of health that influence people's activity levels and eating habits that are difficult for them to control. (P3, P4) (6 marks)
8. **Discuss** how and why the determinants of health can explain differences in the health status of two distinctly different social groups; for example, people born in Australia and people born overseas; Indigenous and non-Indigenous people; people of high and low socioeconomic status. (P3) (6 marks)

Extension

1. Research has shown that a large number of young people with serious mental health problems do not access professional help. **Analyse** how the various determinants of health may impact on the likelihood that a young person will access support to help with mental health problems. (8 marks)
2. Figure 2.11 (page 68) shows significant differences in the mortality rates of Indigenous and non-Indigenous people. Critically **analyse** the impact of the various determinants on the health of Indigenous Australians to explain the significant gap that is evident between their health and the health of non-Indigenous Australians. In your response, highlight how various determinants are interrelated. (8 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

eBookplus

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

CHAPTER 3

What strategies help to promote the health of individuals?



OUTCOMES

On completion of this chapter, you will be able to:

- describe factors that contribute to effective health promotion (P5)
- propose actions that can improve and maintain an individual's health (P6)
- form opinions about health-promoting actions based on a critical examination of relevant information (P15)
- utilise a range of sources to draw conclusions about health and physical activity concepts. (P16)

OVERVIEW

WHAT IS HEALTH PROMOTION?

RESPONSIBILITY FOR HEALTH PROMOTION
Individuals
Community groups and schools
Non-government organisations
Government
International organisations

HEALTH PROMOTION APPROACHES AND STRATEGIES
Lifestyle and behavioural approaches
Preventative medical approaches
Public health approaches

THE OTTAWA CHARTER AS AN EFFECTIVE HEALTH PROMOTION FRAMEWORK
Developing personal skills
Creating supportive environments
Strengthening community actions
Reorienting health services
Building healthy public policy

PRINCIPLES OF SOCIAL JUSTICE
Equity
Diversity
Supportive environments

Health is the result of a complex interaction of people's personal health behaviours and a range of social, economic, cultural and environmental determinants that exist in the society in which they live. These wider social and cultural forces can shape or limit an individual's decision making, affect power relations, and can determine the amount of control an individual has over his or her actions.

For some people, these factors are conducive to good health; that is:

- they have acquired the knowledge, understanding and means to make positive health decisions
- they live and work in environments that support them in making health-promoting choices.

Others may be influenced by factors that prevent them making good health decisions or limit their ability to easily make choices that will promote better health. For example, they may have poor nutrition due to lack of money, poor availability of nutritious foods in their local area or lack of knowledge of nutrition.

It is now widely accepted that, in order to improve the health and well-being of individuals and reduce the burden of preventable diseases, health services need to consider not only factors related to the individual, but also factors relating to the broader community, environment and social context in which people live. If individual behaviour change is to occur it needs to be supported by a variety of social, cultural, economic and political changes to our environment.

In this chapter, we look at strategies that can assist to promote the health of individuals and consider who is responsible for promoting better health for individuals. We examine how the Ottawa Charter provides a framework for health promotion that addresses the social determinants of health. We also explore a range of successful health promotion initiatives based on the action areas of the Ottawa Charter that have contributed to improved health outcomes for Australians.



WHAT IS HEALTH PROMOTION?

Health promotion involves activities that are aimed at enabling people to increase control over their health, to improve their health and prevent illness.

The **Ottawa Charter for Health Promotion** is a document (see Appendix 1, pages 381–3) that represents a global approach to health promotion by the World Health Organization. It aims to enable people to increase control over their health. It outlines prerequisites for health and essential actions for health promotion.

Health promotion aims to achieve better health for everyone. It is the process of preventing ill health and advancing the health of individuals and the community through planned interventions.

The World Health Organization defines health promotion as 'the process of enabling people to increase control over their health and improve their health'. This definition underpins a global approach to health promotion initiated by the World Health Organization. In 1986 this definition was incorporated in a document known as the **Ottawa Charter for Health Promotion** that was developed as part of the first International Conference for Health Promotion.

The Ottawa Charter outlines essential actions for effective health promotion and is based on the understanding that health is socially determined. It recognises the importance of a broad range of approaches to health promotion that assist people to gain greater control over their health and improve their health outcomes. These approaches need to:

- focus on the prevention of ill health, not just on treating illness
- provide resources and opportunities for individuals and groups to achieve positive health
- include school and community health education

- include resources to support healthy living and working environments
- ideally, provide equal access to health and physical activity resources for everyone
- include legislation, policies and economic conditions to protect people from harm.

Health promotion therefore is more than teaching students the importance of good health or promoting lifestyle behaviours that reduce the chance of diseases developing in later life. It involves:

- recognising the social, economic, behavioural, environmental and lifestyle factors that contribute to the lifestyle-related health problems that are currently prevalent
- seeking to address these factors in order to support behavioural change.

Without the provision of systems that help create supportive environments and promote improvements in people's health behaviours, significant improvements in the health of individuals and populations will not occur. The following summary lists the environmental and educational support systems that enable supportive environments to be created.

1. *Government legislation.* Some laws guard our health and well-being. For example, laws about the use of hand-held mobile phones and drink driving limit the number and severity of road crashes.
2. *Government regulations.* These controls ensure that communities maintain certain standards in health practices. For example, regulations on the information that must be provided on food labels ensure consumers are well informed.
3. *Physical supports.* These include the provision of hospitals, nursing homes, surgeries and community health centres.
4. *Economic supports.* Governments must allocate sufficient money to support health and welfare programs and enable them to function effectively.
5. *Social supports.* These include health personnel and community groups who are trained and equipped to assist in health care, such as doctors, nurses, counsellors, support groups and social workers.
6. *Educational supports.* These include traditional health education programs in schools, as well as information, education and advice provided in other settings; for example, community education via the Quit website.

A combination of these support systems, rather than any single factor such as advertising, is most effective in bringing about behavioural changes needed to improve our health.



Figure 3.1: Some laws are designed to guard our health and well-being by limiting risk-taking behaviours.

Research has also shown that effective health promotion must involve the community at all levels. People must feel that they are a part of the system, and that an improvement in their attitudes and practices will be an improvement for everyone.

Nutrition Facts

Serving size 5.oz (144g)
Servings Per Container 6

Amount Per Serving	
Calories 310 **Calories from Fat** 100	
	% Daily Value*
Total Fat 20g	31%
Saturated Fat 2.6g	7%
Trans Fat 1g	
Cholesterol 118mg	29%
Sodium 560mg	38%
Total Carbohydrate 12g	3%
Dietary Fibre 1g	5%
Sugars 1g	
Protein 24g	

Vitamin A 2% **Vitamin C** 1%
Calcium 1% **Iron** 4%

*Percent Daily Values are based on a 2000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Figure 3.2: Food labelling regulations are an example of a health promotion strategy that aims to create supportive environments.



INQUIRY

What is health promotion?

In groups, recall and list any health promotion strategies or initiatives that have been introduced to address the following health concerns:

- tobacco smoking
- binge drinking
- depression
- road injuries
- skin cancer
- overweight/obesity.

Share your group's responses with the class.



RESPONSIBILITY FOR HEALTH PROMOTION

A wide range of people and groups have responsibility for promoting better health. These include:

- individuals
- community groups and schools
- non-government organisations
- various levels of government
- international organisations.

For health promotion to be effective, a coordinated approach by all people and organisations involved is needed to successfully plan, develop and deliver initiatives that address identified areas of concern.



Figure 3.3: A wide range of people, groups and organisations are responsible for health promotion.

Individuals

Individuals play a key role in promoting their own health, because personal behaviour is the major determining factor of health status. Ill health can be prevented by making choices that promote health and leading a healthy lifestyle. However, the living conditions of some people limit their ability to easily make healthy choices and prevent them from taking control of their health, leaving them vulnerable to illness and disease.

For health promotion to be effective, individuals need to be empowered. Individual **empowerment** refers to an individual's ability to make decisions about, or have personal control over their life. We need to be encouraged to participate in improving our level of health. This is best achieved when we are:

Empowerment for individuals means that they are aware of the choices they have, they can make decisions without relying on others or expecting others to make decisions for them, and they can act in various situations in daily life to protect themselves and promote their health.

- provided with accurate and relevant health information that is presented in a format that is easily accessed and understood
- given the opportunity to be involved in decision making about our own and our community's health
- encouraged to work with a wide range of health professionals, knowing that our opinions will be taken into account
- given the opportunity to develop personal skills that will aid us to adopt or maintain positive health behaviours
- provided with social and economic supports such as support groups for weight loss and the facilities for undertaking regular exercise.

A diverse range of individuals working in health-related areas are able to work alongside people in ways that support them to develop greater control over their own health and bring about improvements. These include people traditionally involved in health professions such as:

- general practitioners
- dietitians
- counsellors
- dentists
- health workers
- community nurses.

Health professionals are able to increase people's awareness of health risk behaviours and provide them with information on healthier lifestyles. They can assist individuals to develop skills that can help them to modify these

behaviours or recognise health problems in their early stages. For example, doctors can teach women how to perform regular breast self-examinations or help clients to quit smoking. They can also work with patients to determine how to effectively use the health services available to support positive health choices.



Figure 3.4: Health-care professionals are only one element in the support system needed to improve people's health.

The understanding that health is socially determined has led to a broader range of individuals becoming involved in promoting better health for individuals, including:

- health educators
- social workers
- urban planners
- community workers
- environmental health officers.

These professionals also have roles to play in encouraging individual behavioural change, providing resources to support healthy living and working environments, and focusing on the prevention of ill health.



INQUIRY

Health professionals in your community

eBookplus

1. Use the **headspace** weblink in your eBookPLUS to learn about the health professionals who work in headspace centres.
   (a) Locate your local headspace centre and then use the links in the left-hand menu (e.g. 'what we do' and 'our staff') to research the various health professionals who work in the centre and the services they provide.
   (b) Choose one case study from the 'real experiences' section and outline how headspace helped.
   (c) In the 2014 federal budget, additional spending of $14.9 million was allocated for ten new headspace sites and an evaluation of the program. Research and account for the location of the proposed new sites.

CASE STUDY

An individual at risk

Tamika is 21, unemployed and has little money. She dropped out of school in year 10 and has struggled to find regular full-time work. She has moved house many times in the past few years, even though she could live with her mother, who loves and cares about her but also expects her to take responsibility for her life.

Tamika sleeps most of the day and eats a large, usually high-fat meal at night. She is overweight and has been warned by her doctor that she is at risk of developing diabetes if she does not change her lifestyle. She suffers from depression and feels no-one understands her.

INQUIRY

Empowering individuals to improve their health

Read the case study about Tamika and answer the following questions.

1. Identify factors in Tamika's life that affect her ability to take actions to improve her health.
2. Propose people or groups who could play a role in supporting Tamika and empowering her to improve her level of health. Briefly describe how these people or groups could help to promote Tamika's health.

Health professionals also have a role in working in *partnership* with the community to set health priorities to address areas of concern within the community. They are able to:

- **advocate** on behalf of particular groups for social intervention or increased funding to support improved health
- generate community support for health promotion strategies
- work collaboratively as part of community groups to implement actions that address identified local health concerns.

Advocate means to encourage support for a particular cause, issue or group.

Community groups and schools

Schools play an important role in health promotion. Childhood and adolescence are stages of life when attitudes towards health and health behaviours are still forming, providing schools with an opportunity to have a positive impact on young people's values and beliefs.

Schools are responsible for delivering health and physical education programs that assist young people to develop the knowledge and understandings needed to make positive health choices. They provide opportunities for young people to develop



Figure 3.5: Positive health messages can be instilled in students through classroom learning, playground activities and extracurricular activities.

skills needed to participate confidently in physical activity and manage their own health, while also promoting the value of regular activity and good health. They also equip students with skills to improve their health literacy by teaching them how to critically evaluate health information, products and services. Development of these skills at a young age increases the likelihood that they will be lifelong participants in physical activity and helps form lifestyle habits that will benefit health, both now and in the future.

School policies and practices have the potential to reinforce classroom messages and further promote good health practices among young people. Examples include the following:

- sun safety policies. These aim to promote practices that reduce exposure to harmful UV rays by scheduling outdoor activities at times when UV radiation is lower, providing shaded outdoor areas, having 'no hat, no play' rules and supplying 15+ sunscreen to students when participating in outdoor activities.
- the Fresh Tastes New South Wales Healthy School Canteen Strategy. This requires all New South Wales government schools to provide a healthy, nutritious canteen menu in line with the Australian Dietary Guidelines for Children and Adolescents.
- anti-bullying policies. These reaffirm students' rights to feel safe and outline procedures for identifying, reporting and dealing with bullying behaviours.
- the provision of play equipment for students to use during lunchtimes. This encourages physical activity.

These policies and procedures aim to reduce the harms students may face, while also sending clear positive messages to encourage health-promoting behaviours.

Schools are also commonly used to conduct health promotion initiatives targeted at young people. These health promotion initiatives can be developed and implemented in a variety of ways. For example, they could be:

- developed and coordinated by external groups such as the National Heart Foundation's Jump Rope for Heart
- jointly funded by educational authorities and other government departments such as the national mental health initiative for secondary schools, MindMatters
- initiated and managed by education departments; for example, the Premier's Sporting Challenge.

Individual schools may choose to initiate projects to address identified local health issues, either on their own or in partnership with other government or non-government organisations. The Health Promoting Schools framework provides a model for schools and outside agencies to use when developing school-based initiatives. Developed in line with the principles of the World Health Organization, the framework highlights the importance of not only teaching students about health-related issues, but also making changes to the school's policies, organisation and practices to promote better health. It also highlights the importance of partnerships between the school and parents, local health services and the community in general. Building these partnerships enables schools to:

- utilise available resources and expertise
- actively involve parents in decision making, and
- support parents and caregivers to make changes that will improve the health of children and young people.

CASE STUDY

Breakfast at school — benefits for health and learning

Teachers in the Northern Territory have long been concerned about low attendance rates among Indigenous schoolchildren and poor levels of concentration in class. A major concern was that many students were coming to school hungry, which caused them to be unsettled and lacking in energy. This in turn was affecting their ability to learn and enjoy school which had a long-term impact on their well-being and employment prospects.

There are various reasons why children don't have breakfast at home; for example:

- some parents leave very early for work and aren't able to supervise breakfast
- many children have early transport pick-ups and often skipped breakfast
- some families struggle financially to provide sufficient food for their children or make poor food choices
- there might be a limited understanding of nutrition and its importance for good health.

Health experts are clear about the benefits of a nutritious breakfast. It helps with children's physical and mental development and is essential to maintain energy levels and concentration skills. Skipping breakfast during childhood is also believed to be a factor in increasing obesity later in life.

A school and community health initiative now operating in many schools across Australia, particularly in disadvantaged urban or regional communities, is the Good Start Breakfast Club. The program involves a team of volunteers who serve schoolchildren with cereal, fruit, toast and juice, and teach them healthy eating habits.

The Australian Red Cross runs the program in partnership with Sanitarium Health Foods. Some schools report that Indigenous students' attendance has risen from 50 per cent to around 70 per cent and their overall health, behaviour and willingness to learn have improved significantly.

The General Manager of Sanitarium Health Foods (www.sanitarium.com.au) states the program is about 'nourishing the minds of growing bodies, and teaching kids positive habits that will stay with them for life, ensuring the brightest futures'.



A nutritious breakfast is provided to children at Papunya School in the Northern Territory. The program has seen attendance rise and children healthier and more attentive in class.

INQUIRY

Breakfast at school

Read the case study about the breakfast program and answer the following questions.

1. Identify the problems that led to the introduction of a school breakfast program.
2. Which organisations are working in partnership to make this health initiative possible?
3. Discuss the importance of school-based programs such as the Breakfast Club for the promotion of health, both now and in the future.
4. Read more about the program using the **Breakfast Club** weblinks in your eBookPLUS.

eBookplus

Community-based groups such as migrant support groups, neighbourhood groups or young mothers' support groups can often play an important role in

health promotion through their close relationship with particular population groups. They are often well placed to develop projects that meet community needs or adapt programs to take into account particular barriers that may otherwise limit their effectiveness. For example, a migrant women's support group seeking to promote increased levels of physical activity among females from non-English-speaking backgrounds may implement a program of physical activity that

- allows women to be active within their own cultural group
- overcomes language and transport barriers
- recognises cultural sensitivities relating to activity.

As with schools, community groups may also work in partnership with other organisations to support health promotion initiatives and tailor the initiatives to particular groups and/or local needs.

Non-government organisations

Non-government organisations (NGOs) are organisations that focus on a specific disease or health issue.

Non-government organisations (NGOs) are non-profit making organisations that operate at local, national, or international levels. They are funded from a variety of sources, including public donations, fundraising and government grants. While they receive government funding, their work is not controlled or limited by government policy or legislation.

Non-government organisations generally focus on a specific issue or ailment. The Heart Foundation, the Cancer Council, Asthma Australia and the Inspire Foundation are examples of NGOs that play a significant role in health promotion in Australia. Use the **NGO** weblinks in your eBookPLUS to find out more information about these examples of NGOs.

eBookplus

Non-government organisations undertake a number of roles in health promotion relating to their particular issue. These include:

- conducting activities designed to raise public awareness, such as the Cancer Council Australia's Pink Ribbon Day
- providing educational programs and resources that promote positive health choices and behaviours. For example, the Heart Foundation's Jump Rope for Heart aims to increase young people's knowledge about the benefits of physical activity and the importance of heart health.
- providing accurate and up-to-date information. For example, the Inspire Foundation manages the ReachOut website. This website seeks to offer information, support and resources to young people to improve their understanding of mental health issues, develop a sense of resilience, and increase their coping skills and help-seeking behaviour.
- funding and conducting research into prevention and treatment of a particular disease; for example, cardiovascular disease
- providing support services and counselling to people affected by the disease, their families and carers. The Cancer Council offers a range of help services including a telephone help service, support groups, outreach services for people living in rural locations and peer support programs.



Figure 3.6: headspace is an example of an NGO with roles in health promotion and support.

- advocacy. Many NGOs make submissions or representations to government on a range of issues related to their health concern in an effort to bring about changes to reduce the prevalence of the disease or improve standards of care. The Cancer Council, for example, has lobbied for changes to food labelling regulation to help people select healthier food products and to encourage producers to make healthier food products.



INQUIRY

Health promotion projects by NGOs

eBookplus

Kids Helpline and Youthsafe are examples of NGOs. Use the **Kids Helpline** and **Youthsafe** weblinks in your eBookPLUS and answer the following questions.

1. Describe the role of each of these organisations in promoting better health for young people.
2. Outline some of the projects and initiatives that each organisation has instigated in an effort to improve the health of adolescents.

Government

All levels of government share a degree of responsibility for promoting better health within their community. The nature and scope of the health promotion initiatives they undertake vary considerably due to differences in priorities, allocated funding and resources available.

Commonwealth Government

The Commonwealth Government is responsible for:

- planning and forming national health policies
- identifying priority areas for action and coordinating health promotion campaigns to ensure national health priorities are addressed in an effective and efficient way
- giving direction to state health policy making and influencing its delivery
- allocating funding for health promotion, special projects and research to state and local government groups as well as NGOs
- introducing regulations and legislation to ensure the maintenance of health.



INQUIRY

The Commonwealth Government's health promotion responsibilities

Draw up a table like the one below. For each area of responsibility, brainstorm and fill in examples that demonstrate how the government fulfils its health promotion responsibilities.

Areas of responsibility	Examples
1. Formulating national health policies	
2. Coordinating national health campaigns	
3. Directing state policies	
4. Allocating funding	
5. Regulations/legislation	

The Commonwealth Government is responsible for formulating and overseeing long-term programs and strategies that address Australia's health

priorities. These programs seek to reduce the risk factors for chronic diseases suffered by many Australians in order to improve the general well-being of the nation and lessen the burden of chronic poor health. Examples of these programs (use the weblinks to find out more) include:

- **Quitnow — National Tobacco Campaign**
- **National Drugs Campaign**
- **Get Set 4 Life**
- **Healthy Spaces and Places**
- **Shape Up Australia**
- **Live Longer! campaign**
- **Be The Influence — Tackling Binge Drinking initiative.**

National programs often involve a collaborative partnership between federal and state governments and can also be supported by industry and other organisations with an interest in promoting good health. Organisations such as the Cancer Council, the National Heart Foundation and the Australian Medical Association are some of the groups that have collaborated on the National Tobacco Campaign. Research is used to inform the strategies developed and evaluation is undertaken to measure their effectiveness and determine changes in knowledge, behaviour and attitudes that may have taken place.

The Commonwealth Government is also responsible for allocating the funding and developing systems to ensure all Australians have access to affordable, high-quality health-care services that are convenient. A variety of strategies are needed to adequately cater for the health-care needs of Australians living in vastly different geographic locations and support them to improve their health and prevent illness.

SNAPSHOT

Shape Up Australia

Shape Up Australia is an initiative developed by the Federal Government. It aims to help Australians reduce their waist measurements and improve their overall health and well-being.

Through the Shape Up Australia initiative, the Australian Government is seeking to strengthen and better coordinate obesity prevention efforts across Australia by partnering with organisations that support healthy lifestyle choices.

Consumers receive many messages about how to lead healthy lifestyles. By finding government and non-government groups that co-brand with Shape Up Australia, consumers can identify credible and evidence-based information, products and services to assist them in maintaining a healthy body weight.

To be eligible to use the brand, organisations will need to meet certain criteria, including that their products, services or activities align with national dietary and physical activity guidelines. This ensures that all Shape Up Australia branded activities are evidence-based, and that consumers can have confidence when they see the brand that the information and advice they receive is credible. Provided that the brand eligibility criteria are met, organisations use the Shape Up brand free of charge.

One of the first resources to bear the Shape Up Australia brand is the Eat for Health cookbook. The cookbook was developed to support the implementation of the revised Australian Dietary Guidelines and make healthy eating easy for the whole family. Over 30 recipes are provided, and each one is accompanied by icons that show consumers at a glance how many serves of the five food groups the meal contains.

A range of tools and resources are available on the Shape Up Australia website (www.shapeup.gov.au) for use by consumers and partnering organisations, including advice relating to engaging in physical activity and making healthy food choices.

Physical activity is important in maintaining healthy body weight, and Shape Up Australia provides advice relating to the amount of physical activity

individuals should engage in. Ways that physical activity can be incorporated into everyday life are outlined, such as parking further away from work and walking the rest of the way. Advice is also provided relating to building up physical activity over time to ensure the changes made are sustainable over time.

Food choices play a significant role in maintaining a healthy body weight, and the Shape Up Australia website provides tips on choosing healthier foods at home and when eating out. Recipes are also provided that aim to educate consumers with regards to preparing healthy meals.



INQUIRY

The Commonwealth Government's role in promoting better health

Read the snapshot on Shape Up Australia and answer the following questions. You can read more about this initiative using the **Shape Up Australia** weblink in your eBookPLUS.

eBookplus

1. Outline the purpose of the Shape Up Australia campaign and the strategies involved in the initiative.
2. Describe the roles and responsibilities of the following people/groups:
   (a) individuals
   (b) non-government organisations
   (c) government.
3. Justify why the Commonwealth government is best placed to lead and coordinate health promotion strategies such as the Shape Up Australia initiative.

State government

State governments have the primary responsibility for planning and delivering specific health promotion and disease prevention programs. These programs may be funded by Commonwealth grants, jointly funded by the federal and state government, or funded solely by the state itself. Each state has a department of health that includes health promotion personnel who develop and run health promotion programs.

The New South Wales Department of Health (NSW Health) is divided into areas, with Area Health Services allocated funds to implement health promotion initiatives that support identified state and local needs. The diversity of communities that exists across New South Wales highlights the importance of giving these services the responsibility of developing programs that cater for the needs of the population group in their area.



INQUIRY

Live Life Well initiatives

eBookplus

1. Use the **Live Life Well** weblink in your eBookPLUS and read the information it provides on the home page.
2. Click on the link in the left-hand menu bar for 'Live Life Well Initiatives in NSW'. Investigate a health promotion initiative that is being organised by your area health service. Write a report on this initiative that includes:
   (a) a description of the initiative
   (b) an outline of its aims
   (c) the population group on which the initiative focuses
   (d) the setting for implementing the initiative
   (e) the health promotion strategies that are involved in the initiative.

States are also responsible for planning and forming health policies and legislation that aim to reduce health risks, decrease the incidence of major health problems and promote better health for all. State laws around smoking in work environments and public spaces, opening hours of licensed premises, drink driving, vehicle and passenger restrictions for P1 and P2 licence holders, and WorkCover requirements are examples of legislation introduced at state level aimed at promoting health and reducing injury.

Local governments

Local governments are given specific health roles for helping to implement state-controlled programs at a community level. For example, they ensure swimming pools are fenced and are responsible for carrying out inspections to ensure compliance with food handling, storage and preparation regulations by businesses selling food.

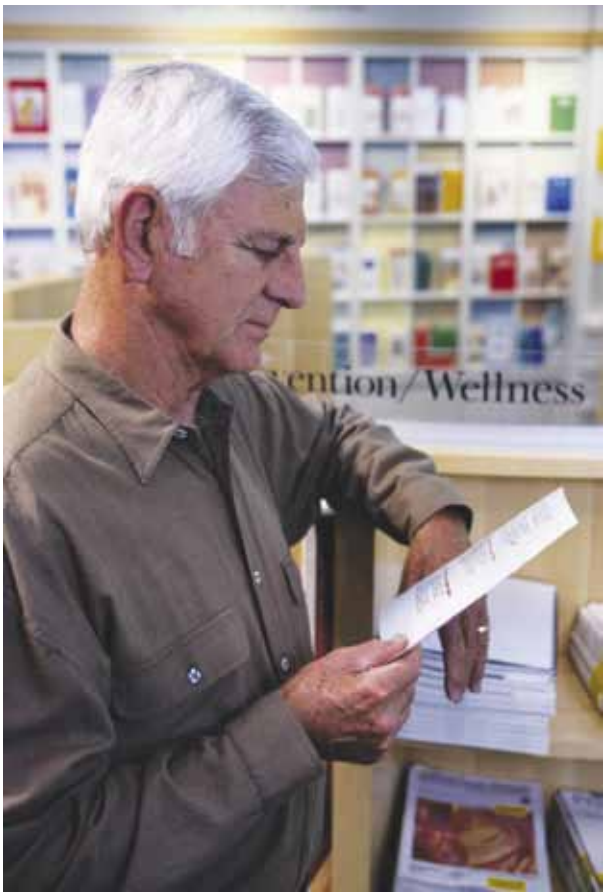


Figure 3.7: Local government libraries and medical centres play an important role in providing health information.

However, a recent trend has seen local councils participating in a broader range of health promotion programs. For example, they have been responsible for developing lifestyle events and programs using community infrastructure and facilities, such as creating community gardens and holding 'come and try' workshops in local parks and halls. Such programs seek to address local issues and strengthen community involvement in actions that target these issues.

It has become increasingly common for local councils to participate in activities as part of campaigns that are developed by other levels of government or organisations; for example, World No Tobacco Day or the Cancer Council's Australia's Biggest Morning Tea. The introduction of programs such as the Healthy Communities Initiative has also made grants available for local councils to develop and run their own health strategies to promote healthier lifestyles. These strategies often see local people involved in determining the priorities for local action and may target particular groups in the community; for example, the elderly or cultural groups.

Local governments are responsible for undertaking long-term environmental planning. This means they play a significant role in promoting opportunities for people to be physically active within their communities. Zoning regulations and land use policies can ensure healthy urban design principles are incorporated into local plans. These principles include:

- provision of open public spaces such as parks and play areas
- introduction of measures to slow or ban traffic from areas with large numbers of pedestrian activity
- construction and maintenance of well-lit walking and cycling tracks
- installation of safe play equipment and exercise stations in local parks.

Local governments are also used as avenues for the dissemination of health promotion messages and information. Council libraries can be used to display promotional material and distribute brochures and leaflets related to health, while council staff and websites can inform residents of upcoming health promotion events and activities in the local area.

Local public libraries are currently used to provide accessible drug information to communities throughout New South Wales. The drug info@your library initiative provides public libraries across the state with easy-to-read information about various drugs via web resources, regularly updated book collections and free pamphlets. Council may also provide venues for support groups to meet and education programs to be conducted.

International organisations

The **World Health Organization** is a specialised agency of the United Nations that acts as the coordinating authority on international public health issues. It provides leadership on global health issues, helps countries address public health concerns, monitors disease outbreaks, assesses the performance of health systems around the world and promotes health research.

The **World Health Organization** (WHO) is one of the major international organisations responsible for health promotion. Established in 1948, WHO is a specialised agency of the United Nations (UN) that serves as the coordinating authority on international public health issues. Its membership consists of all UN member countries that accept WHO's constitution and approved other countries.

WHO undertakes a number of key responsibilities in the global promotion of better health for the citizens of all countries. These include:

- providing leadership on health issues causing significant worldwide concern and establishing partnerships that will bring about the changes necessary to improve the health of all people, particularly those belonging to disadvantaged and vulnerable groups and populations. In 2004 WHO was responsible for developing the Global Strategy on Diet, Physical Activity and Health in an effort to reduce the worldwide incidence of death and chronic diseases related to poor diet and inactivity.
- working collaboratively with governments, NGOs and other agencies to support countries to establish and implement appropriate health promotion strategies and programs in order to bring about the highest attainable standard of health for all people
- setting international health standards for elements that are essential for promoting good health, such as water and air quality and food safety standards
- producing an annual report that provides governments, donor agencies, international organisations and others with the information necessary to make policy and funding decisions
- influencing research priorities and disseminating information produced by research to drive evidence-based change to health-related policies and practices.



Figure 3.8: The World Health Organization is a specialised agency of the United Nations that is concerned with international public health.

INQUIRY

Responding to global health issues

Read the snapshot on the role played by the World Health Organization in coordinating responses to disease outbreaks and answer the following questions.

1. Outline the role that the World Health Organization plays in addressing global public health issues such as epidemics.
2. Explain why a coordinated network like the Global Outbreak Alert and Response Network is needed to maintain and promote public health across the world.
3. Use the **World Health Organization Global Alert and Response (GAR)** weblink in your eBookPLUS to find out more about emerging and re-emerging epidemic diseases that pose a potential threat to world health.
4. Discuss ways that organisations such as the World Health Organization are able to support governments to improve the health of their citizens.
5. Debate the need for an international organisation to promote health. Justify your arguments with examples.

eBookplus

SNAPSHOT

Global Outbreak Alert and Response Network — GOARN

Partnership in Outbreak Response

Today, there is growing recognition that an outbreak anywhere can potentially represent an emergency of international public health concern.

Outbreaks threaten the health of the world's population. They require regional and global alert and response mechanisms to ensure rapid access to technical advice and resources and to support national public health capacity.

No single institution or country has all of the capacities to respond to international public health emergencies caused by epidemics and by new and emerging infectious diseases.

WHO ensures that countries have rapid access to the most appropriate experts and resources for outbreak response through the Global Outbreak Alert and Response Network (GOARN). GOARN was created in April 2000 to improve the coordination of international outbreak responses and to provide an operational framework to focus the delivery of support to countries.

GOARN's primary aims are to:

- Assist countries with disease control efforts by ensuring rapid and appropriate technical support to affected populations
- Investigate and characterise events and assess risks of rapidly emerging epidemic disease threats
- Support national outbreak preparedness by ensuring that responses contribute to sustained containment of epidemic threats.

Since 2000, WHO and GOARN have responded to over 50 events worldwide with over 400 experts providing field support to some 40 countries.

GOARN has helped to build consensus on guiding principles for international outbreak alert and response and to establish operational protocols to standardise field logistics, security, communications and streamlined administrative processes to ensure rapid mobilisation of field teams. WHO has also developed its capacity at all levels, with regional and sub-regional response teams initiating field operations with GOARN partners.

New strategic areas are being developed over the next two years to increase GOARN's effectiveness:

- Strengthening the network composition and regional focus to rapidly adapt and draw upon multi-disciplinary support from GOARN
- Developing further specific capabilities in outbreak response team leadership, integrated data management, logistics and communications, and field-based administrative procedures and protocols
- Refining WHO/GOARN's expert collaboration and virtual networking for international technical collaboration.

For further information, contact: goarn@who.int

Source: WHO website. Accessed on 27 December 2013.

The philosophy, structures and principles that guide the WHO's work have been instrumental in shifting the way that governments and organisations throughout the world approach health promotion. They have advocated for approaches that not only empower individuals and communities, but also recognise the underlying social, economic and environmental determinants of health. This has resulted in a greater understanding of the importance of actions directed towards changing social, environmental and economic conditions to alleviate their impact on public and individual health.

In 1986 the WHO was responsible for organising the First International Conference on Health Promotion. This conference saw the production and acceptance of the Ottawa Charter for Health Promotion — an action plan for all nations to implement in order to achieve health for all by 2000 (see Appendix 1, page 381).

The basic principles of the Ottawa Charter continue to provide the framework that underpins health promotion strategies developed at all levels of government in Australia (this is discussed further on pages 123–8). Subsequent conferences have reiterated and built upon the principles outlined in the Ottawa Charter, including the Helsinki Statement on Health in All Policies that was issued at the 8th Global Conference on Health Promotion coordinated by the WHO in 2013.



HEALTH PROMOTION APPROACHES AND STRATEGIES

Traditional approaches to health promotion have tended to focus on specific diseases, illnesses and injury prevention and have centred on medical intervention to cure or prevent ill health. Contemporary approaches to health promotion now acknowledge the significant role played by underlying social, environmental and economic determinants such as employment, income, level of education, geographic location and cultural beliefs in the level of health achieved by individuals or population groups. Research has shown that effective health promotion requires a range of approaches and strategies to address the many factors that determine the health of individuals and populations and to bring about long-term improvements. These approaches include:

- lifestyle and behavioural approaches
- preventative medical approaches
- public health approaches.

Furthermore it must involve the community at all levels, so that people feel engaged in decisions that aim to bring about change and empowered to improve their health.

Lifestyle and behavioural approaches

A **lifestyle approach** to health promotion aims to reduce or prevent the incidence of risk behaviours that contribute to poor health.

A **lifestyle approach** to health promotion is based on the premise that the major causes of morbidity and mortality within Australia are diseases resulting from poor lifestyle behaviour choices. It assumes that the provision of relevant information and skills will enable people to adopt a healthy lifestyle and thereby improve their health. This approach is directed at improving risk factors related to individual behaviour, such as poor eating habits, physical

Social marketing refers to the use of marketing techniques to improve health and well-being by changing attitudes and behaviour in relation to a particular product or issue.

inactivity, smoking, unsafe sexual activity and drug and alcohol abuse. A lifestyle approach to health promotion emphasises the role an individual plays in improving their own health status. Health promotion programs that use this approach target people at the individual or population level in an effort to change their behavioural choices. Health education programs, **social marketing** campaigns, the promotion of self-help or self-care practices and public policies are strategies that are commonly used under this approach to support healthy lifestyles.

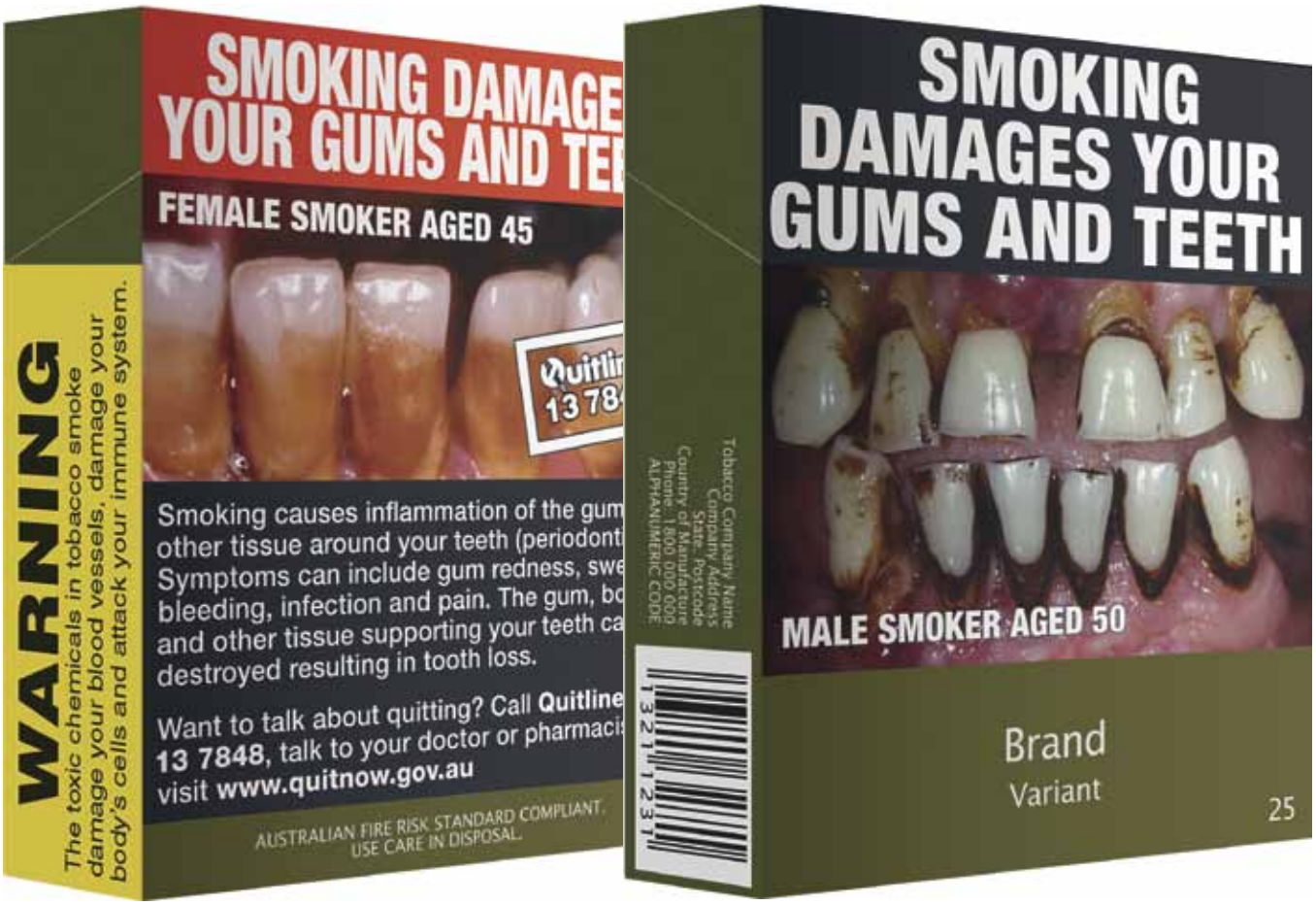


Figure 3.9: Health warnings on cigarette packets aim to encourage individuals to change their own health behaviour. Health warnings are an example of a behavioural approach to health promotion.

Examples of health promotion programs that work within this model include:

- web-based help services such as ReachOut that seek to enhance young people's health knowledge and skills to support and improve their mental health and well-being
- physical activity initiatives targeting school-aged children that aim to increase levels of regular physical activity and reduce sedentary behaviour
- quit smoking campaigns and strategies that encourage people to stop smoking or persuade them to remain smoke free
- road safety campaigns that challenge people's attitudes towards unsafe driving behaviours such as speeding.

INQUIRY

Effectiveness of lifestyle approaches aimed at young people

eBookplus

Research a recent campaign of the Commonwealth Government in relation to the issue of binge drinking among young people. An example is the Be The Influence—Tackling Binge Drinking campaign. Use the **Be The Influence** weblinks in your eBookPLUS or a recent substitute. Read the information on what the campaign is about and then look at the campaign website to respond to the following questions.

1. Explain why the campaign is an example of a lifestyle approach to health promotion.
2. Identify the campaign's key target audience and describe the strategies used to engage this audience.
3. Outline the campaign's objectives.
4. Critically evaluate the likely effectiveness of this campaign in achieving its objectives and changing the drinking behaviour of young people.
5. Propose strategies and actions that could be taken to address the harmful drinking patterns of some young people and promote better health.

Preventative medical approaches

Preventative medical approaches are those that use medical treatments or interventions to promote health.

Preventative medical approaches are based on a more traditional approach to health promotion. These approaches centre around medical personnel such as doctors, community nurses and other health professionals working with individuals or populations. These practitioners work to identify physiological risk factors within these individuals or groups such as high blood pressure, abnormal cell growth or lack of immunisation. Medication or medical interventions are then used to eliminate or treat these risk factors. A preventative medical approach focuses on both disease prevention and the treatment of illness and their symptoms to limit their potential impact on a person's health.

Health-promoting strategies used as part of a preventative medical approach can occur at the primary, secondary and tertiary stages.

- Actions taken at a primary prevention stage aim to prevent an illness ever occurring. Childhood immunisation programs that vaccinate children against diseases such as polio, whooping cough, hepatitis B and human papillomavirus (HPV) are one example of a primary prevention strategy.
- Secondary level prevention programs try to reduce the likelihood that a disease will develop, particularly in people identified as being in high-risk groups. In incidences where a disease is detected these strategies also aim to slow its spread. Examples of secondary prevention strategies include monitoring blood pressure and cholesterol levels of those at risk of heart disease, free mammograms for women aged over 50, regular Pap smears for women who are sexually active and the prescription of antibiotics for someone diagnosed with a sexually transmitted infection.
- Tertiary prevention strategies seek to prevent chronic ill health occurring through the use of effective rehabilitation that stops a disease recurring once it has been diagnosed and treated. For example, an asthma management plan will be developed by a GP for a person diagnosed with asthma to assist them to manage the condition and a rehabilitation program will be devised for a person involved in a serious road accident to support their long-term recovery.

INQUIRY

Preventative medical approaches to cervical cancer

eBookplus

Research the Commonwealth Government's 'Immunise Australia' program using the **Immunise Australia** weblink in your eBookPLUS. Click on 'Diseases A-Z' and locate the information on HPV. Read about the HPV vaccination program and answer the following questions.

1. Explain:
   (a) how the program works
   (b) why it is an example of a preventative medical approach to health promotion.
2. Vaccinations do not prevent all forms of cervical cancer, meaning that Pap smears are still needed. Argue whether immunising young people against HPV is an effective health promotion strategy. Give reasons to support your arguments.
3. Studies have found that fewer than 45 per cent of 18–25-year-old women had undergone a Pap smear. Propose ways to increase the number of young women who have regular Pap smears.

Public health approaches

The **public health** approach to health promotion involves establishing programs, policies and services that create environments that support health.

Public health approaches are a more recent trend in health promotion. They have been significantly influenced by the policies and philosophies of the World Health Organization. These approaches take a more holistic approach to health and recognise the role played by factors outside the control of the individual and the immediate health system.

Public health approaches go beyond a medical approach of achieving health through the cure and eradication of illness, to trying to foster better health within a broader social and economic context. These strategies seek to address the broad underlying social and environmental determinants that contribute to poor health (such as access to affordable, nutritious food, housing, income, employment, social isolation, transport, geographic location and education) and create healthier environments that support people to make positive health choices. The approach therefore advocates for a broader range of people from various health and welfare related areas, such as social workers, urban planners and educators, to work with medical-based professionals in developing and implementing health-promoting initiatives to create healthier environments.

A public health approach to health promotion also encourages individuals and communities to be actively involved in determining their health priorities and developing and implementing health promotion strategies that meet these needs. In this way it seeks to empower individuals and population groups to enable them to exercise control over their health and work collaboratively with health professionals to improve their level of health.

Examples of health promotion programs that use a public health approach include those in health-promoting schools and health-promoting workplaces.

Health-promoting schools are schools where all members of the school community work together to promote and protect the health of students through the curriculum, the creation of a safe and supportive school environment, and the establishment of partnerships with parents, health services and the wider community to support improvements in student health.

Health-promoting schools

Schools that take a broad, coordinated, whole-of-school approach to the health and well-being of all members of their school community are considered to be **health-promoting schools**. Based on a research-based framework, health-promoting schools regard the health of their students and those in the school

community as a high priority. They set out to positively influence the health of students by creating, promoting and supporting healthy practices and environments across the school setting. This involves implementing health-promoting strategies through three interrelated areas:

1. the curriculum
2. school organisation, ethos and environment
3. partnerships with families and the local community.

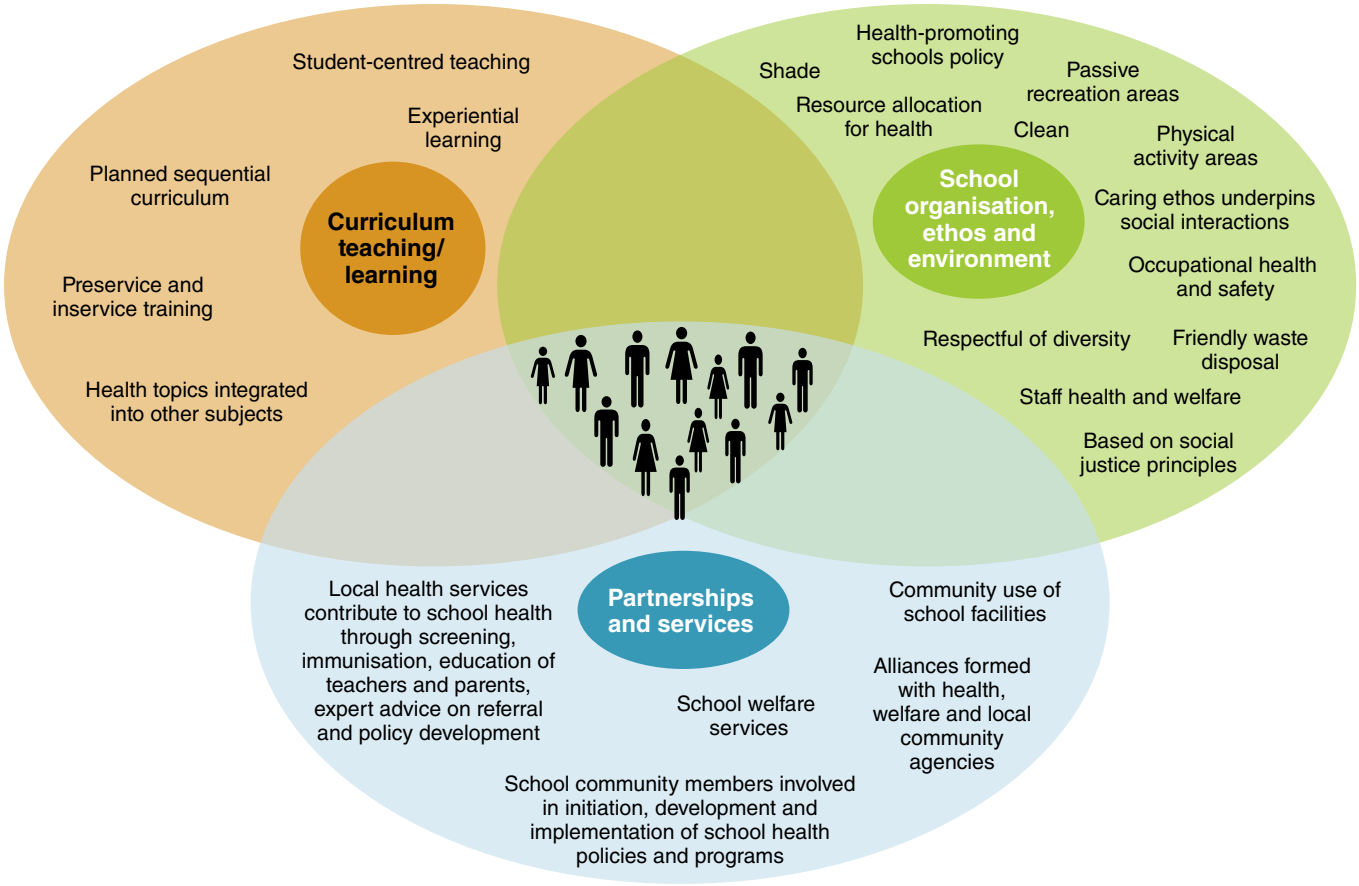


Figure 3.10: Health Promoting Schools framework

The national mental health initiative for secondary schools, MindMatters, is an example of a program that uses a whole school approach based on the Health Promoting Schools framework.

The program provides schools with:

- a range of curriculum resources that are designed to enhance students' social and emotional skills and increase their understanding of mental health. These resources can be used in a variety of key learning areas to support teaching for and about mental health across the curriculum.
- opportunities for reflecting on student engagement and the nature of pedagogies that are likely to increase engagement and support students' sense of belonging
- material to review school practices in relation to issues affecting mental health and support changes to policies, structures, practices and curriculum to promote and protect mental health
- information on ways to identify, consult and involve parents, external agencies and other relevant community members in the promotion of mental health.

Live outside the box

Live Outside the Box is an interactive, fun, two-week challenge for Stage 3 (years 5 and 6) primary school students, on how to maintain a healthy, active lifestyle.

Students are encouraged, with the support of their families and teachers, to *Live Outside the Box* for two weeks. This means turning off the TV and computer games, getting outside, moving, playing and being more active. It also means reducing the amount of less healthy foods and replacing these with healthier alternatives.

As part of the challenge, each student receives a passport from their teacher. Each category in the passport represents healthy choices that students can make to maintain a balanced lifestyle. Students are awarded points each day for the following categories:

- Eating a healthy breakfast
- Drinking water instead of sugary drinks
- Eating fruits and vegetables
- Reducing the amount of 'sometimes' foods
- Being physically active
- Reducing sedentary activities.

To ensure family involvement and support for the student, parents and carers sign off the passport each night. Teachers can also run a range of activities within the school community to promote and support the challenge.

Once the challenge is complete, students receive a certificate (Gold, Silver or Bronze) based on the amount of points they have totalled.

Where did it originate?

The challenge has been adopted from the *Q4: Live Outside the Box* developed by Northern Sydney Central Coast Area Health Service. *Live Outside the Box* is a partnership between NSW Health and the NSW Department of Education and Training.

How can my school benefit?

Live Outside the Box:

- is FREE and can be implemented at any time throughout the school year
- engages the whole school community and helps build momentum around the importance of a healthy, active lifestyle
- can be used in a practical way to demonstrate the *5 ways to a healthy lifestyle* and to support the PDHPE K–6 curriculum
- includes a kit which contains instructions, teaching and learning activities, activity sheets and school newsletter articles
- is supported by Area Health Services contacts who can offer further advice and support.

How can I get involved?

Live Outside the Box is being promoted as part of the *Live Life Well @ School* initiative to all NSW Government primary schools. *Live Outside the Box* is also available as a 'stand alone' program for all NSW primary schools, including non-government schools.

Resources can be ordered through the NSW Resource Distribution Centre *Live Outside the Box Order Form* (PDF 30kb). For further information, contact your local NSW Area Health Service Health Promotion Unit.

Have fun participating!

Source: http://www.healthykids.nsw.gov.au/campaigns-programs/live-outside-the-box.aspx



INQUIRY

Health-promoting schools

Read the snapshot on the Live Outside The Box initiative and answer the following questions.

1. Draw your own diagram of the Health Promoting Schools framework (figure 3.10) and place the headings 'Curriculum', 'Environment' and 'Partnerships' in the circles.
2. Identify parts of the Live Outside The Box challenge that fit within the framework and include these in your diagram under the appropriate heading.
3. Explain why this initiative is an example of a public health approach to health promotion.

Health-promoting workplaces

Health-promoting workplaces are those where workplace policies, practices and activities are developed and implemented to improve the health and well-being of all workers.

Workplace health promotion strategies are defined as joint efforts undertaken by employers, employees and the wider community to improve the health and well-being of workers. A **health-promoting workplace** recognises that a healthy workforce can benefit both employers and employees by improving morale, reducing stress, decreasing staff turnover, reducing absenteeism and increasing productivity. Improvements in the health of workers may be achieved by making changes to the workplace and general working environment, encouraging workers to participate in activities that aim to enhance their health and well-being, and supporting personal development. The impact that non-work related factors in the general environment, such as family welfare, home and commuting conditions, may have on the health of workers is also recognised. Strategies such as flexible working conditions may be implemented in health-promoting workplaces to reduce the effect of these factors on the overall well-being of employees.

The programs developed by health-promoting workplaces are related to more than occupational health and safety measures. A variety of initiatives may be established for workers and management to voluntarily participate in to promote better health and well-being. These could include strategies such as fitness and physical activity programs, provision of workplace counselling, free vaccinations for hepatitis B or influenza, workplace massage sessions, health information seminars, establishment of healthy canteens in workplaces and on-site provision of weight loss or quit smoking programs. Decisions relating to the type of programs that are developed and how they are implemented should be negotiated between employees, management and unions, with the involvement of health professionals being sought when required.

CASE STUDY

Jimmy Possum

Australian furniture manufacturer Jimmy Possum treats employee health and well-being with just as much love and care as their prestige products. CEO and driving force behind Jimmy Possum's health and well-being program, Margot Spalding, explains why she is such a passionate advocate for the health of her 'little possums'.

A Bendigo icon, Jimmy Possum is a family business that has grown to be one of Australia's premier furniture makers supplying products across the country. Owned and established by Margot Spalding and husband Alan, Jimmy Possum's success is driven by a team of highly-skilled employees. Margot and Alan have made it their mission to value the health of their team as much as they value its work.

For close to a decade, Jimmy Possum has offered an engaging and inclusive health and well-being program that focuses on both physical and mental health to provide employees with every opportunity to be happy and healthy, both inside and outside of work.

"Everybody knows happier and informed people do better in the workplace because it creates a positive environment. If you have unfit, unhealthy and disgruntled workers, it's not good for anyone. But if you have people who are healthy and happy with positive things to talk about, it's good for business," Mrs Spalding said.

As a manufacturing business with 30-odd apprentices, Jimmy Possum has a young male-dominated workforce who often make poor lifestyle decisions that affect their health. To engage this demographic in health and well-being programs, Jimmy Possum regularly adapts and revamps its health and well-being initiatives to think outside the square and offer something for everyone.

"In 2010, we ran a program called Filthy, which stands for fit and healthy. The program was a four-week challenge to engage our male-dominated

(continued)

workforce by bringing out their competitive side. The challenge measured people on areas like diet, exercise and how much alcohol they were drinking," Mrs Spalding said.

"A lot of young people binge drink but, because our boys are competitive, they really cut back, because the Filthy challenge made them stop and think. They learned they could go their mate's place and drink nothing because it was their choice and they were in control. The Filthy challenge was absolutely incredible and a huge success — we're making it a regular event and will run it again this year."

At Jimmy Possum, health and well-being is embedded in the daily operations of the business. Whether it's healthy snacks available throughout the day, a wide variety of education seminars, or free counselling offered to employees and their families, health and well-being is fundamental to the company's culture.

"Our seminars are hugely popular with our employees and their families. We offer sessions on men's health, women's health, stretching, sun protection, sleep, depression and type 2 diabetes, just to name a few," Mrs Spalding said.

Jimmy Possum's program is ultimately about providing employees with the opportunity to be healthy and empowering them to make smart and informed health decisions.

"Health underpins everything. If you're not healthy, you can't function in life. Our health and well-being program shows we care about our people and like to provide them with an opportunity to be healthy. You're never going to convince everyone to do everything and that's okay. But if you get people to take up some initiatives, you're making a positive impact to their health," Mrs Spalding said.

With 80 per cent of employees choosing to participate in aspects of the program, Jimmy Possum is obviously hitting the mark with the activities on offer. In fact, Jimmy Possum's focus on health is one of the key aspects impacting the company's recruitment and retention.

"People want to come and work here because of our health program. When I'm interviewing people across the country, they know about our program — it's the number one thing people talk about during recruitment. It's an absolute added benefit to people and there's no question it's of great benefit to the business," Mrs Spalding said.

According to Margot Spalding, a healthy workforce benefits both employees and business success, so Australian businesses have an important role to play in educating and influencing employee health.

"It's people's choice whether or not they want to be healthy. You can't force your employees but you have to encourage and inspire them. I think that's the biggest thing — to inspire people to care about their health."

Source: Work Safe Australia.



INQUIRY

Jimmy Possum — a health-promoting workplace

Read the case study on Australian furniture manufacturer, Jimmy Possum. Explain why Jimmy Possum is a health-promoting workplace.



APPLICATION

Strategies to improve young people's health

Imagine that you and your classmates have been invited to attend a National Summit on Young People's Health. The purpose is to develop a range of strategies to improve the health of young Australians.

1. Prepare for the summit as follows.
   (a) Identify the key health issues that young people currently face.
   (b) Identify health-promoting strategies that have been or are currently being implemented to address these issues. Determine which of these strategies should continue because of their effectiveness.
   (c) Propose other actions that could be implemented to bring about improvements in young people's health.

(d) Identify people or groups that would be involved in implementing or supporting these strategies and outline their roles.
(e) Outline the intended outcomes of your proposed actions.

2. Conduct the summit as a class and participate in it as a delegate.
3. At the conclusion, evaluate the different strategies that were suggested by all delegates that attended.
4. Explain two actions that were suggested that you believe would result in significant improvements in young people's health. Give reasons to justify your choice of these two actions.



THE OTTAWA CHARTER AS AN EFFECTIVE HEALTH PROMOTION FRAMEWORK

In 1977, the World Health Organization (WHO) recognised that governments across the world should be working towards attaining a level of health for all citizens that would enable them to lead socially and economically productive lives by 2000. This became known as a global 'Health For All' strategy. To help achieve this goal, a document called the Ottawa Charter for Health Promotion was developed in 1986 in Ottawa, Canada, which outlined five areas of action to achieve health for all (see Appendix 1, pages 381–3). The charter is significant because it gave direction to health promotion through clear definitions, action plans and positive involvement. Agreement to the principles of the Ottawa Charter saw countries across the world adopt the public health approach as a new way of approaching health promotion. A summary of the charter's main points is given in figure 3.11.

Health promotion is:
the process of enabling people to increase control over and improve their health.

The prerequisites for health improvement are:
peace, shelter, food, education, income, stable ecosystem, sustainable resources, social justice and equity.

The charter advocates that:
good health is important for social, economic and personal development and is an important dimension of quality of life.

This will enable us to:
share opportunities and resources to allow all to achieve their fullest health potential.

We must mediate and:
involve all people in health promotion and health care. Different groups in society (e.g. governments), too, must mediate for the pursuit of health.

Health promotion action means:
1. *Building a public health policy* — e.g. legislation for better health, healthier goods and services, more enjoyable environments.
2. *Creating supportive environments* — encouragement of reciprocal maintenance; that is, take care of one another and the environment.
3. *Strengthening community action* — such as encouraging self-help, social support and participation in health-related matters.
4. *Developing personal skills* — by providing information and enhancing life skills, leading to greater control over one's own health.
5. *Re-orienting health services* — the health sector must look beyond providing clinical and curative services and look to health promotion that addresses the total needs of the individual as a whole person.

For the future:
1. *Commitment to health promotion* — the conference encouraged all participants to actively address health promotion issues in their own countries.
2. *Call for international action* — the conference called on WHO and all international organisations to help with health promotion so that Health for All by the Year 2000 would become a reality.

Figure 3.11: Important points from the 1986 Ottawa Charter for Health Promotion (*Source:* Adapted from Fran Baum 1998, *The New Public Health: An Australian Perspective*, Oxford University Press, South Melbourne, pp. 16–17.)

The Ottawa Charter action areas are still regarded as essential to any effective health promotion worldwide. They are based on the understanding that health is socially determined and encourage health professionals and governments not only to educate people about health matters, but also to change the environments in which people live and to involve the community in projects to improve health.

The Ottawa Charter for Health Promotion identified the following prerequisites for health.

- The basic necessities for health are peace, shelter, education, food, income, a stable ecosystem, sustainable resources, social justice and equity.
- Health is a positive concept emphasising social and personal resources, as well as physical capabilities.
- All people should be able to achieve their health potential through the provision of equal opportunities and resources.
- All sectors within the community are responsible for health promotion — health, social and economic sectors, governments, industry, local authorities, media and voluntary organisations.

In order to achieve these ideals, the Ottawa Charter recognised that there are five essential actions to improve health and create greater equality in health:

1. developing personal skills
2. creating supportive environments
3. strengthening community actions
4. reorienting health services
5. building healthy public policy.



INQUIRY

The Ottawa Charter's historical significance

The Ottawa Charter has had considerable influence on the understandings of health promotion that have developed in Australia, the approaches that have been adopted and the people or organisations that have involved themselves in these approaches.

Explain how the Ottawa Charter marked a change in approaches to health promotion in Australia.

Developing personal skills

Personal and social development occurs through the provision of information, education for health and the enhancement of life skills. This increases options in exercising control over our own health, our environments and in making choices that will promote health. Skills such as problem solving, planning, decision making, communicating and goal setting can be developed in schools, workplaces and in other community settings through actions by professional and voluntary organisations, the media and health services. These skills enhance our health by making us feel more responsible, empowered and self-confident. We will then have a greater capacity to respond to changes and adjustments that occur in our lives.

Example of this action include:

- mandatory Health and Physical Education curriculum from Kindergarten to Year 10
- media campaigns on the harmful consequences of drug use
- teaching people ways to prepare healthier meals

- providing online information about how to quit smoking
- educating girls and women about how to perform breast self-examinations.

Creating supportive environments

This action area focuses on the places where people live, work and play. It also focuses on increasing people's ability within these settings to make health-promoting choices. It is concerned with our social and physical environments. We need to take care of, protect and support each other, our community and our natural and built environments from threats to health. The organisation of work and leisure and the use of technology should enhance health and provide a safe, stimulating, satisfying and enjoyable environment.



Figure 3.12: Providing safe places for children to play and socialise is one way that the community can create supportive environments.

Workplaces, support groups, health services, schools, the media and families can all help to provide supportive environments. Examples of actions that help to create a healthy environment include:

- sporting venues providing areas that are alcohol free
- manufacturing vehicles that run on unleaded E10 fuel
- creating 40 km/h zones around schools
- providing counsellors in schools
- establishing healthy canteens in schools
- local councils building recreational facilities such as cycleways and walking tracks
- Quitline support and information being made available in numerous languages.

Strengthening community actions

The focus of this area is the empowerment of communities to identify and implement actions to address their health concerns. If communities can work together to set health priorities, make decisions, plan strategies and implement them, they will have greater ownership and control of the health promotion processes. Groups within the community that may seek to develop initiatives to address particular local issues include schools, workplaces, local governments, community health centres, self-help groups and cultural support agencies.

Examples of this action area include:

- Active After-School Communities
- Health-promoting schools
- Lions Club Driver Reviver stations
- Projects developed and implemented by Aboriginal Medical Services.

Reorienting health services

Reorientation means adjusting the direction or focus of a service to create a fresh approach.

The focus and delivery of health services has moved away from an emphasis on the more traditional aspects of health: diagnosis, treatment and rehabilitation. The **reorientation** of health services has focused on the well-being of the whole person: promoting health, preventing ill health and supporting well-being. This requires a change in attitude and the organisation of health services, and changes to professional education, training and research.

Health promotion can take place in a number of settings, such as schools, workplaces and community health centres, as well as through NGOs, such as the National Heart Foundation of Australia and the Cancer Council.

Examples of the reorientation of health services include:

- the National Heart Foundation working with schools to implement the Jump Rope for Heart program
- provision of free mammograms for women aged 50–69 years by BreastScreen NSW
- training GPs to help smokers quit smoking
- increasing funding for research and health promotion
- NSW Health working in partnership with schools to deliver free school-based vaccination programs.

Building healthy public policy

This relates to the decisions made at all levels of government and by organisations that work towards health improvement. It goes beyond the health sector and involves more than providing hospitals and medical policies. It includes legislation, policies, taxation and organisational change in areas such as recreation, welfare, transport, education and housing. This coordinated action helps to make healthier choices the easier choices in our working and living environments.



Figure 3.13: Regulations around occupational health and safety are aimed at minimising the risk to workers in potentially hazardous work situations.

Some examples of healthy public policy include:

- reduced taxes on low-alcohol beer to encourage its production and consumption
- legislation relating to unsafe driving behaviours such as driving under the influence of alcohol and using mobile phones when driving
- laws requiring fast food and snack food chains to display kilojoule information at the point of sale
- occupational health and safety regulations
- school policies related to sun safety
- legislation requiring plain packaging of tobacco products.



INQUIRY

Effective health promotion

eBookplus

Investigate and prepare a report on a successful health promotion initiative, either on a national scale or at your local community level. You may wish to use the weblinks provided in your eBook PLUS to investigate the **Active After-School Communities Initiative** or the **8700 kJ consumer education campaign**, or research another health promotion of your choice. Use the following questions to structure your report.

1. Describe the aims of the health promotion initiative.
2. Explain:
   (a) how the five action areas of the Ottawa Charter have been addressed in this initiative
   (b) why this has contributed to its success.

The emphasis of recent health promotion centres on creating a physical, social, economic and cultural environment that enables people to achieve maximum well-being. The Ottawa Charter action areas are central to many health promotion initiatives and programs in Australia. One successful and world-acclaimed health promotion example in Australia was the national HIV/AIDS strategy from 1989 to 1995. Australia's response to the HIV/AIDS epidemic focused on more than a healthier individual approach by addressing the five action areas (see table 3.1, page 128).



INQUIRY

Actions and strategies

Review the actions undertaken as part of the Sixth National HIV Strategy 2010–2013 that are shown in table 3.1 (page 128). Explain how the action areas of the Ottawa Charter and the various strategies used within each area contributed to positive health outcomes for the following groups:

- groups identified as priority communities and population
- health professionals and health care workers such as GPs, nurses, specialists, mental health workers, welfare agencies and health promotion services
- people living with HIV.



APPLICATION

Exploring the use of the action areas to improve health

1. In small groups, select an area of concern for health that has improved in recent years, for example, reduction in road injuries or decreases in tobacco use.
2. Research actions that have been undertaken by various levels of government, workplaces, non-government organisations and community groups to address the health issue.
3. Use your research to complete a table similar to table 3.1 (page 128) to show how each of the five action areas of the Ottawa Charter has been addressed in order to achieve improvements in relation to the health issue.
4. Using your completed table, identify:
   (a) actions that might fit into more than one area of the Ottawa Charter
   (b) groups targeted by various actions and strategies used to promote health improvements.
5. Report back to the class on your selected health issue and discuss each group's findings.

Table 3.1: The Sixth National HIV Strategy 2010–2013

Action area of the Ottawa Charter	Examples of actions or strategies used
Developing personal skills 	• provide information to support safe sex and safe injecting practices • develop knowledge and build individual skills around HIV risk-reduction strategies • raise awareness of STIs and risk behaviours through the national media and communication technologies • build resilience and coping strategies for people living with HIV
Creating supportive environments 	• use wide range of strategies to distribute sterile injecting equipment, including through needle and syringe programs • provide culturally appropriate and easily accessible education programs and services to support risk-reduction practices • increase access to needle and syringe programs and drug treatment programs, particularly for people who inject drugs, sex workers, and Aboriginal and Torres Strait Islander people
Strengthening community actions 	• work in partnership with community sector agencies to develop and implement programs for specific priority groups (e.g. gay men, sex workers) • develop peer education programs • work in partnership with HIV-positive people to develop HIV health promotion and prevention strategies • promote HIV testing among gay men, particularly from culturally and linguistically diverse backgrounds
Reorienting health services 	• target specific groups at risk for prevention and support (e.g. gay men and men who have sex with men, Aboriginal and Torres Strait Islander people) • strengthen training programs and continue medical education in HIV for GPs • train health care workers in ways to better support people diagnosed with HIV to adhere to complex treatment regimes • undertake research to assist with the development of appropriate health promotion initiatives that target people travelling to countries where HIV is prevalent • ensure workforce training programs for people in mainstream health agencies include HIV awareness and education to reduce stigma and discrimination
Building healthy public policy 	• ensure anti-discrimination laws give people with HIV the same access to health care as other members of the community • monitor the implementation of the National Guidelines for the Management of People with HIV Who Place Others at Risk • protect the human rights of HIV-positive people to reduce stigma and marginalisation within the community.

PRINCIPLES OF SOCIAL JUSTICE

Social justice is a value that favours the reduction or elimination of inequity, the promotion of inclusiveness of diversity and the establishment of environments that are supportive of all people.

The adoption of principles of **social justice** is fundamental to effective health promotion. These principles seek to ensure that individuals and groups identified as being the most disadvantaged (and therefore most likely to be experiencing poor health) are provided with sufficient resources and support to empower them to improve their health. On occasions this can see significantly more resources being allocated to particular groups compared to the general population in an effort to narrow the gap that exists and improve the health of the whole population. Agreement with social justice principles requires a valuing of diversity, the provision of equal opportunities to maintain equity and the creation of supportive environments to promote better health.

Equity

Equity is the allocation of resources according to the needs of individuals and populations, the goal being to achieve equality of outcomes.

Equity means taking action to achieve fairness. In health, this is done by allocating resources and entitlements, including power, fairly across the population. The needs of individuals and populations have to be carefully considered to ensure all individuals within society have access to the same opportunities for achieving optimal health. People experiencing extreme disadvantage such as those suffering poor health, living in poverty or in remote locations need to be allocated more resources if their health outcomes are to change. In other words, people who are disadvantaged may need to be treated differently to be treated equally.



Figure 3.14 The principles of social justice include the need to make health services equal for all groups in the population.

INQUIRY

Inequities in Indigenous communities

Read the snapshot below about differences that exist between Indigenous and non-Indigenous people in regards to food security and answer the following questions.

1. Define the term 'food insecurity'.
2. According to the Dietitians of Australia, the Australian Red Cross and the Public Health Association of Australia, what inequities exist in relation to food security between Indigenous and non-Indigenous people?
3. Discuss factors that make it difficult for some Indigenous people to access sufficient, safe and nutritious foods.
4. Propose strategies that could be implemented to address these inequities and identify the people/groups who would be responsible.

SNAPSHOT

Leading organisations rally: Food security the missing link in 'closing the gap'

Leading health organisations, the Dietitians Association of Australia and the Public Health Association of Australia, have joined forces with Australian Red Cross to draw attention to the health gap between Aboriginal and Torres Strait Islander people and other Australians, due to food insecurity.

The three organisations are releasing their 'Food Security for Aboriginal and Torres Strait Islander Peoples' policy at Parliament House in Canberra today.

According to the organisations, one in four (24 per cent) Aboriginal and Torres Strait Islander people report food insecurity, compared with just five per cent of non-Indigenous Australians. Public Health Association of Australia CEO Michael Moore said: 'We're calling on all levels of Government to address food insecurity in Aboriginal and Torres Strait Islander people. Many in this population group do not have access to sufficient, safe and nutritious food to lead a healthy and active life — an issue they say is not getting any better and needs urgent attention.

'Factors such as poverty, low or inadequate incomes, poor housing, including basic set-ups to store and prepare food, and less access to nutritious food place these Australians at higher risk.'

Claire Hewat, CEO of the Dietitians Association of Australia, said the result is that many Aboriginal and Torres Strait Islander families go hungry, and that diet-related diseases run rife in this population.

'Sadly, in this group of Australians, we see high rates of preventable diet-related diseases like obesity, type 2 diabetes and heart disease,' said Ms Hewat.

She said nutrition needs to be a priority if the health of Aboriginal and Torres Strait Islander people is to improve.

According to Jennifer Evans, National Coordinator, Families Children and Food Security at Australian Red Cross, Aboriginal and Torres Strait Islander people do not have an equal opportunity to be as healthy as non-Indigenous Australians, with poorer access to healthy food, primary health care and health infrastructure.

'This is reflected in data showing life expectancy for Aboriginal and Torres Strait Islander people is 11.5 years shorter for males and almost 10 years shorter for females, compared with other Australians,' said Ms Evans.

The 'Food Security for Aboriginal and Torres Strait Islander Peoples' policy highlights the need for all levels of government to take the lead in addressing food insecurity, working with non-government organisations and Aboriginal and Torres Strait Islander people.

Source: Australian Red Cross media release, 10 December 2013.

Diversity

Australia is an extremely diverse nation, not only in terms of our multicultural populations but also in terms of the varying social 'markers'; for example, age, gender, sexuality, socioeconomic status, geographic location and levels of educational achievement. These social 'markers' require attention to make things fair and just, so that the inequalities and injustices in relation to health are questioned and challenged and inclusiveness is promoted.

In order to raise the levels of health currently experienced by the whole population and to narrow the gap between advantaged and disadvantaged groups in Australia, it is important that health promotion strategies recognise and acknowledge the **diversity** that exists between various groups. This assists the tailoring of strategies to better cater for the particular needs of different groups. For example, initiatives targeted at people living in rural locations need to be designed and delivered in different ways from those developed for urban residents. Providing people from particular groups with a voice in determining their own health needs and actively involving them in planning is one way of ensuring the appropriateness of programs.

Diversity is variety, or difference, between individuals and groups of people.

Sensitivity to a person's cultural background and beliefs is an important component of effective health promotion. Language barriers, misconceptions, lack of cultural awareness and unfamiliarity with health support services can all limit people's ability to access information and support. The development of culturally appropriate resources, the provision of health promotion material in languages other than English and the involvement of health workers from specific cultural backgrounds in the planning and delivery of initiatives are examples of ways of demonstrating that diversity is valued.

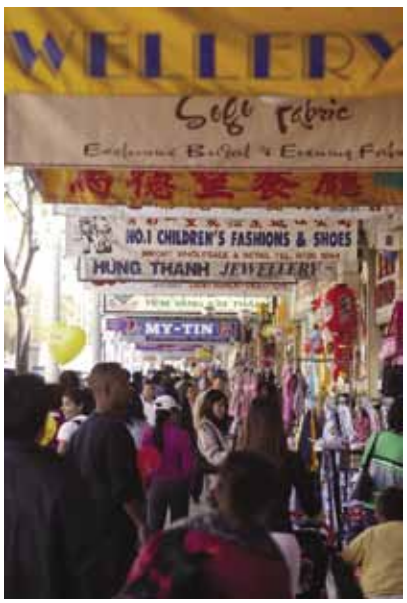


Figure 3.15 Health needs and issues differ in Australia's culturally diverse communities.

Supportive environments

The social environment in which a person lives or works has a significant influence on that person's level of health and their ability to be able to make changes to improve their health. Good health is achieved in environments that:

- are relatively free of violence and pollution, and that have a regular supply of safe water and nutritious food
- have an adequate supply of basic necessities such as clothing, shelter and transport
- provide opportunities for recreation and variety in daily living
- cause less stress
- are relatively free of factors that cause isolation and alienation
- have low levels of poverty
- provide safe and interesting work.

Strategies that aim to promote better health need to address the social, cultural, physical and economic factors present in people's lives in order to create environments that are supportive of health. For example, a person who works a long distance from home in a sedentary job, with no public transport available to them and few exercise facilities in their local area may find it difficult to regularly participate in physical activity. The environment in which they live and work creates barriers that make it harder for them to choose to be active. Changes in work practices, a wider range of transport and employment options, and improved local facilities are needed to create an environment that is more supportive of their health.

In some cases government legislation or policies may be required to bring about changes to environments so they better support good health. Government legislation that bans smoking in restaurants, government buildings, pubs, clubs and transport services; laws around speeding in school zones; policies around healthy school canteens; and occupational health and safety laws are all examples of government actions that assist in the creation of environments that promote improved health outcomes.

Incorporating principles of social justice in health promotion initiatives does not inevitably mean improvements in health will take place. The allocation of additional resources and support to particular individuals or groups does not necessarily result in equity in terms of health outcomes, nor does the design of supportive environments guarantee lifestyle changes. People may continue to engage in health risk behaviours that negatively affect their health. Following these principles does, however, provide all Australians with the opportunity to exercise greater control over their own level of health in order to bring about improvements.



INQUIRY

Applying social justice principles

eBookplus

1. Use the **Quitnow** weblink in your eBookPLUS to explore the Quitnow website. This website, which is part of the National Tobacco Campaign, aims to provide information and support to assist people to quit smoking.
2. Identify strategies used as part of the campaign that demonstrate an application of the principles of social justice.
3. Research other health promotion initiatives such as those relating to physical activity, sun protection, road safety or healthy eating. Identify strategies within these initiatives where social justice principles have been applied.
4. Report your findings to the class.

SUMMARY

- Health promotion is the process of enabling individuals to increase control over their health and improve their health.
- Health promotion aims to improve the social, economic, cultural, environmental and behavioural conditions that people live in to ensure they support health-promoting choices.
- Various individuals, groups and organisations, along with all levels of government, play a role in helping to promote good health.
- Individuals have some responsibility for promoting their own health by making positive healthy choices. Individually initiated behaviour change is more likely to occur when people feel empowered and supported.
- Health professionals can assist to empower people to make healthy choices by providing them with information and supporting them to develop skills that will benefit their health.
- Schools and community organisations are common settings for health promotion activities as they share a close relationship with the local community and can target local health priorities.
- Non-government organisations focus on a specific health problem. They promote health by increasing awareness, undertaking research, fund raising, providing support services and lobbying.

- All levels of government share a responsibility for promoting health improvements by providing the funding, strategic leadership, infrastructure and personnel needed to create supportive environments.
- The World Health Organization acts as a coordinating authority on global health issues.
- The philosophy, principles and structures of the World Health Organization guide government approaches to health promotion.
- There are three main approaches to health promotion: a lifestyle approach, a preventative medical approach and a public health approach.
- A lifestyle approach focuses on addressing lifestyle behaviours that contribute to disease and poor health.
- A preventative medical approach centres on using medical interventions and treatments to eliminate or reduce health risks.
- A public health approach is a more holistic approach that recognises the need to address the social and economic factors that influence people's ability to control their own health.
- The public health approach involves a collaborative approach to health promotion whereby communities, government, health professionals and other agencies work together to improve health.
- The Ottawa Charter provides an effective framework for health promotion initiatives to be modelled upon.
- There are five action areas of the Ottawa Charter: developing personal skills; creating supportive environments; strengthening community action; reorienting health services; and building healthy public policy.
- Acceptance and application of social justice principles is essential for effective health promotion.

QUESTIONS

Revision

1. Using examples, **outline** what is involved in health promotion. (P5) (3 marks)
2. **Describe** the roles and responsibilities that the following people have in health promotion:
   (a) health professionals
   (b) non-government organisations
   (c) governments
   (d) World Health Organization. (P5) (5 marks)
3. **Explain** the roles played by the different levels of government in health promotion and discuss how their roles are interrelated. (P5) (4 marks)
4. **Explain** why a collaborative approach towards health promotion by individuals, communities, organisations and governments is highly effective in bringing about improvements in health. (P5) (4 marks)
5. **Describe** the three different approaches to health promotion. Provide examples of each approach that seek to address health issues affecting young people. (P6, P15) (5 marks)
6. **Outline** the role that the Ottawa Charter has played in changing the approaches taken to promoting better health in Australia. (P5, P15) (3 marks)
7. **Identify** the five action areas of the Ottawa Charter and explain how each contributes to the promotion of health. (P5) (5 marks)
8. Choose one area of concern in relation to young people's health. **Explain**, using examples, how a supportive environment could contribute to more positive health outcomes for young people in relation to this issue. (P6, P15) (4 marks)
9. **Describe** a health-promoting strategy that addresses the issues of equity and diversity. (P6) (4 marks)

(continued)

10. **Explain** why the application of the principles of social justice to health promotion initiatives is more likely to bring about improvements in people's health. (P15) (5 marks)

Extension

1. Imagine you are the Federal Minister for Health. **Propose** a health promotion initiative you would implement to address a current health issue facing young people. Be sure to **demonstrate** how your health promotion initiative incorporates the five action areas of the Ottawa Charter and how you have applied the principles of social justice principles. (P6, P15) (10 marks)
2. **Evaluate** the effectiveness of the three approaches to health promotion in improving the health of young people. (P15, P16) (8 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

PRELIMINARY CORE 2

The body in motion

eBookplus

eLESSONS

Video lessons with worksheets for Preliminary Core 2:

- **Testing physical fitness**
  Searchlight ID: eles-0156
- **Fluid mechanics**
  Searchlight ID: eles-0157

Interactivities for Preliminary Core 2:

- **Label: muscular system**
  Searchlight ID: int-0922
- **Label: skeletal system**
  Searchlight ID: int-0923

These eLessons and interactivities are available in the student resources tab of your eBookPLUS. Visit **www.jacplus.com.au** to locate your digital resources.



CHAPTER 4
Body systems and movement



OUTCOMES

On completion of this chapter, you will be able to:

- explain how body systems influence the way the body moves (P7)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation (P17)
- value the technical and aesthetic qualities of and participation in physical activity. (V&A)

OVERVIEW

SKELETAL SYSTEM
Major bones involved in movement
Structure and function of synovial joints
Joint actions

MUSCULAR SYSTEM
Major muscles involved in movement
Muscle relationship
Types of muscle contraction

RESPIRATORY SYSTEM
Structure and function
Lung function
The exchange of gases
Effect of physical activity on respiration

CIRCULATORY SYSTEM
Components of blood
Structure and function of the heart, arteries, veins and capillaries
Pulmonary and systemic circulation
Blood pressure

Long bones are longer than they are wide and they function as levers.

Short bones have a short axis and are found in small spaces such as the wrist. They serve to transfer forces.

Flat bones have a broad surface and serve as places of attachment for muscles and to protect vital organs.

Cancellous bone is the spongy or porous inner structure of bone that often contains and protects bone marrow.

Bone marrow is a soft, fatty vascular tissue in which blood cells are made, located in the interior cavities of bones.

Articular cartilage is a firm, smooth, flexible connective tissue that covers the end of bones where they form joints.

The human skeleton has 206 bones.

The arrangement of these bones enables five main functions including:

- support for the body, giving it shape, form and posture
- protection of vital organs and soft tissue
- assistance in body movement by providing the attachment for muscles and being able to serve as levers
- manufacture of blood cells in the marrow cavities
- provision of a storehouse for essential minerals such as calcium and phosphorus.

Bones range in shape and size, a feature that allows them to perform specialised functions. The main types are **long bones**, **short bones** and **flat bones**. Long and short bones function as levers or to transfer forces. Flat bones usually provide protection for vital organs.

The outer part of bone consists of dense, strong compact bone tissue and forms the actual shaft of long bones. At the extremities or ends of long bones, there is a criss-cross network of spongy bone tissue called **cancellous bone** which is strong but light and able to withstand stress (see figure 4.1). This is the area that flares out to articulate (meet) with adjacent bones, forming joints. The centre cavity of the bone and the spaces of the spongy bone are filled with **bone marrow** which contains blood vessels, fat and blood-forming tissue.

On the articular surface (the area where bones meet) of the compact bone is a softer but highly resilient material called **articular cartilage**. This prevents jarring and allows the bones to move freely on each other.

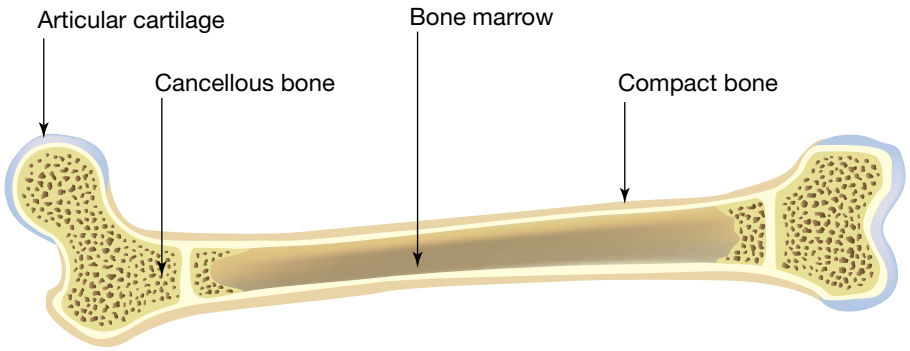


Figure 4.1: The structure of a long bone

The major bones of the human body are shown in figure 4.2. Not all the bones identified in this figure are involved in movement. For example, the skull comprises many bones, but their role is to protect vital brain tissue rather than assist movement. Our focus in this chapter is on the bones that comprise and surround joints, establishing connecting structures that enable movement.

Bones provide structure to the body in the same way that a frame gives structure to a house. Bones move only because muscles pull them, often rapidly, through specific positions, enabling activities such as throwing, kicking, running and swimming. During movement, large long bones move considerably while others move marginally or not at all as they anchor joint structures. It is still important to be familiar with all bones that surround a joint so you fully understand how that structure functions during movement.

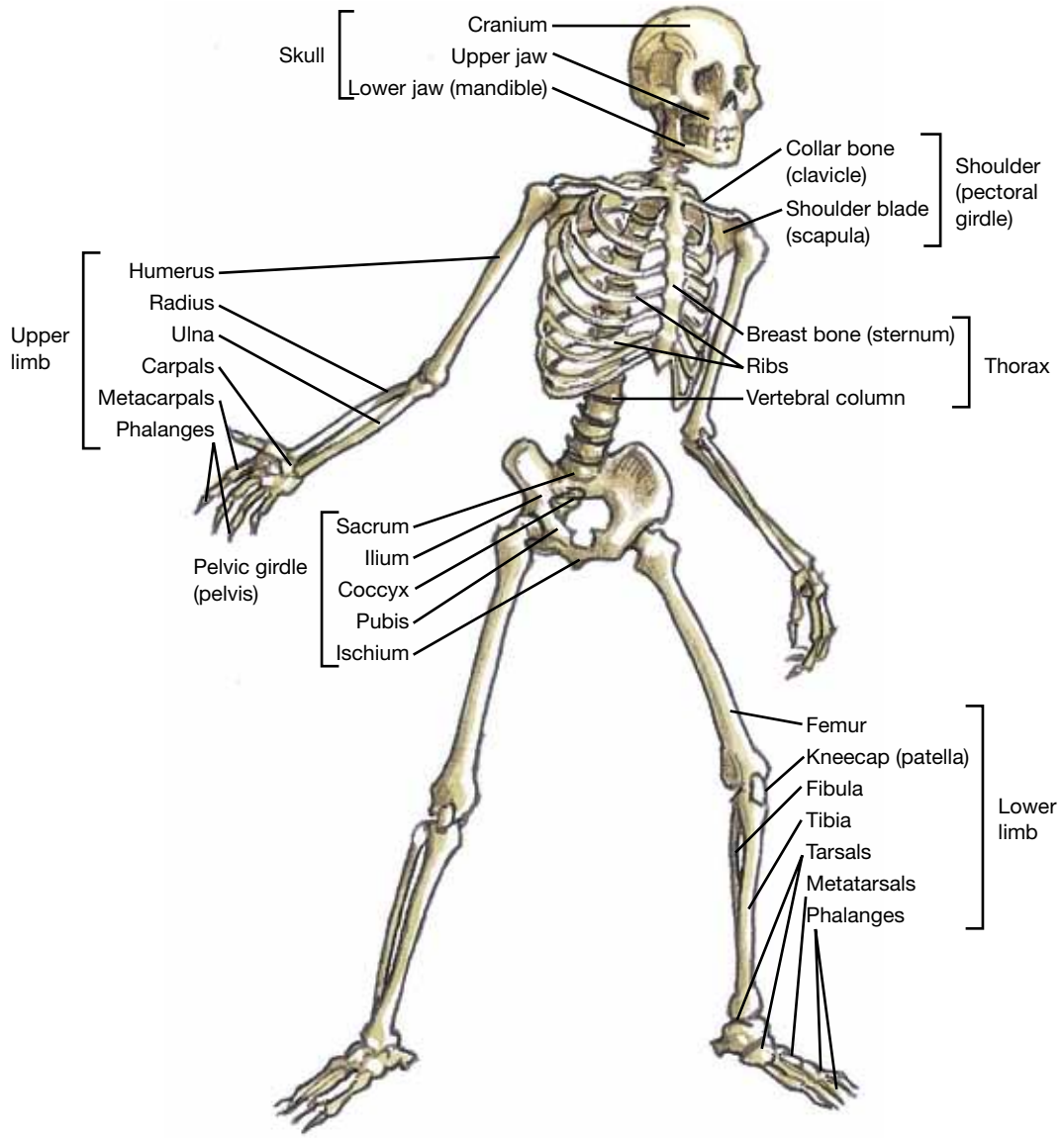


Figure 4.2: Major bones in the human body

An anatomical reference system called *directional terms* is used to identify the location of bones. The starting point assumes that the body is in the anatomical position; that is, a reference position where the subject is standing erect, facing front on and with palms facing forward (see figure 4.3(a)). From here, we can locate a bone by saying where it is relative to another part of the body. For example, in anatomical terms, superior means 'towards the head'. For location purposes we might say that the chest is superior to the hips or the knee is superior to the foot. Anatomical terms as they apply to locating body parts are shown in figure 4.3.

1. *Superior* — towards the head; for example, the chest is superior to the hips
2. *Inferior* — towards the feet; for example, the foot is inferior to the leg
3. *Anterior* — towards the front; for example, the breast is on the anterior chest wall (see figure 4.3(b))

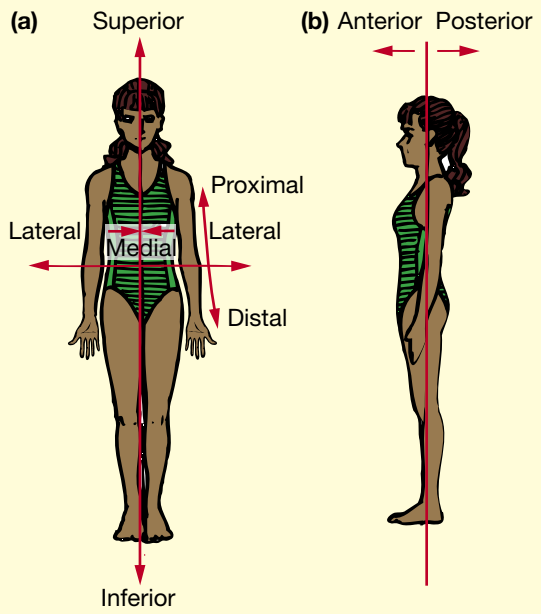


Figure 4.3: The **(a)** anatomical and **(b)** anterior and posterior positions

4. *Posterior* — towards the back; for example, the backbone is posterior to the heart (see figure 4.3(b))
5. *Medial* — towards the midline of the body; for example, the big toe is on the medial side of the foot
6. *Lateral* — towards the side of the body; for example, the little toe is on the lateral side of the foot
7. *Proximal* — towards the body's mass; for example, the shoulder is proximal to the elbow
8. *Distal* — away from the body's mass; for example, the elbow is distal to the shoulder.

Major bones involved in movement

The major bones involved in movement are as follows.

- *Clavicle (collar bone).* This is a long bone that provides attachment between the shoulder girdle and the vertebral column. It gives greater mobility to the shoulder joint when movement is taking place, such as throwing a softball.
- *Scapula (shoulder blade).* This is a large, triangular flat bone. The scapula/clavicle structure allows the arm to attach to the trunk portion of the skeleton. Many muscles involved in movement attach to this bone.
- *Humerus.* This is the major long bone in the upper arm joining the shoulder to the elbow. It can move in most directions and even rotate within the shoulder joint, as might be required for bowling in cricket.
- *Radius.* This long bone is found on the thumb side of the forearm. It works with the ulna in providing structure to the forearm and allowing it to rotate on the elbow joint. Muscles work on and around the radius and ulna

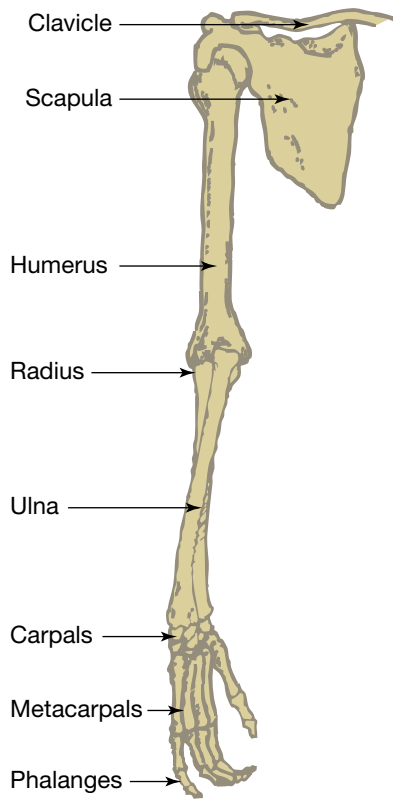


Figure 4.4: Bones of the upper limb

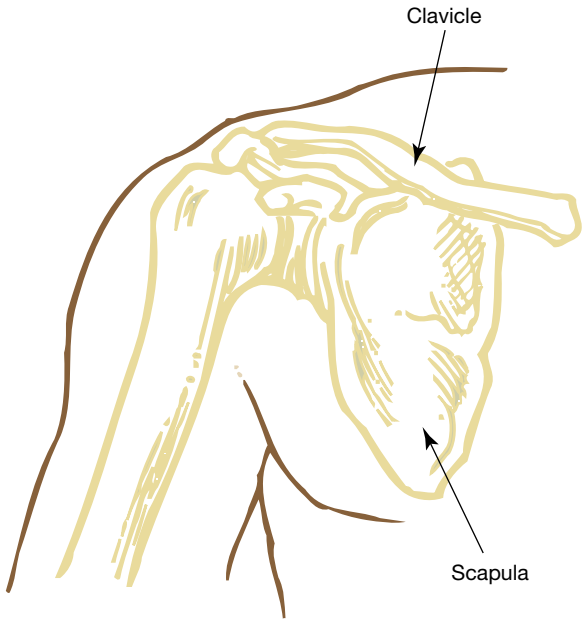


Figure 4.5: Detailed view of the scapula and clavicle

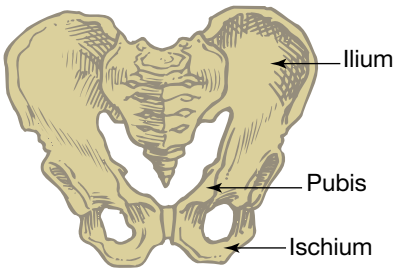


Figure 4.6: Bones of the pelvis

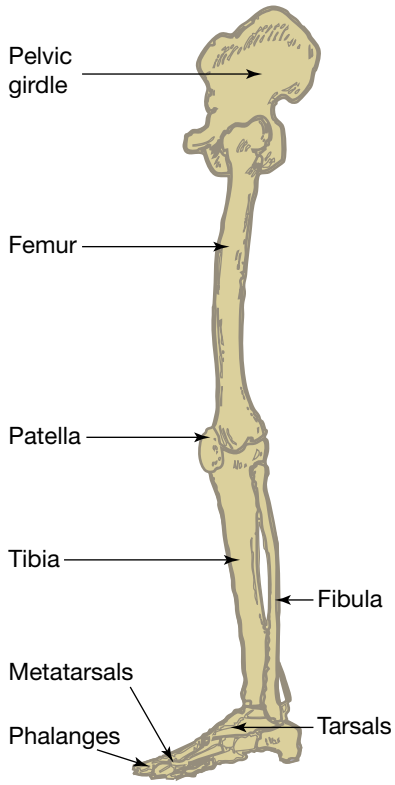


Figure 4.7: Bones of the lower limb

rotating the palm of the hand, as might be required during freestyle swimming or providing topspin to a table tennis ball.

- *Ulna*. This is the longer bone of the forearm, found on the little finger side.
- *Carpals, metacarpals* and *phalanges*. These are the bones of the wrist and fingers. Carpals are short bones; metacarpals and phalanges are long. Collectively they provide structure to the hand allowing it to perform important fine motor movements such as catching, holding a bat, flicking as part of a throw, spinning a ball and squeezing.
- *Pelvic girdle*. The pelvis comprises a number of bones and provides the base of support necessary for the weight of the upper body. While not directly contributing to movements such as kicking, it is important because it also allows for the attachment of the lower limbs and muscles of the leg and lower back. The pelvic girdle allows less movement than the shoulder girdle because the supporting ligaments are short and strong. The hip joint where the femur (thigh bone) attaches is deep, adding to the stability of the structure.
- *Femur* (thighbone). The femur is the longest and strongest bone in the body, having the capability to support up to 30 times the weight of an adult. The bone is covered by large muscles that extend from the pelvic girdle to the shin, enabling many movements such as running and kicking.
- *Patella* (kneecap) is a small, flat triangular bone whose main role is to provide protection to the knee.
- *Tibia* or shinbone is the larger of two long bones that form the lower leg. It bears most of the body weight and of course is involved in all movements of the lower body, such as running, kicking and swimming.
- *Fibula* is a slender long bone that lies parallel with and on the lateral side of the tibia. It works with the tibia in providing support and stability to the lower leg while allowing slight rotation from the knee joint.
- *Tarsals, metatarsals* and *phalanges* comprise the bones of the foot. Tarsals are short bones; metatarsals and phalanges are long. They work as a unit providing a structure that enables leg movements including walking, running, balancing, hopping and kicking.



The skeletal system and its role in movement

Equipment

Textbook, diagram of a skeleton, an anatomical model of the skeleton, a skeletal chart, blank labels

Procedure

1. Refer to the text about the major bones of the body and to figure 4.2. Using a diagram of the skeleton, label the major bones involved in movement.
2. Work in pairs, rotating the role of performer and analyst during the following activities. As one student slowly performs each action, the other should identify the bones involved in the movement and establish the role played by each bone; for example, support, transfer of load.
   (a) Throwing a javelin
   (b) Kicking a football
   (c) Paddling a canoe
   (d) Bowling in cricket
   (e) Shooting in netball
   (f) Swinging a golf club

Structure and function of synovial joints

A joint is a junction of two or more bones and is commonly referred to as an *articulation*. There are three types of joint — **immovable** or **fibrous**, **slightly movable** or **cartilaginous**, and **freely movable** or **synovial**.

An **immovable** or **fibrous joint** is a joint where no movement is possible. Examples of this type of joint include the bones of the cranium, which are fused in lines called sutures.

A **slightly movable** or **cartilaginous joint** is a joint that permits limited movement. Examples of this joint exist in the vertebral column, where fibrous cartilage between discs allows a limited range of movement.

A **freely movable** or **synovial joint** is one that allows maximum movement. Most joints in the body are synovial joints; for example, the hip joint.

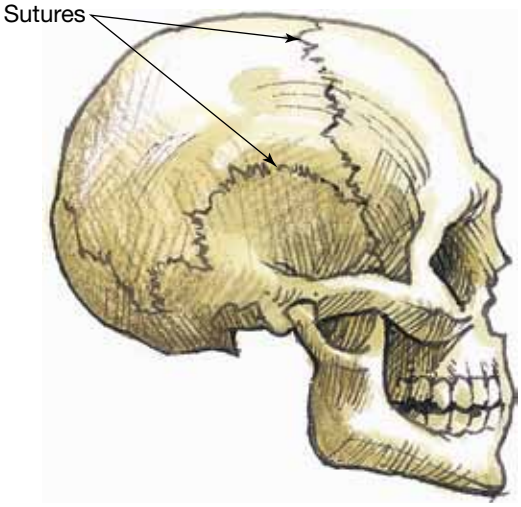


Figure 4.8: The sutures in the skull are an example of an immovable or fibrous joint.

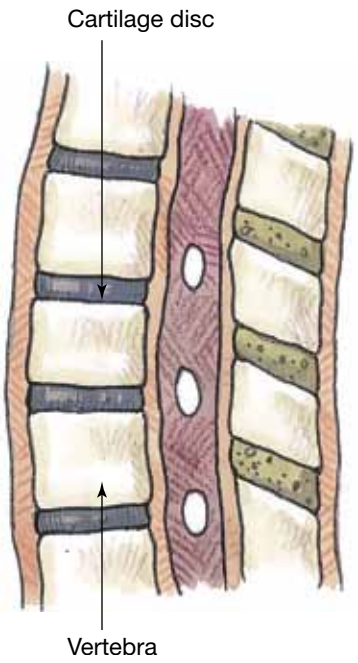


Figure 4.9: Example of a slightly movable/cartilaginous joint

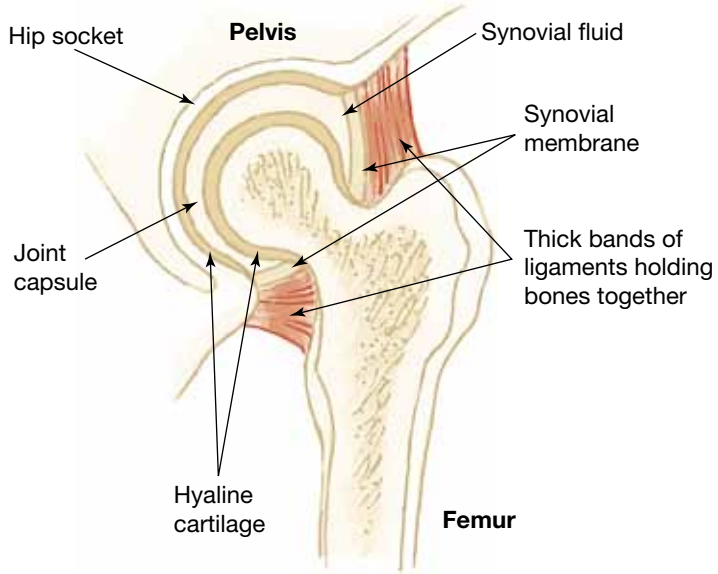


Figure 4.10: The hip joint is an example of a freely movable or synovial joint.

The knee joint is a typical synovial joint. Although its structure is complex, its features are typical of that of synovial joints throughout the body. The most important structures in synovial joints are tendons, ligaments, cartilage and synovial fluid.

Ligaments

Ligaments are well-defined, fibrous bands that connect the articulating bones. They are designed to assist the joint capsule to maintain stability in the joint by restraining excessive movement, but can also control the degree and direction of movement that occurs.

Ligaments are relatively inelastic structures that may become permanently lengthened when stretched excessively. This can occur in injury to the joint and may lead to some joint instability.

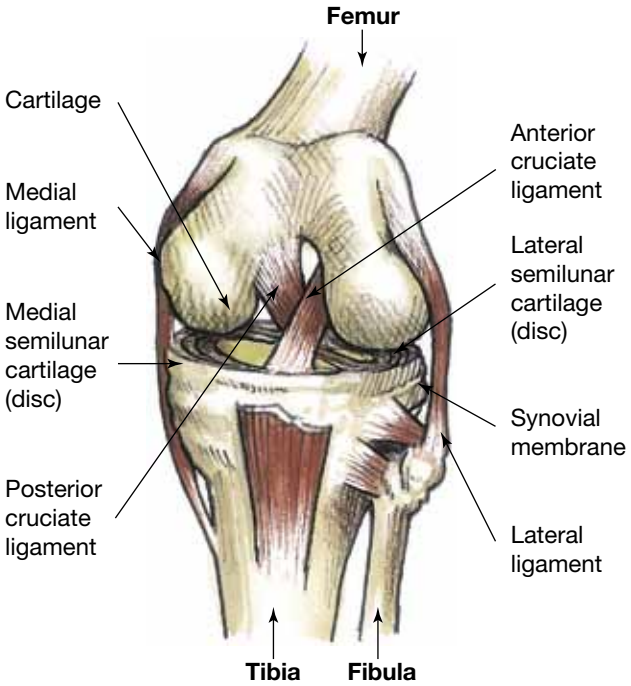


Figure 4.11: The knee joint (anterior view)

Tendons

Tendons are tough, inelastic cords of tissue that attach muscle to bone. Joints are further strengthened by muscle tendons that extend across the joint and assist ligaments to hold the joint closed.

Synovial fluid

Synovial fluid acts as a lubricant, keeping the joint well oiled and the moving surfaces apart. As no two joint surfaces fit together perfectly, synovial fluid forms a fluid cushion between them. It also provides nutrition for the cartilage and carries away waste products.

The amount of synovial fluid produced depends on the amount and type of physical activity of the joint. When the articular cartilage is under pressure — that is, during movement — fluid is 'pumped' into the joint space. The viscosity (stickiness) of the fluid can also vary, with the synovial fluid becoming more viscous with decreases in temperature. This may be the reason for joint stiffness in cold weather.

Hyaline cartilage

While synovial fluid acts as a cushion between the articulating surfaces of the bones, they are also covered with a layer of smooth, shiny cartilage that allows the bones to move freely over each other. Hyaline cartilage has a limited blood supply but receives nourishment via the synovial fluid. This cartilage is thicker in the leg joints, where there is greater weight bearing.



Observing synovial joints in action

Equipment

Textbook, model of skeletal system

1. In pairs, observe the anatomical model, giving particular attention to the joints. If possible, gently manipulate major joints while noting the structure of bones that articulate at the joint.
2. Copy and complete the table at the top of the next page.
3. Use the information you have gathered to discuss the relationship between the types of bone (long, short, flat) and movement allowable at each joint.

Joint name	Joint type	Articulating bones	Movement allowable
Shoulder			
Elbow			
Wrist			
Hip			
Knee			
Ankle			

INQUIRY

eBookplus

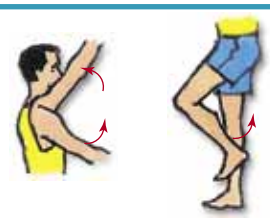
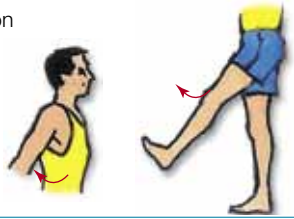
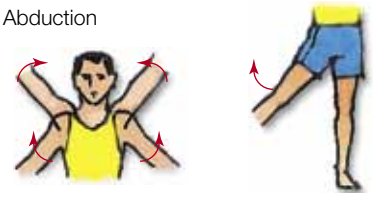
The role of joints in movement

1. What do you think would be the effect of a ruptured medial ligament on movement? Use the **Medial ligaments** weblink in your eBookPLUS to help you answer this question.
2. What would be the effect of missing menisci on movement?
3. The human skeletal system is remarkable in that it allows us to perform a very wide range of movements. Discuss how the various joint structures allow us to run quickly, throw a shot-put and perform a somersault in gymnastics.

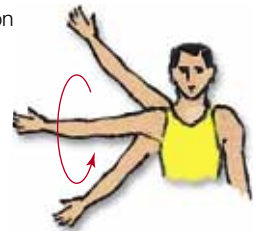
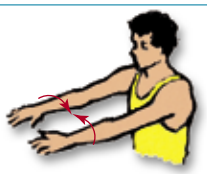
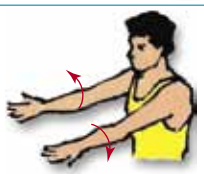
Joint actions

The numerous joints of the body, together with the muscles around these joints, allow us to perform a remarkable range of twisting, turning and rotating movements. Physiologists use specific terminology to describe those movements, which are called joint actions. An example is flexion which refers to the action of two bones coming closer together, as happens when we bend the elbow. In this action, the radius and ulna are drawn closer to the humerus. The types of joint actions are summarised in table 4.1.

Table 4.1: Types of joint actions

Joint action	Description
Flexion 	A movement that decreases the angle between the bones at the joint; for example, bending the leg at the knee or the arm at the elbow
Extension 	A movement that increases the angle between the bones at the joint; for example, straightening the leg at the knee
Abduction 	The movement of a body part away from the midline of the body; for example, raising the leg or arm to the side

(continued)

Joint action	Description
Adduction 	The movement of a body part towards the midline of the body; for example, lowering the arm or leg towards the midline
Inversion 	Rotation of the foot to make the sole of the foot face inwards
Eversion 	Rotation of the foot to make the sole of the foot face outwards
Rotation 	Moving a body part such as the head or trunk around on its long axis
Circumduction 	The circular movement of a body part; for example, making a large movement with the arm that describes a cone in space
Pronation 	The rotation of the hand and forearm that causes the hand to face palm downwards
Supination 	The rotation of the hand and forearm that causes the hand to face palm upwards
Dorsiflexion 	This is flexion of the ankle. It is a movement that pulls the top of the foot towards the tibia.
Plantar flexion 	This is extension of the ankle. It is a movement that moves the top of the foot from the tibia; that is, pointing the toes.

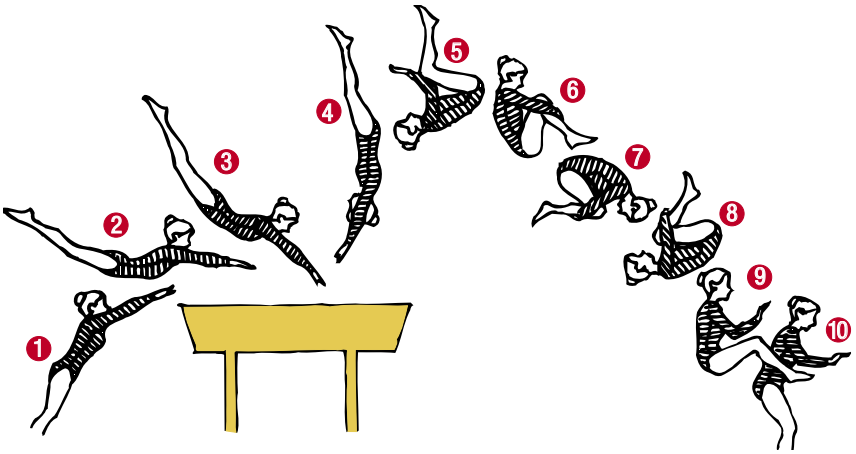
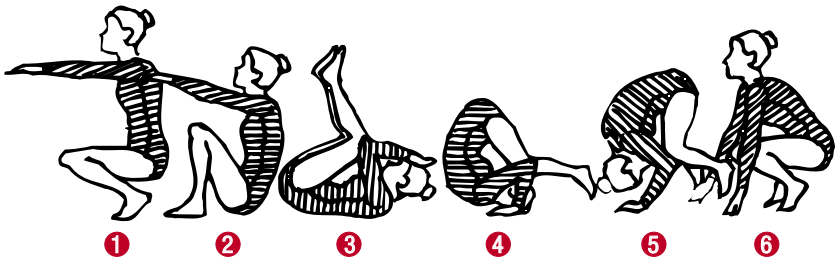
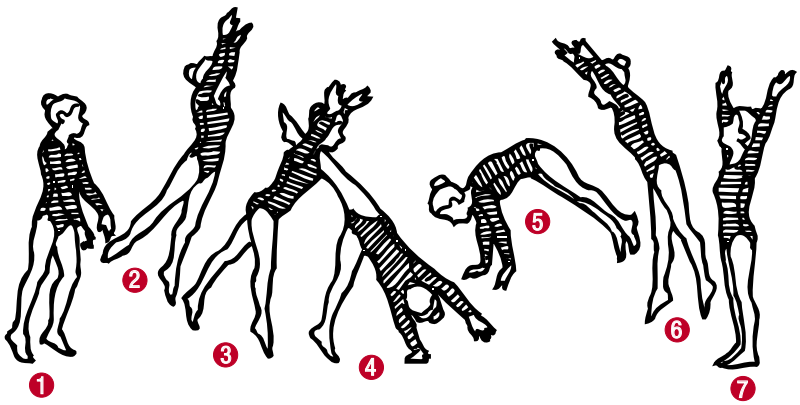
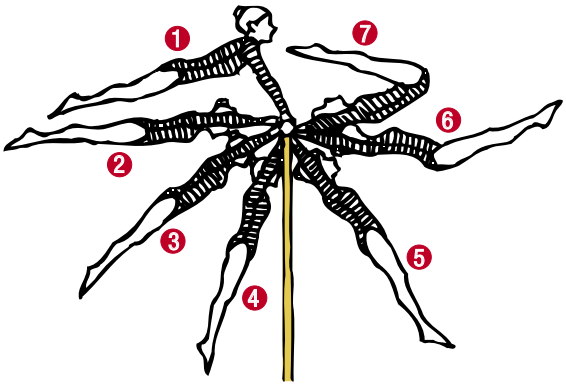


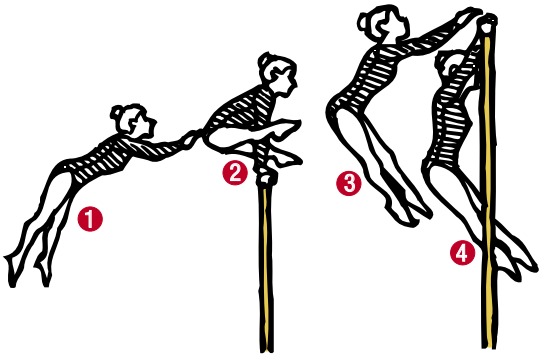
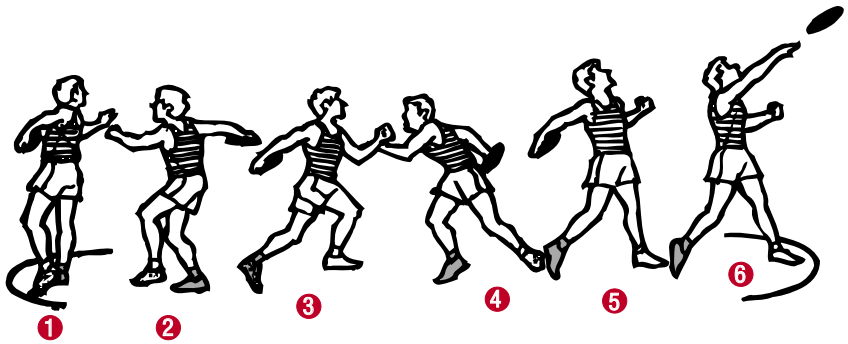
INQUIRY

Identifying joint action

Closely examine the illustrations in table 4.2 (pages 146–7). Indicate the type of movement taking place at the specified joint.

Table 4.2: Joints involved in movements

Movement	Joint
1. 	Knees (points 4–6) Knees (9–10) Hips (4–6) Hips (9–10) Neck (3–6)
2. 	Neck (2–4) Elbows (2–4) Feet at point 1 Feet at 3
3. 	Hips (5–7) Arms (1–2) Feet (6–7)
4. 	Hips (5–7) Arms (1–2)

Movement	Joint
5. 	Hips (1–2) Hips (2–4)
6. 	Hips (1–6) Left knee (2–6) Neck (1–4) Right foot (4–5)



APPLICATION

Joint actions

Work in pairs. One person names a specific joint action and the other person performs an example of the movement. Continue until all joint actions have been explored, then change roles.



INQUIRY

Joint actions in a sport or activity

Identify each of the joint actions in a particular sport or activity. Suggest how knowledge of joint structures could improve efficiency of movement and lessen the risk of injury.



MUSCULAR SYSTEM

There are more than 600 muscles in the body and they are all attached to bones. The role of muscles is to contract. When they contract, we move. Muscles are unable to push to enable movement. Instead they shorten, causing joint movement, then relax as opposing muscles pull the joint back into position. The major muscles of the body are shown in figure 4.12.

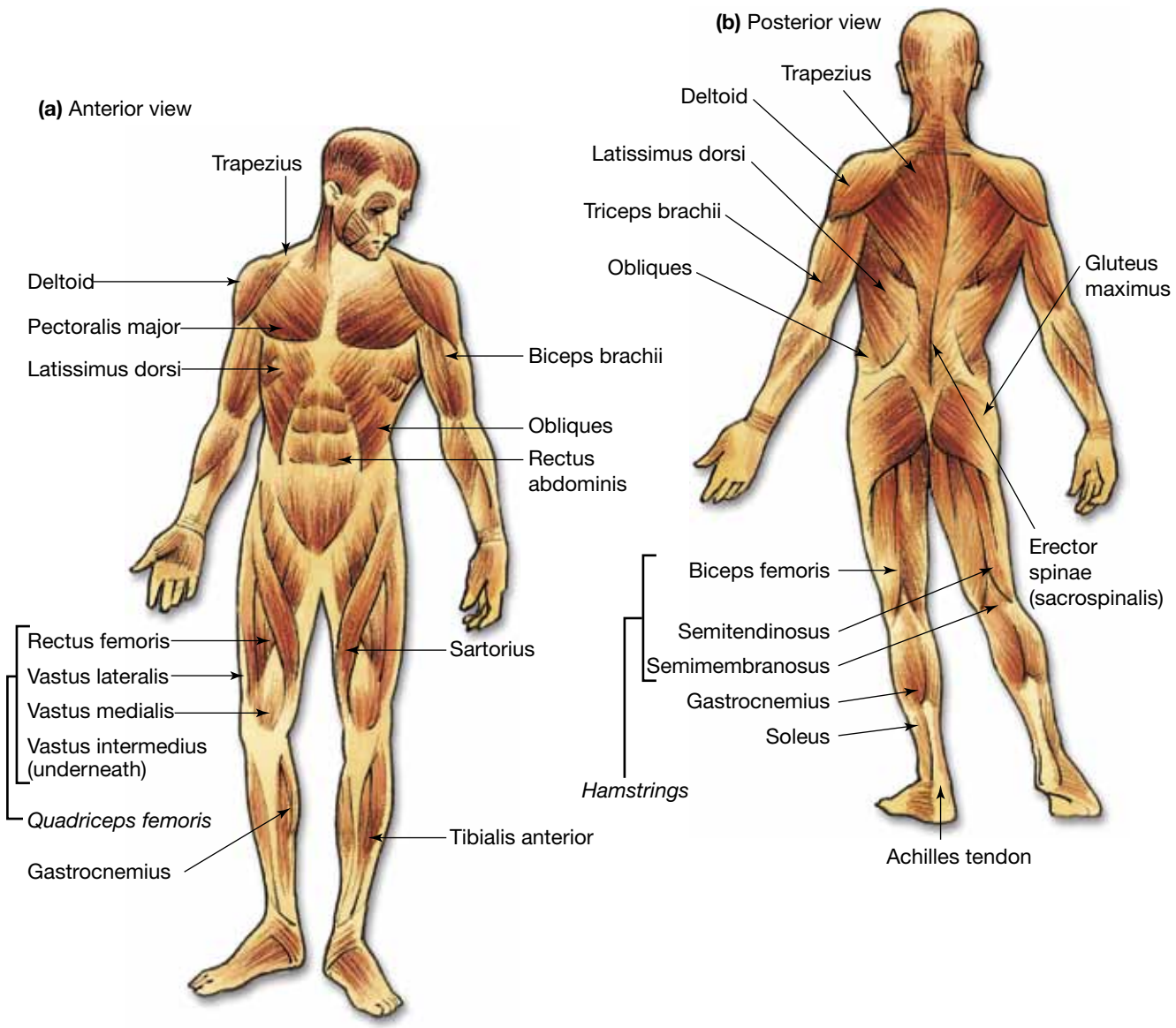


Figure 4.12: Muscles of the human body

The muscle's point of attachment to the more stationary bone is called its **origin**. In most cases, this point is nearer the trunk.

The **insertion** of a muscle is the point of attachment at the movable end. This end tends to be away from the body's main mass.

The muscle **action** refers to movement made at the joint when the muscle contracts.

To locate muscles, it is important to establish the **origin** and **insertion** of the muscle. The origin of the muscle is usually attached directly or indirectly to the bone via a tendon. The attachment of the muscle is usually by a tendon at the movable end, which tends to be away from the body's main mass. When the muscle contracts it causes movement. This is called muscle **action**.

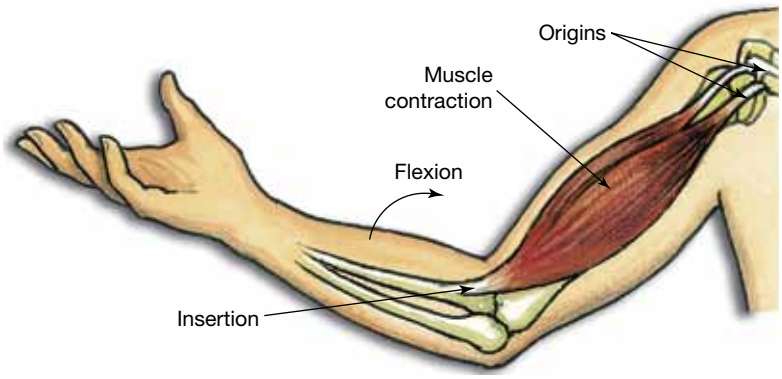


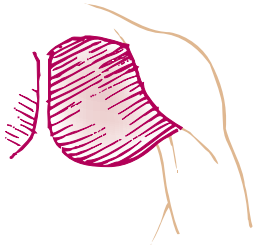
Figure 4.13: The origin, insertion and action of the biceps brachii

Major muscles involved in movement

The identification and location of the major muscle groups is summarised in table 4.3.

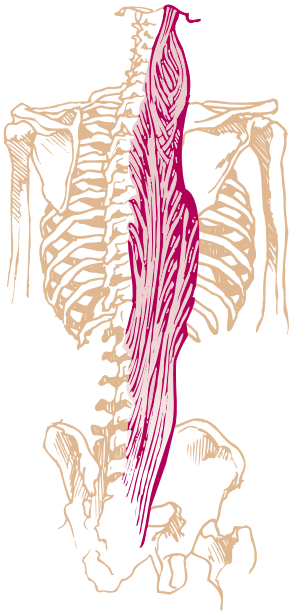
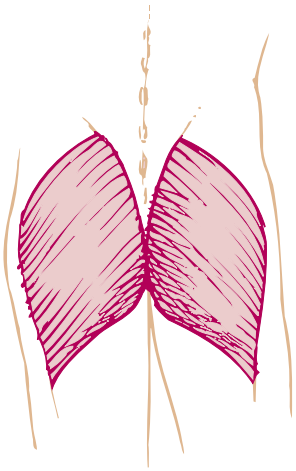
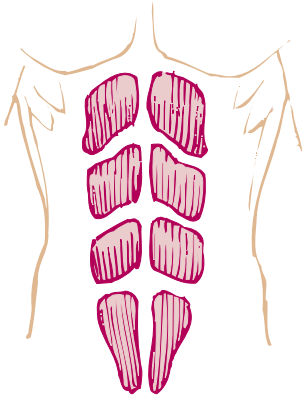
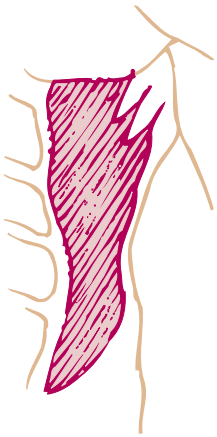
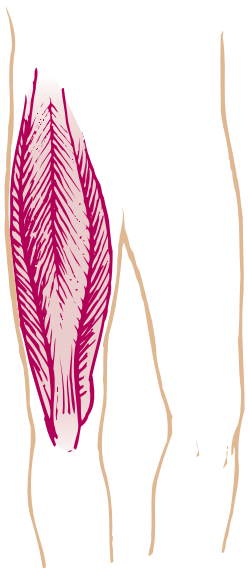
Palpation is a term that means feeling a muscle or muscle group. Most of the muscles shown in table 4.3 are superficial muscles because they are just underneath the skin surface and can be palpated. It is often easier to palpate a muscle if we move it a little.

Table 4.3: Location of major muscles and their actions

Muscle	Origin, insertion, action
Upper limb Deltoid 	Origin: scapula, clavicle Insertion: humerus Action: abduction of arm
Biceps brachii 	Origin: humerus, scapula Insertion: radius Action: flexion of arm and forearm, supination of forearm
Triceps 	Origin: scapula, humerus Insertion: ulna (proximal end) Action: extension of arm and forearm
Trunk Latissimus dorsi 	Origin: spine: T6–L5 vertebrae, iliac crest Insertion: humerus (proximal end) Action: adduction, extension and rotation of arm
Trapezius 	Origin: base of skull, C7–T5 vertebrae Insertion: scapula (upper surface), clavicle Action: adduction of scapula, elevation of shoulders
Pectorals 	Origin: sternum, clavicle Insertion: head of humerus Action: flexion and adduction of arm

(continued)

Table 4.3: *(continued)*

Muscle	Origin, insertion, action
Erector spinae (sacrospinalis) 	Origin: base of skull Insertion: sacrum Action: extension of back (trunk)
Gluteus maximus 	Origin: posterior surface of pelvis, sacrum Insertion: femur Action: extension and abduction of thigh
Rectus abdominis 	Origin: crest of pubis Insertion: ribs 5, 6, 7 Action: flexion of trunk
External obliques 	Origin: lower 8 ribs Insertion: iliac crest Action: flexion and rotation of trunk
Lower limb Hamstrings 	Origin: ischium, femur Insertion: tibia, head of fibula Action: extension of thigh, flexion of lower leg
Quadriceps 	Origin: iliac crest, femur Insertion: tibia (proximal end), patella Action: flexion of hip, extension of lower leg

Muscle	Origin, insertion, action
Gastrocnemius 	Origin: femur (distal end) Insertion: heel bone (posterior) Action: knee flexion, plantar flexion of foot
Soleus 	Origin: tibia and fibula Insertion: heel bone (posterior) Action: plantar flexion of foot
Tibialis anterior 	Origin: tibia Insertion: ankle, tarsal, metatarsal Action: dorsiflexion and inversion of foot

APPLICATION

Palpating muscles

Working in pairs, palpate as many muscles as is convenient. Try to identify place of origin, belly (main part) of the muscle and point of insertion. Change roles after each muscle palpation.

INQUIRY

Muscle palpation and identification

1. Which five muscles were easiest to palpate?
2. Which muscles were most difficult to palpate?
3. Why is palpation difficult with some muscles?
4. Examine the action of each muscle that you were able to palpate. Identify how that muscle influences the way we move by describing a movement caused by the contraction of the muscle.
5. Discuss the importance of the strength of tendons in 'collecting' muscle fibres and joining them to a bone.

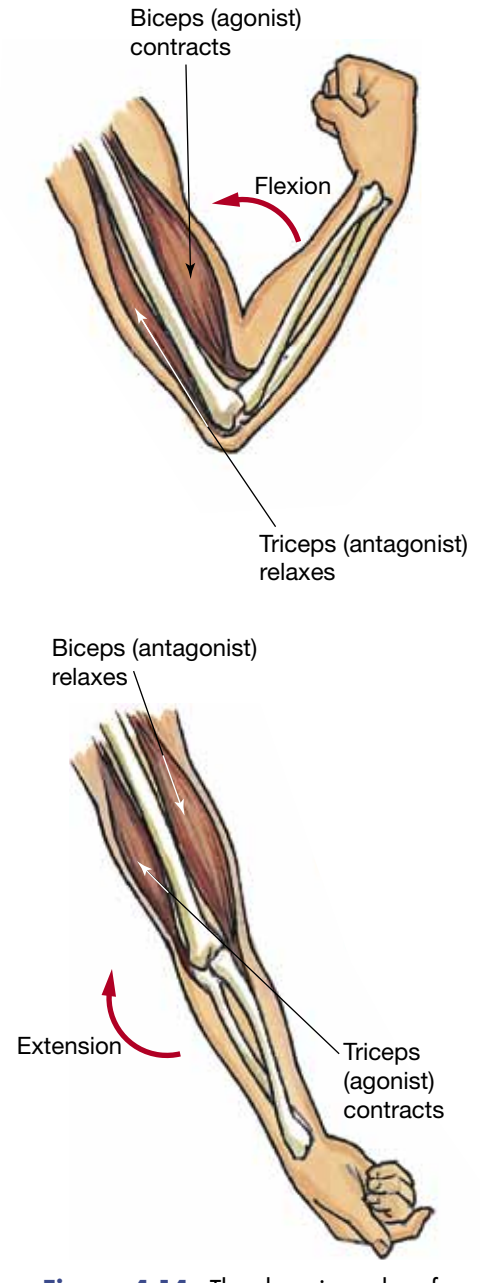


Figure 4.14: The changing roles of muscles — bending and straightening the arm

Muscle relationship

In producing a particular movement, a muscle performs one of three roles. It can act as an agonist, antagonist or stabiliser (or fixator).

Agonist

An *agonist* or prime mover is the muscle causing the major action. There are agonists for all movable joints and usually more than one is involved in a particular joint movement.

Antagonist

An *antagonist* is a muscle that must relax and lengthen to allow the agonist to contract, thus helping to control an action. The agonist works as a pair with the antagonist muscle. The two roles are interchangeable depending on the direction of the movement.

Antagonists cause an opposite action to that caused by the agonist. For example, figure 4.14 shows that:

- in bending the elbow, the flexor (biceps) is the agonist while the extensor (triceps) is the antagonist, relaxing for flexion to occur
- in straightening the elbow, the extensor (triceps) is the agonist while the flexor (biceps) is the antagonist.

Similarly, abductors and adductors are generally antagonistic to each other.

Stabiliser

Stabiliser or fixator muscles act at a joint to stabilise it, giving the muscles a fixed base. The muscle shortens very little during its contraction, causing minimal movement. This permits the action to be carried out correctly and allows other joints to work more effectively. For example, in a dynamic movement such as throwing, while some shoulder muscles serve to propel the object, others act as stabilisers to allow the efficient working of the elbow joint and to reduce the possibility of damage to the joints.

Types of muscle contraction

When a muscle is stimulated, it contracts. This may happen in a number of ways. There are three principal types of muscle contraction — **concentric**, **eccentric** and **isometric**. Both concentric and eccentric contractions are isotonic contractions (also called dynamic contractions) because the length of the muscle will change; that is, it will become shorter or longer. In contrast, an isometric contraction is a form of static contraction where length is unchanged despite application of tension.

Examples of concentric contractions are the contraction of the rectus abdominis to raise the trunk during a sit-up, or the biceps contracting to lift a weight, as shown in figure 4.15.

Examples of eccentric contractions are the rectus abdominis extending to gradually lower the trunk during the downward action of a sit-up, or the biceps muscle fibres lengthening as the weight is returned to its original position, as shown in figure 4.16.

A **concentric** contraction is the most common type of muscular contraction. During this contraction, the muscle shortens, causing movement at the joint.

An **eccentric** contraction occurs when the muscle lengthens while under tension. The action often happens with the assistance of gravity.

An **isometric** contraction occurs when the muscle fibres are activated and develop force, but the muscle length does not change; that is, movement does not occur.

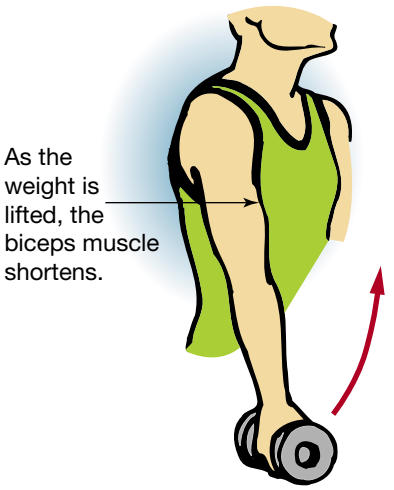


Figure 4.15: An example of a concentric contraction. The biceps shortens to lift the weight.

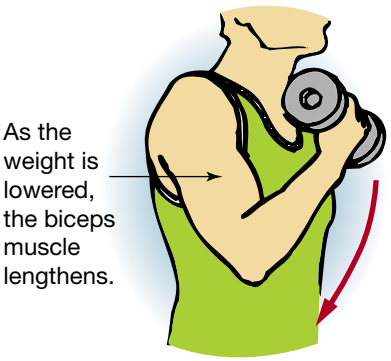


Figure 4.16: An example of an eccentric contraction. The biceps lengthens to lower the weight.



Figure 4.17: Isometric muscle contractions are important in rock climbing and many other physical activities and sports.

Isometric contractions are commonly seen in attempted movements where a resistance cannot be overcome. Examples are a weight-lifter trying to lift a weight that cannot be moved, or a person pushing against a wall. In each case, the effort is being made, but the muscle length does not change because the resistance is too great.

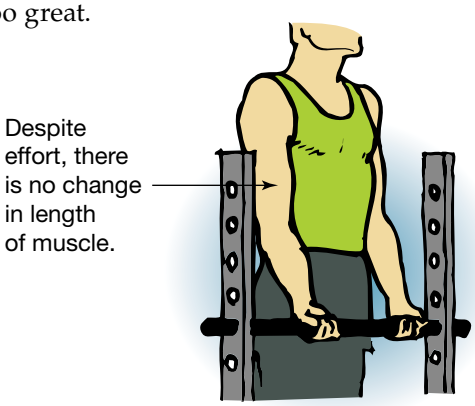


Figure 4.18: An example of an isometric contraction. The muscle length does not change when trying to lift a fixed weight.

APPLICATION

Joints and movement

Following is a list of common sporting movements. Working in pairs, have one person imitate each of the actions:

- arm action while taking a shot in basketball
- wrist action while taking a shot in netball
- arm action during an overarm throw
- knee action during a vertical jump
- foot action during the take-off in a long jump.

Observe each action closely and then copy and complete the following table.

Movement	Bones involved	Muscles and their roles	Joint action	Type of contraction
Arm action — basketball shot				
Wrist action — netball shot				
Arm action — overarm throw				
Knee action — vertical jump				
Foot action — long jump take-off				

INQUIRY

Anatomical structures and movement

Copy and complete a mind map similar to figure 4.19, to respond to the question: 'How does the body's musculoskeletal system influence and respond to movement?'

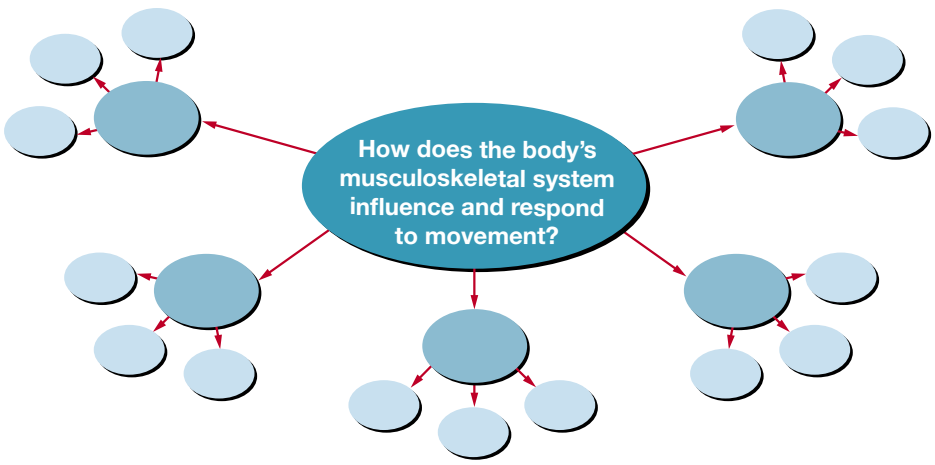


Figure 4.19: Sample mind map

Structure and function

Every cell in our body needs a constant supply of oxygen (O_2) and food to maintain life and to keep the body operating effectively. But how does oxygen get from the atmosphere to the muscles and other body tissues? How is carbon dioxide (CO_2) removed from the body? What causes us to breathe? What is lung capacity and how does it influence our physical performance? These are the types of questions that can arise when we consider the system through which the human body takes up oxygen and removes carbon dioxide in the process known as **respiration**.

Respiration is the process by which the body takes in oxygen and removes carbon dioxide.

Respiration is a process that occurs in practically all living cells. It uses oxygen as a vital ingredient to free energy from food and can be characterised by the following equation:

Glucose (from food)	+	**Oxygen** (O_2 breathed in)	➠	**Carbon dioxide** (CO_2 breathed out)	+	**Energy**	+	**Water**

This process is made possible through the respiratory system that facilitates the exchange of gases between the air we breathe and our blood. The respiratory system acts to bring about this essential exchange of gases (CO_2 and O_2) through breathing; the movement of air in and out of the lungs. The lungs and the air passages that ventilate them make up the basic system.

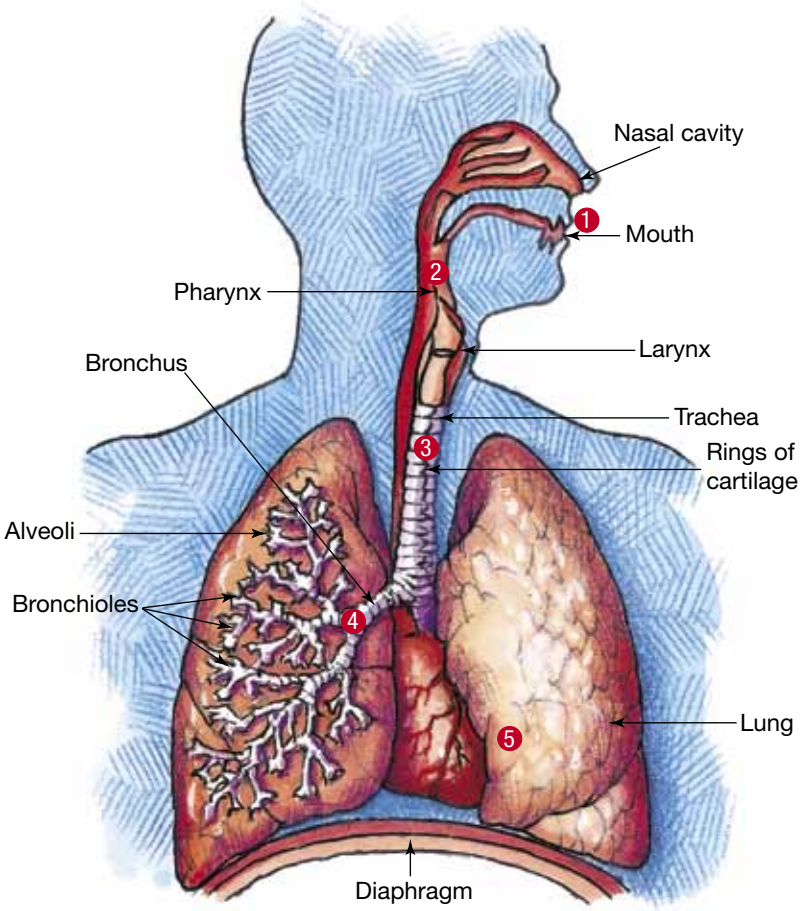


Figure 4.20: The respiratory system. The ribs have been cut away to show the chest cavity on the left.

The passage of air from the nose to the lungs can be followed in figure 4.20.

1. Air containing oxygen from the atmosphere enters the body either through the nose or the mouth. When entering through the nose it passes through the nasal cavities and is warmed, moistened and filtered of any foreign material.
2. The pharynx or throat serves as a common passage for air to the trachea (windpipe) or food to the oesophagus. It leads from the nasal cavity to the larynx (voice box) located at the beginning of the trachea.
3. The trachea is a hollow tube strengthened and kept open by rings of cartilage. After entering the chest cavity or thorax, the trachea divides into a right and a left bronchus (bronchial tube), which lead to the right and left lungs respectively.
4. The inner lining of the air passages produces mucus that catches and holds dirt and germs. It is also covered with microscopic hairs (cilia) that remove dirt, irritants and mucus through steady, rhythmic movements.

5. The lungs consist of two bag-like organs, one situated on each side of the heart. They are enclosed in the thoracic cavity by the ribs at the sides, the sternum at the front, the vertebral column at the back and the diaphragm (a dome-shaped muscle) at the base. The light, soft, lung tissue is compressed and folded and, like a sponge, is composed of tiny air pockets (see figure 4.21)

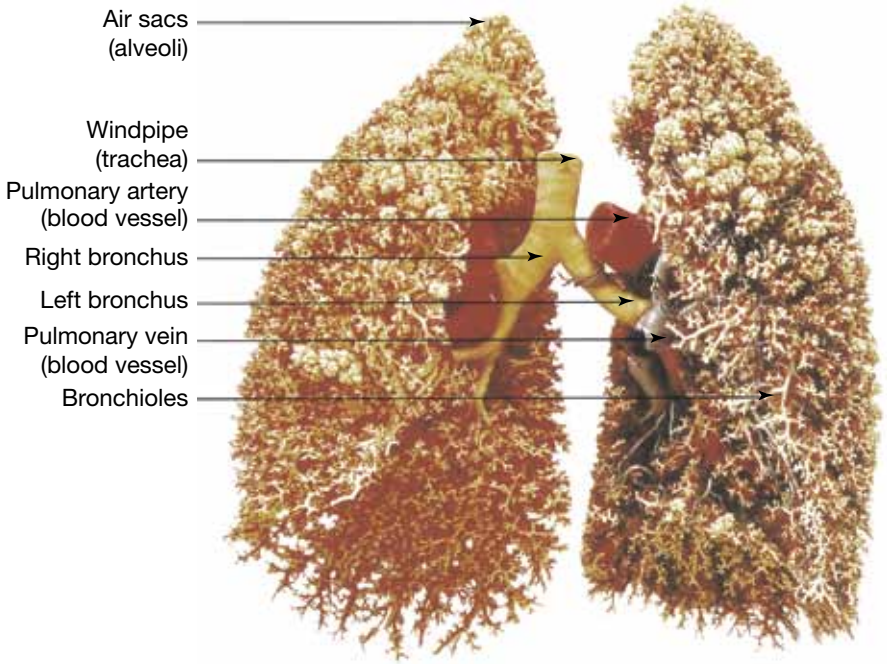


Figure 4.21: Human lungs are made up of bronchi, bronchioles and alveoli.

The right and left bronchi that deliver air to the lungs divide into a number of branches or bronchioles within each lung. These bronchioles branch many times, eventually terminating in clusters of tiny air sacs called *alveoli* (singular — alveolus). The walls of the alveoli are extremely thin, with a network of capillaries (tiny vessels carrying blood) surrounding each like a string bag (see figure 4.22). This is where oxygen from the air we breathe is exchanged for carbon dioxide from our bloodstream.

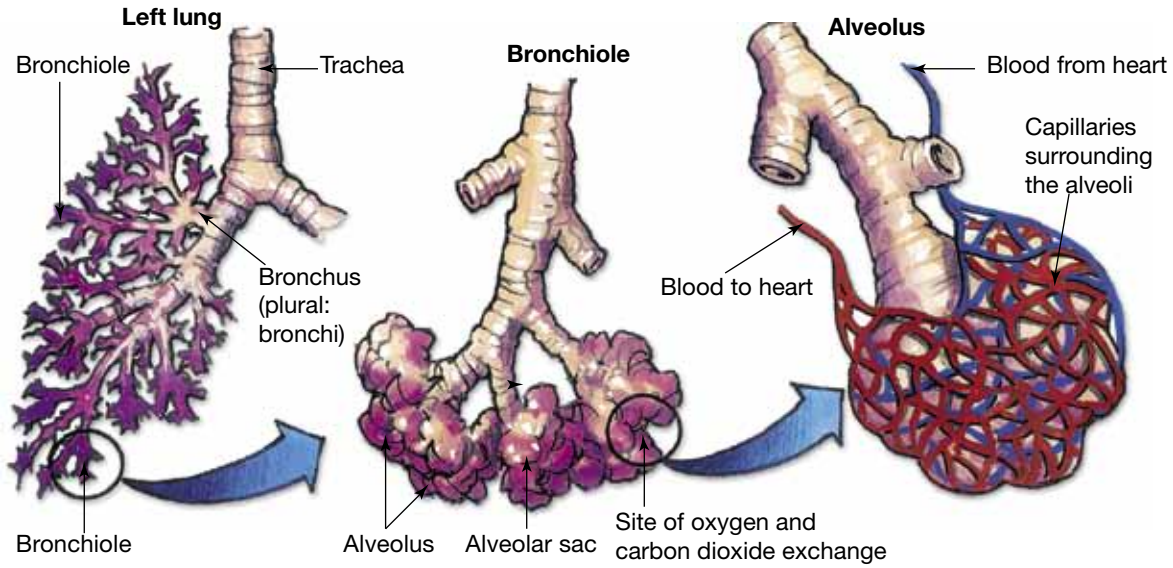


Figure 4.22: Air enters the lungs through the bronchi. The air moves into the bronchioles, then enters the microscopic air sacs called alveoli.

Lung function

Breathing is the process by which air is moved in and out of the lungs. It is controlled automatically by the brain and involves two phases: inspiration and expiration.

Inspiration and expiration

Inspiration is air movement from the atmosphere into the lungs; breathing in.

During **inspiration**, the diaphragm contracts and flattens as the external intercostal muscles (between the ribs) lift the ribs outwards and upwards (see figure 4.23(a)). This movement increases the volume of the chest cavity and pulls the walls of the lungs outwards, which in turn decreases the air pressure within the lungs. In response to this, air from outside the body rushes into the lungs through the air passages.

Expiration is air movement from the lungs to the atmosphere; breathing out.

During **expiration**, the diaphragm relaxes and moves upwards as the internal intercostal muscles allow the ribs and other structures to return to their resting position (see figure 4.23(b)). The volume of the chest cavity is therefore decreased,

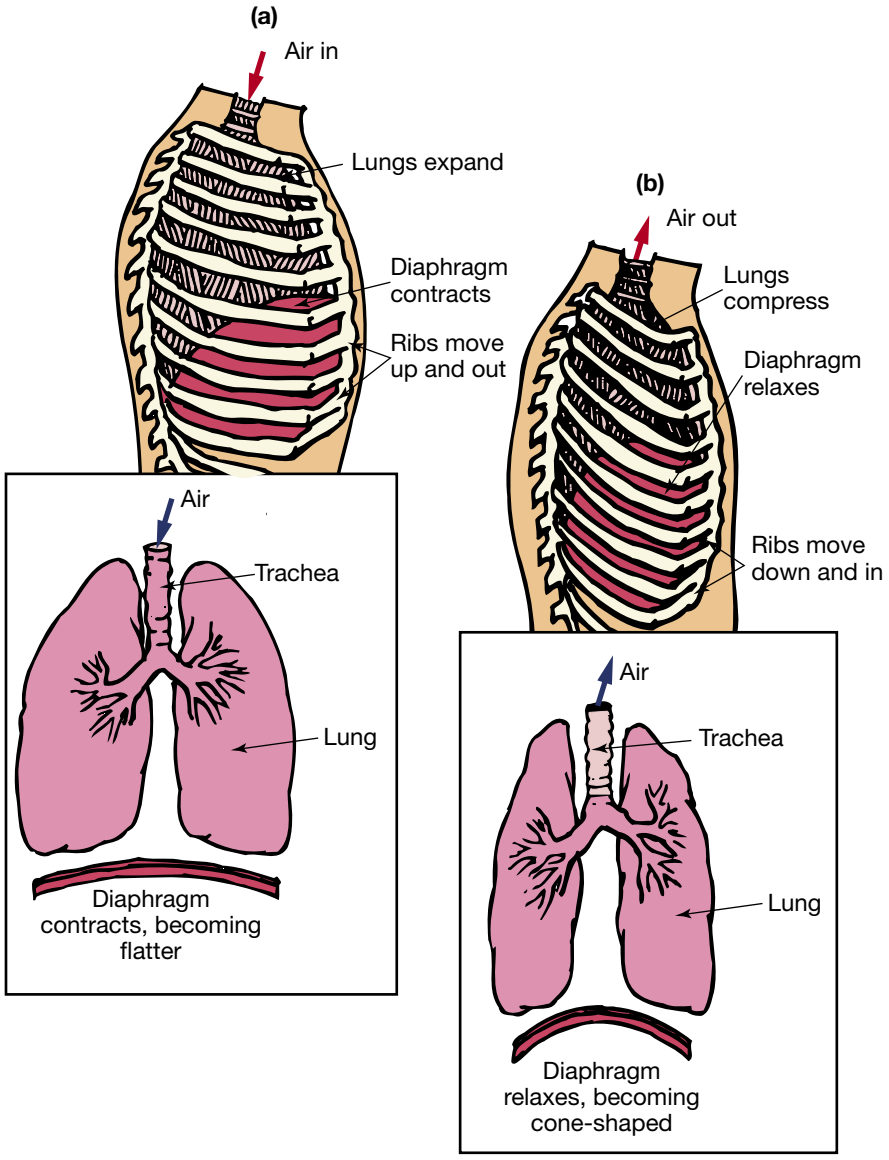


Figure 4.23: **(a)** Inspiration and **(b)** expiration

which increases the air pressure inside the lungs. Air is consequently forced out to make the pressures inside and outside the lungs about equal.

Under normal resting conditions we breathe at a rate of approximately 12 to 18 breaths per minute. This rate can increase with physical activity, excitement or elevated body temperature. It also changes with age, being higher in babies and young children.

INQUIRY

Inspiration and expiration

eBookplus

Use the **Inspiration and expiration** weblink in your eBookPLUS to observe a short video of how inspiration and expiration function.

Describe what happens during inspiration and expiration.

The exchange of gases

During inspiration, the alveoli are supplied with fresh air that is high in oxygen content and low in carbon dioxide. On the other hand, blood in the capillaries arriving at the alveoli is low in oxygen and high in carbon dioxide content, as shown in table 4.4. The different concentrations of oxygen and carbon dioxide between the blood and the air result in a pressure difference.

Table 4.4: The composition of inspired and expired air by percentage at rest

Gas	Inhaled air (per cent)	Exhaled air (per cent)
Oxygen (O_2)	20.93	16.4
Carbon dioxide (CO_2)	0.03	4.1
Nitrogen (N) and other gases	79.04	79.5

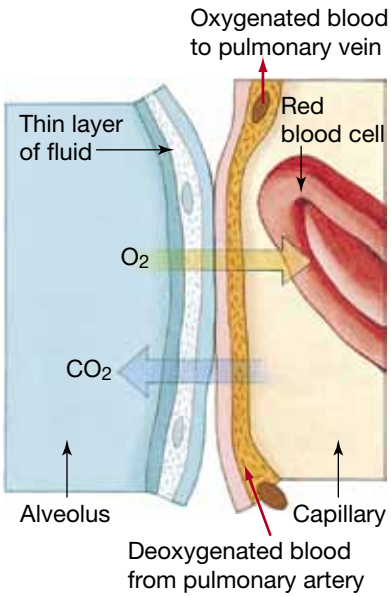


Figure 4.24: As blood goes past an alveolus, the blood gives up carbon dioxide and picks up oxygen. These gases move in and out by diffusion through the thin alveolar walls.

Gases such as oxygen and carbon dioxide move from areas of high concentration or pressure to areas of low concentration or pressure. Oxygen, therefore, moves from the air in the alveoli across the alveolar–capillary wall into the blood, where it attaches itself to haemoglobin in the red blood cells. At the same time, carbon dioxide is unloaded from the blood into the alveoli across the alveolar–capillary wall to be breathed out. This two-way diffusion is known as the exchange of gases (or gaseous exchange) and is diagrammatically represented in figure 4.24.

Exchange of gases, using the same principle, occurs between blood in the capillaries of the arterial system and the cells of the body; for example, the muscle cells. Here, oxygen is unloaded to the cells while carbon dioxide resulting from cell metabolism is given up to the blood. Blood that is high in carbon dioxide content (deoxygenated blood) is carried back to the lungs where it unloads carbon dioxide.

INQUIRY

The exchange of gases

eBookplus

Use the **Exchange of gases** weblink in your eBookPLUS to observe a short video detailing how the exchange of gases in the lungs takes place.

Describe how the exchange of gases takes place in the lungs.

INQUIRY How does smoking affect lung function?

Investigate what happens in gaseous exchange when the person is a smoker. Discuss how this affects physical performance. Carry out your own research or use the **Smoking and lung function** weblink in your eBookPLUS for this chapter for information.

Effect of physical activity on respiration

During physical activity, the body's higher demand for oxygen triggers a response from our respiratory system. Increased rates of breathing combine with increased volumes of air moving in and out of the lungs, to deliver more oxygen to the blood and remove wastes. At the same time, blood flow to the lungs has been increased as a result of the circulatory system's own response to the exercise (discussed on pages 160–70).

Physical activity brings about a number of immediate adjustments in the working of the respiratory system.

1. The rate and depth of breathing often increase moderately, even before the exercise begins, as the body's nervous activity is increased in anticipation of the exercise. Just the thought of a jog can increase our demand for oxygen!
2. Once exercise starts, the rate and depth of breathing increase rapidly. This is thought to be related to stimulation of the sensory receptors in the body's joints as a result of the movement. Further increases during the exercise result mainly from increased concentrations of carbon dioxide in the blood, which triggers greater respiratory activity.
3. The increases in the rate (frequency) and depth (tidal volume or TV) of breathing provide greater ventilation and occur, generally, in proportion to increases in the exercise effort (workload on the body). Refer to figure 4.25.

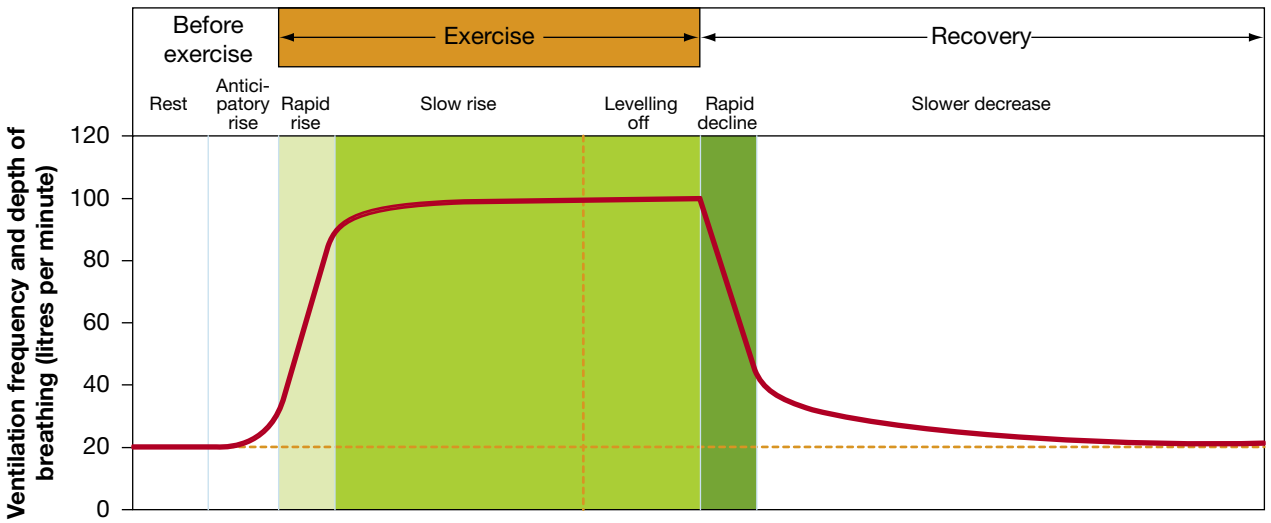


Figure 4.25: Changes in ventilation (frequency and TV) during moderate exercise. These changes are due mainly to CO_2 levels in the blood produced during exercise. In maximal exercise, the levelling off doesn't occur. Ventilation continues to increase until exercise ceases. During the recovery period, CO_2 levels are reduced. (*Source:* D. K. Mathews and E. L. Fox, *The Physiological Basis of Physical Education and Athletics*, 3rd edn, W. B. Saunders, Philadelphia, 1981, p. 168. Reprinted with permission W. C. M. Brown.)

APPLICATION

Lung function and physical activity

Equipment
Stopwatch, recording sheets

This application aims to measure changes in lung function between rest and exercise. Work in pairs, as recorder and subject.

(a) The subject should rest while the recorder counts the subject's number of breaths per minute and records the information.
(b) The subject should then run 100 metres as quickly as possible. The recorder records the subject's breathing rate during the minute following the run.
(c) Finally, the subject should run steadily for four to five minutes, then have their breathing rate monitored for one minute.

INQUIRY

How does physical activity affect my rate of breathing?

1. Compare the number of breaths recorded for each test in the preceding application and indicate any differences.
2. Did you notice any difference in the depth of breathing between rest and physical activity? If so, suggest why this might occur.
3. Discuss the effects of physical activity on breathing rate. Why do you think this change occurs?
4. Which type of exercise (short burst or longer distance) had the greater effect on breathing rate? Suggest reasons for your answer.
5. Use the internet or a reputable source to explore the effects of asthma on lung function. Suggest how asthma can be improved by certain exercise programs.

CIRCULATORY SYSTEM

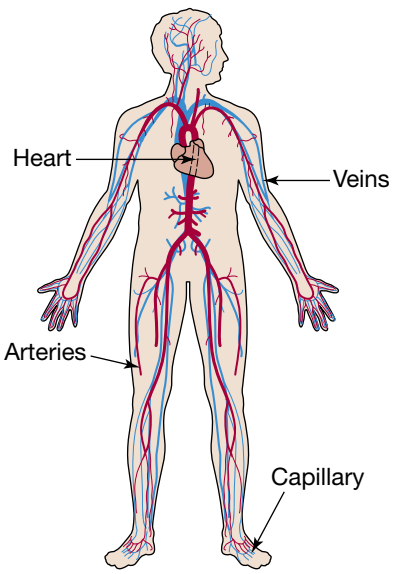


Figure 4.26: The circulatory system

The continual and fresh supply of oxygen and food that the tissues of the body require is provided by the blood. Blood flows constantly around the body from the heart, to the cells, and then returns to the heart. This is called *circulation*. The various structures through which the blood flows all belong to the **circulatory system**, which is also referred to as the **cardiovascular system** (cardio — relating to the heart; and vascular — relating to the blood vessels). This transport system delivers oxygen and nutrients to all parts of the body and removes carbon dioxide and wastes. It consists of:

- blood
- the heart
- blood vessels — arteries, capillaries and veins.

Components of blood

Blood is a complex fluid circulated by the pumping action of the heart. It nourishes every cell of the body. An average sized person contains about five litres of blood. Blood's main functions include:

- transportation of oxygen and nutrients to the tissues and removal of carbon dioxide and wastes
- protection of the body via the immune system and by clotting to prevent blood loss

The **circulatory** or **cardiovascular system** is a network that distributes blood containing oxygen and nutrients and collects wastes. It comprises the heart, arteries, blood and veins.

Plasma is a straw-coloured liquid mainly consisting of water (about 90 per cent).

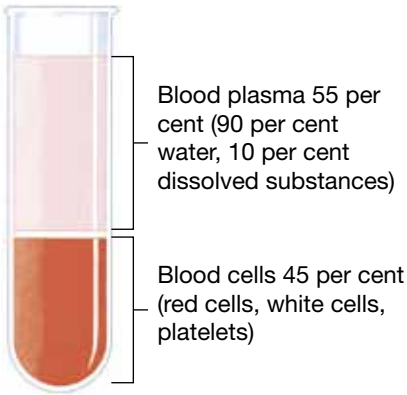


Figure 4.27: Components of blood



eBookplus

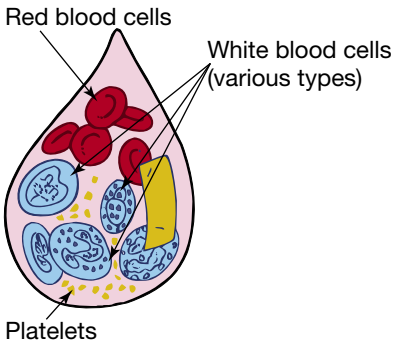


Figure 4.28: The structure of blood cells and platelets

Platelets are fragments of cells found in blood and are responsible for clotting.

- regulation of the body's temperature and the fluid content of the body's tissues.

Blood consists of a liquid component (55 per cent of blood volume) called **plasma** and a solid component (45 per cent of blood volume) made up of red and white blood cells and platelets.

Plasma

Substances such as plasma proteins, nutrients, hormones, mineral salts and wastes are dissolved in the plasma and are necessary for the nourishment and functioning of tissues. Much of the carbon dioxide and very small amounts of oxygen are also carried in a dissolved state in plasma.

Water is a significant component of the circulatory system and controls body heat through sweating. When we work hard, the blood transfers excess heat generated by the body to the surface of the skin to be lost. If sweating is extreme, excessive loss of water from plasma and tissues can decrease blood volume, making frequent hydration (replacement of water) necessary.

Red blood cells

Red blood cells are formed in bone marrow. Their main role is to carry oxygen and carbon dioxide around the body. They contain iron and a protein called haemoglobin. Haemoglobin readily combines with oxygen and carries it from the lungs to the cells. Red blood cells outnumber white blood cells by about 700 to one.

Red blood cells have a flat disc shape that provides a large surface area for taking up oxygen. About two million red blood cells are destroyed and replaced every second. They live for only about four months.

On average, men have 16 grams of haemoglobin per 100 millilitres of blood (as a percentage of blood volume), while women average 14 grams per 100 millilitres of blood. Women, therefore, have lower levels of haemoglobin and a slightly lessened ability to carry oxygen in the blood.

Anaemia

What is anaemia? Use the **Anaemia** weblink in your eBookPLUS to investigate the symptoms of anaemia. Using the information, discuss how being anaemic could affect physical performance.

White blood cells

White blood cells are formed in the bone marrow and lymph nodes. They provide the body with a mobile protection system against disease. These cells can change shape and move against the blood flow to areas of infection or disease.

The two most common types of white blood cells are phagocytes, which engulf foreign material and harmful bacteria, and lymphocytes, which produce antibodies to fight disease. Diseases such as HIV/AIDS, which suppress the activity of the immune system, do so by disrupting the normal functioning of the white blood cells.

Platelets

Platelets are tiny structures made from bone marrow cells that have no nucleus. They help to produce clotting substances that are important in preventing blood loss when a blood vessel is damaged.

Structure and function of the heart, arteries, veins and capillaries

Heart

The heart is a muscular pump that contracts rhythmically, providing the force to keep the blood circulating throughout the body. It is slightly larger than a clenched fist and is the shape of a large pear. The heart lies in the chest cavity between the lungs and above the diaphragm, and is protected by the ribs and sternum.

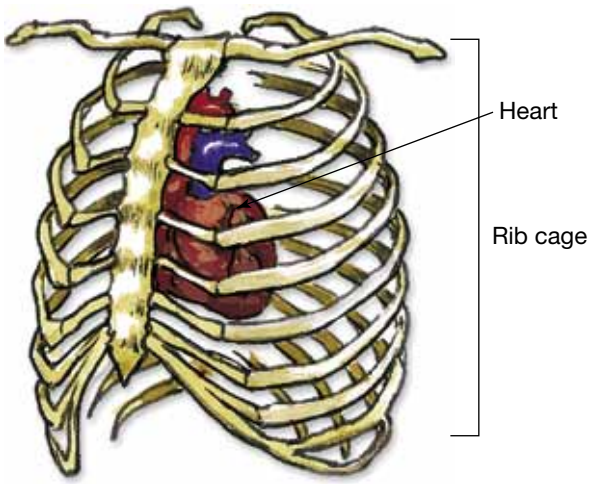


Figure 4.29: Position of the heart

The heart beats an average of 70 times per minute at rest. This amounts to more than 100 000 beats per day. In one day the heart pumps approximately 12 000 litres of blood, which is enough to fill a small road tanker.

A muscle wall divides the heart into a right and left side. Each side consists of two chambers:

- *atria* — the upper, thin-walled chambers that receive blood coming back to the heart
- *ventricles* — the lower, thick-walled chambers that pump blood from the heart to the body.

A system of four one-way valves allows blood to flow in only one direction through the heart; that is, from the atria to the ventricles (the atrioventricular valves) and from the ventricles into the main arteries taking blood away from the heart (the arterial valves).

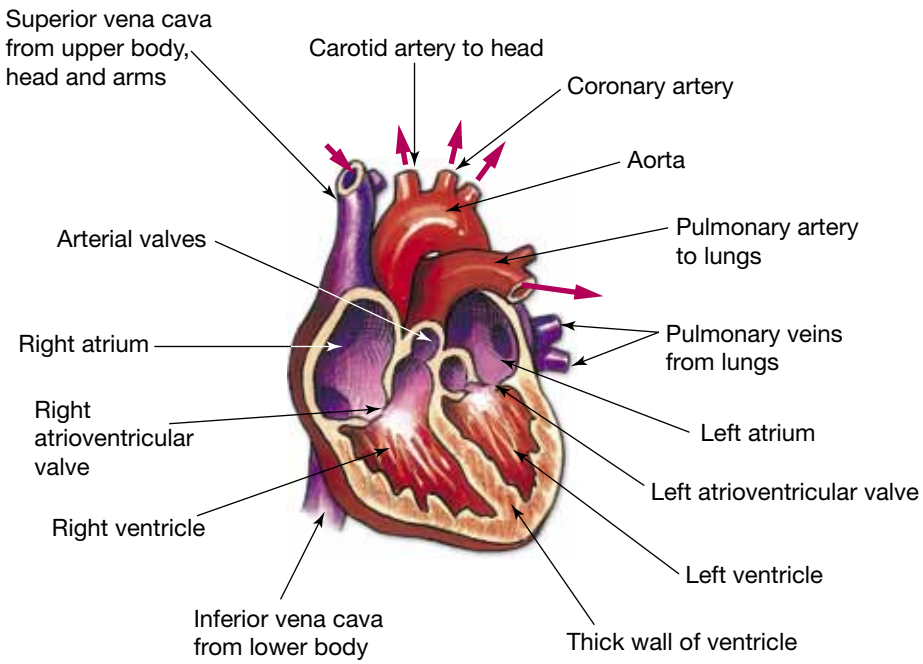


Figure 4.30: The heart. The atrioventricular valves consist of flaps that are attached to the sides of the ventricles by tough cords, the heart strings. The arterial valves are like little pockets.

Action of the heart

The heart is able to receive blood from the veins and pump it to the lungs and the body through a rhythmic contraction and relaxation process called the cardiac cycle. The cardiac cycle consists of the:

- *diastole* (relaxation or filling) phase. The muscles of both the atria and ventricles relax. Blood returning from the lungs and all parts of the body flows in to fill both the atria and ventricles in preparation for systole (contraction).
- *systole* (contraction or pumping) phase. The atria contract first to further fill the ventricles. The ventricles then contract and push blood under pressure to the lungs and all parts of the body. As they contract, the rising pressure in the ventricles closes the atrioventricular valves (between the atrium and the ventricle) and opens the valves in the arteries leaving the heart (the aorta and the pulmonary artery).

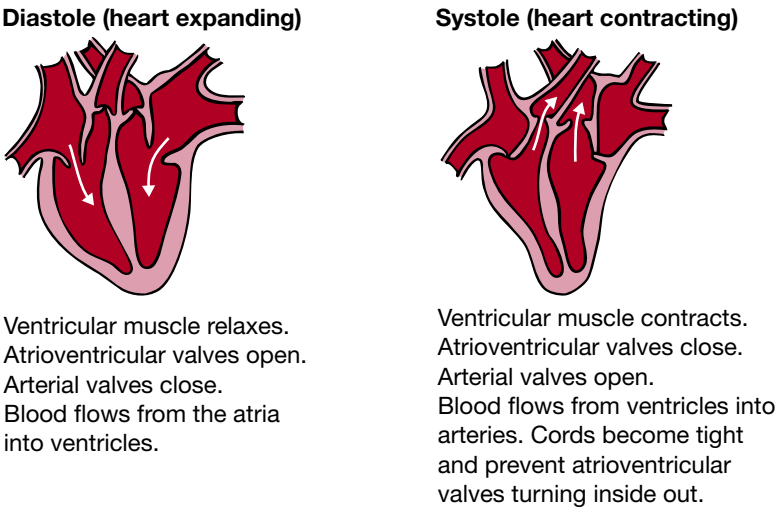


Figure 4.31: The action of the heart during the two phases, diastole and systole

Heartbeat

The heart is made to contract or beat regularly by small impulses of electricity that are initiated and sent out from a natural pacemaker in the wall of the right atrium.

The heartbeat is heard as a two-stage 'lub-dub' sound. An initial low pressure sound is caused by the atrioventricular valves closing. This occurs at the beginning of the ventricular contraction (systole) after blood has filled the ventricles. The high pressure sound that follows is caused by the valves closing at the exits to the heart, and occurs after blood has been pushed from the ventricles at the end of the systole phase. Unusual heart sounds can mean that the valves may not be working properly.

Each time the ventricles contract (that is, the heart beats), a wave of blood under pressure travels through the arteries, expanding and contracting the arterial walls. This pressure wave is called a pulse. It reflects the fluctuating pressure of blood in the arteries with each heartbeat. The pulse can be felt at various points where an artery lies near the skin surface, in particular the radial pulse at the base of the thumb and the carotid pulse at the side of the neck.

Blood supply to the heart

The heart (cardiac muscle) itself requires a rich supply of blood and oxygen to enable it to contract repeatedly. It receives this through its own system of cardiac blood vessels that branch off the aorta and spread extensively over the heart wall (myocardium). This is called the *coronary circulation*. The heart muscle has a very high demand for blood (particularly during exercise) and extracts more than 75 per cent of the oxygen delivered to it both at rest and during exercise.

During exercise when the heart's extra demands for oxygen must be met, coronary circulation accounts for up to approximately 10 per cent of the total

blood volume leaving the left ventricle, compared to approximately three per cent at rest.

Arteries

Arteries are blood vessels that carry blood away from the heart.

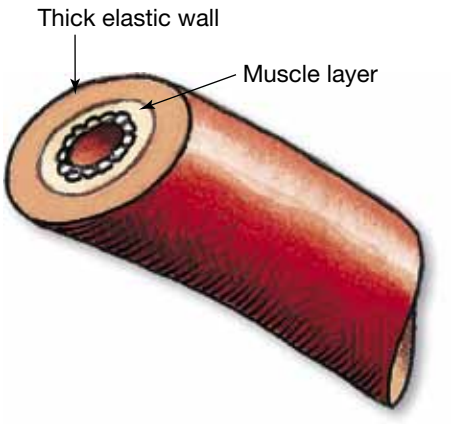


Figure 4.32: An artery has a thick, elastic wall, covering layers of smooth muscle.

Arteries carry blood away from the heart. They have thick, strong, elastic walls containing smooth muscle to withstand the pressure of the blood forced through them.

The blood pumped under pressure from the left ventricle passes through the aorta (the largest artery) and throughout the body. At the same time, blood from the right ventricle passes through the pulmonary artery to the lungs where it collects oxygen and then returns to the heart. These large exit arteries branch into smaller arteries that eventually divide into tiny branches called arterioles. Arterioles in turn divide into microscopic vessels (capillaries).

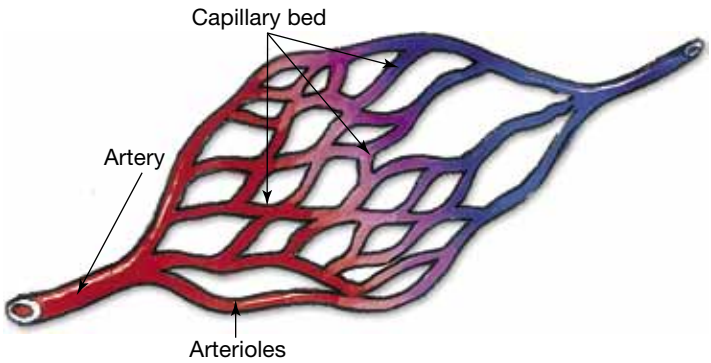


Figure 4.33: Arteries branch into arterioles, which divide into capillaries.

Capillaries are the smallest of all blood vessels. They function to exchange oxygen and nutrients for waste.

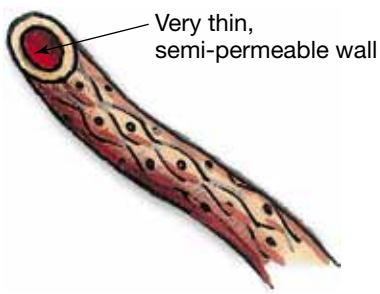


Figure 4.34: A capillary has a very thin wall that allows oxygen and nutrients to pass into the cells and carbon dioxide to move from the cells to the blood.

Capillaries

The **capillaries** are a link between the arterioles and the veins. They rejoin to form tiny veins called venules.

In active tissue such as the muscles and brain, the capillary network is particularly dense with much branching of very fine structured vessels. This provides a large surface area for the exchange of materials between the blood and the fluid surrounding the cells (interstitial fluid).

Capillary walls are extremely thin, consisting of a single layer of flattened cells. These walls allow oxygen, nutrients and hormones from the blood to pass easily through to the interstitial fluid, then into the cells of the body's tissues. The blood pressure (due to the pumping action of the heart) helps to force fluid out of the capillaries.

Meanwhile, carbon dioxide and cell wastes are received back into the capillaries. This diffusion of oxygen and other nutrients from the capillaries into the cells and carbon dioxide and wastes from the cells into the capillaries is known as *capillary exchange* (see figure 4.35).

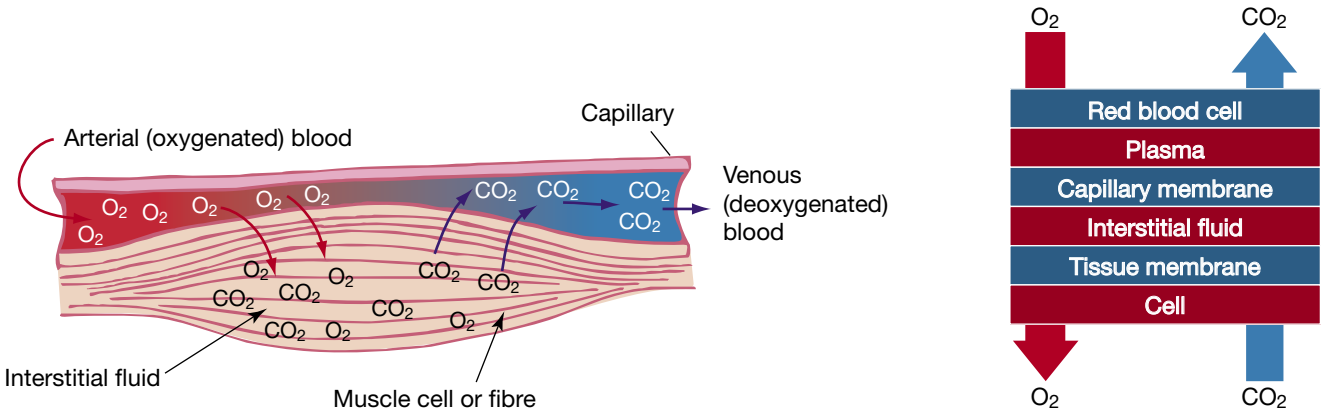


Figure 4.35: Capillary exchange at the muscle cell

Veins

Veins carry deoxygenated blood from the body tissues back to the right atrium. Pulmonary veins from the lungs differ in that they carry oxygenated blood to the left atrium.

The venules collect deoxygenated (low oxygen content) blood from the capillaries and transfer it to the **veins**.

As pressure in the veins is low, blood flows mainly against gravity (blood flow in the veins above the heart is, however, assisted by gravity). The walls of veins are thinner than those of arteries, with greater 'give' to allow the blood to move more easily. Valves at regular intervals in the veins prevent the backflow of blood during periods when blood pressure changes.

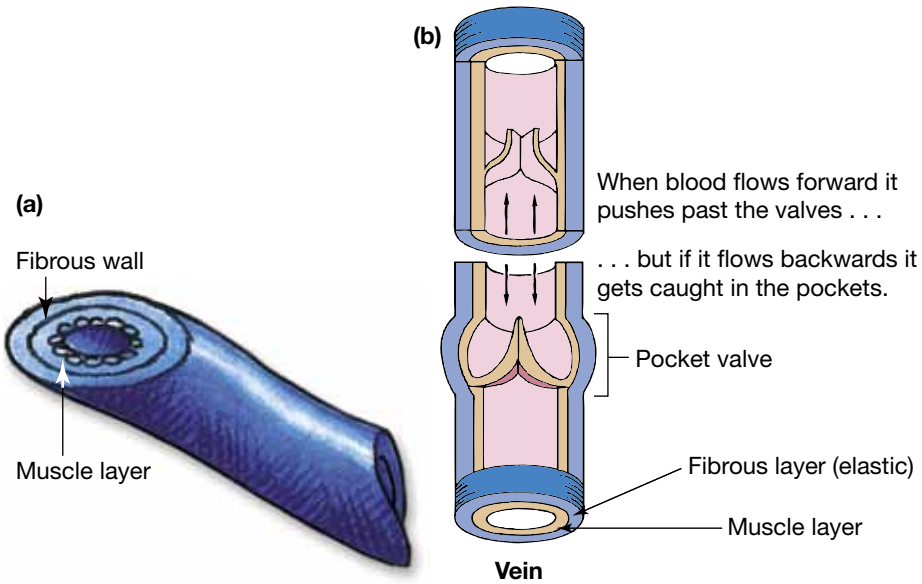


Figure 4.36: **(a)** The wall of a vein is less elastic and thinner than that of an artery. **(b)** Valves in the veins prevent the backflow of blood.

Pressure changes created by the pumping action of the heart stimulate blood flow in the veins and help to draw blood into it during diastole (relaxation phase). The return of blood from the body back to the heart (venous return) is further assisted by rhythmic muscle contractions in nearby active muscles (muscle pump) which compress the veins (see figure 4.37). It is also assisted by surges of pressure in adjacent arteries pushing against the veins.

If we stop exercising suddenly or stand still for long periods, the muscle pump will not work. Blood pooling (sitting) then occurs in the large veins of

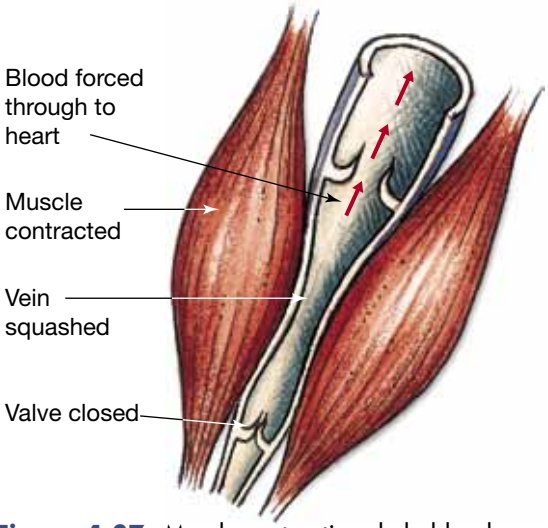


Figure 4.37: Muscle contractions help blood flow along the veins.

the legs because of the effect of gravity. This can result in a drop in blood pressure, insufficient blood flow to the brain and possible fainting. This pooling of blood has implications for the cool down period after strenuous exercise. Rather than stop the exercise immediately, it is recommended that the activity is gradually tapered off with lower intensity exercise and maintained until the heart rate returns to a steady state. This allows blood from the extremities to be returned to the heart and lungs for re-oxygenating. It also promotes the disposal of waste products such as lactic acid.

Pulmonary and systemic circulation

Both sides of the heart work together like two pumps with overlapping circuits. The right side receives venous blood that is low in oxygen content (de-oxygenated) from all parts of the body and pumps it to the lungs. The closed circuit of blood to and from the lungs is the **pulmonary circulation**.

The left side of the heart receives blood high in oxygen content (oxygenated) from the lungs and pumps it around the body. This circuit to and from the body is called **systemic circulation**.

Pulmonary circulation is the flow of blood from the heart to the lungs and back to the heart.

Systemic circulation is the flow of blood from the heart to body tissue and back to the heart.

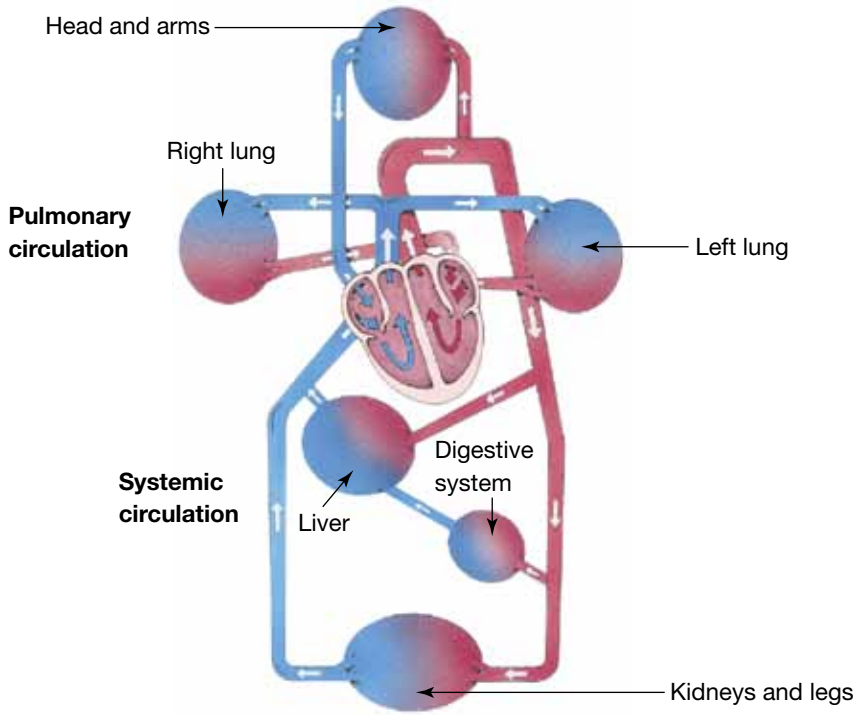


Figure 4.38: The pulmonary and systemic circulatory systems



INQUIRY

Impacts of improved circulatory system

Investigate factors that contribute to poor circulation. How would an improved circulatory system impact on your health, movement efficiency and athletic performance? Present your findings as a PowerPoint.

To assist in gathering information, use the **Circulation** weblink in your eBookPLUS for this chapter.

eBookplus

APPLICATION

Circulatory system and movement performance

Examine the following image representing the body's circulatory system. Label the parts indicated by the lines. Now imagine you are a drop of blood. Describe your passage through the entire circulatory system, beginning with entry into the right atrium. Analyse your role in influencing physical performance as you move from one type of blood vessel to the next.

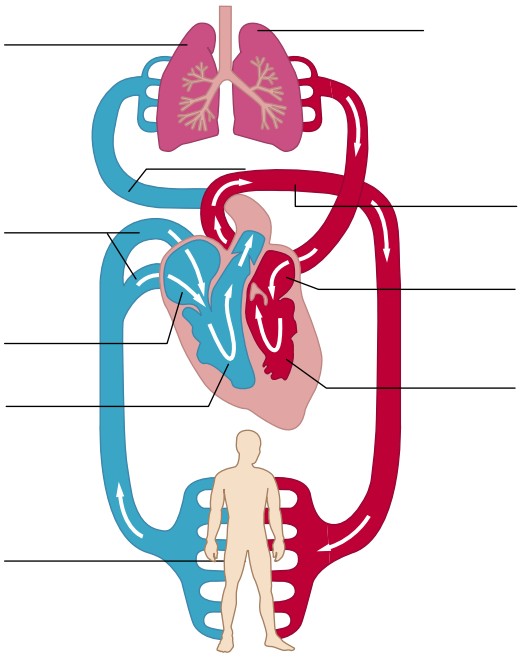


Figure 4.39: Analysing the movement of blood through the circulatory system

Blood pressure

What is blood pressure?

The term blood pressure refers to the force exerted by blood on the walls of the blood vessels. The flow and pressure of blood in the arteries rises with each contraction of the heart and falls when it relaxes and refills. Blood pressure has two phases — **systolic** and **diastolic**.

Systolic pressure is the highest (peak) pressure recorded when blood is forced into the arteries during contraction of the left ventricle (systole).

Diastolic pressure is the minimum or lowest pressure recorded when the heart is relaxing and filling (diastole).

Blood pressure generally reflects the quantity of blood being pushed out of the heart (cardiac output) and the ease or difficulty that blood encounters in passing through the arteries (resistance to flow). It is determined by:

- *cardiac output.* Any increase in cardiac output results in an increase in blood pressure.
- *volume of blood in circulation.* If blood volume increases because of increased water retention, such as when salt intake is high, blood pressure increases. During blood loss, such as during a haemorrhage, blood pressure falls.
- *resistance to blood flow.* If the viscosity (stickiness) of the blood is increased, such as during dehydration, resistance increases. The diameter of the blood vessels also affects blood flow through the vessels. With narrowing of the vessels (for example, in atherosclerosis), resistance to blood flow is increased. The elasticity of the arterial walls acts to maintain blood flow. As deposits build up on the walls, the arteries become less elastic and harder

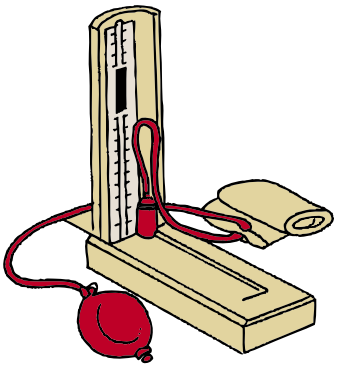


Figure 4.40:
A sphygmomanometer

A **sphygmomanometer** is an instrument used to measure blood pressure.

(arteriosclerosis), thereby making it more difficult for blood to flow. Any increase in the resistance to blood flow consequently causes elevated blood pressure.

- *venous return.* Since this affects cardiac output, it also affects blood pressure.

Blood pressure can be recorded with a **sphygmomanometer** and is measured in millimetres of mercury (mm.Hg) (see figure 4.40). It is expressed as a fraction that represents systolic pressure over diastolic pressure (for example, $\frac{120}{80}$). When blood pressure is recorded in a relaxed healthy person, 'normal' systolic pressure is in the range of 100 mm.Hg to 130 mm.Hg, with 'normal' diastolic pressure being 60 mm.Hg to 80 mm.Hg (see figure 4.41).

Blood pressure varies in response to posture (lying or standing), breathing, emotion, exercise and sleep. Temporary rises due to excitement, stress or physical exertion are quite natural and blood pressure returns to normal with rest. Under normal conditions, it provides valuable information about how well the circulatory system is operating.

Measuring blood pressure

When measuring blood pressure with a sphygmomanometer, an inflatable cuff is attached to a gauge that records the pressure in the cuff. The cuff is firmly wrapped around the upper arm above the elbow and is inflated with a hand pump. This squeezes the artery under the cuff until the blood flow stops. The diaphragm of a stethoscope is placed over the artery just below the cuff at the elbow joint (inside of the arm). The cuff pressure is carefully released while watching the slowly falling mercury in the gauge. Two distinct sounds are heard — one representing the peak of blood pressure and the other representing the lowest pressure within the artery.

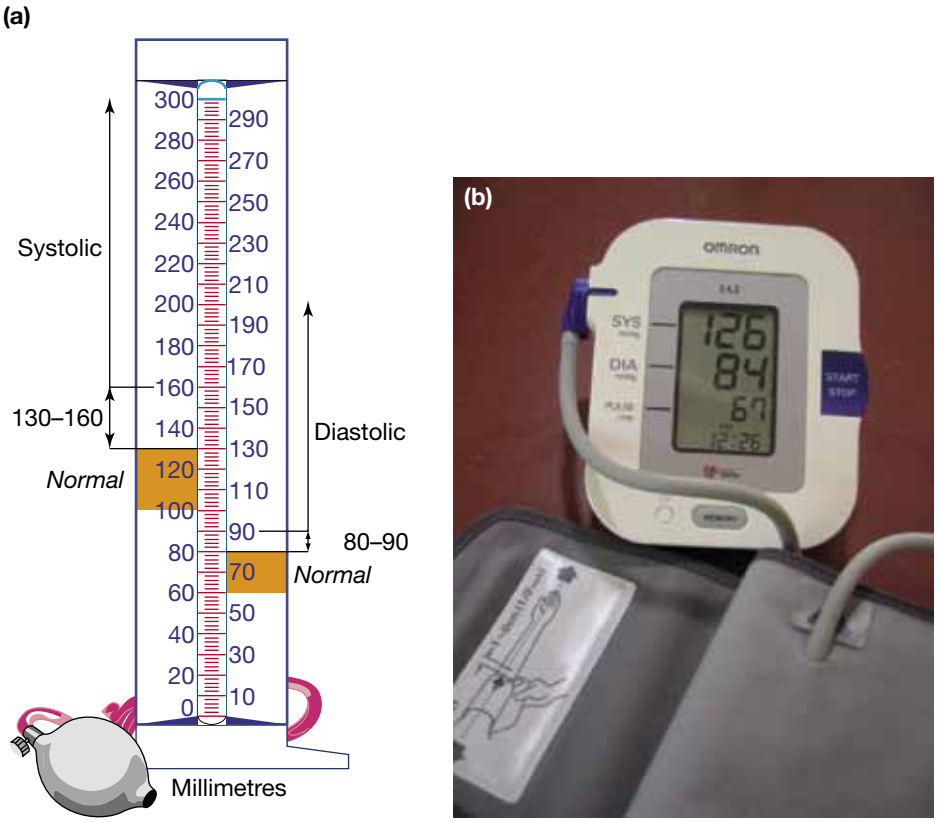


Figure 4.41: **(a)** A mercury gauge showing normal readings. The pressures above 130–160 systolic and 80–90 diastolic should be judged as being high only after the patient's age, current treatment and other risk factors have been considered. **(b)** Blood pressure reading using an electronic blood pressure machine

With each heartbeat, as small amounts of blood return to the artery past the obstruction (the cuff) a thudding sound is heard. The position of the mercury in the gauge is noted as the first sounds are heard. This reading represents the systolic blood pressure.

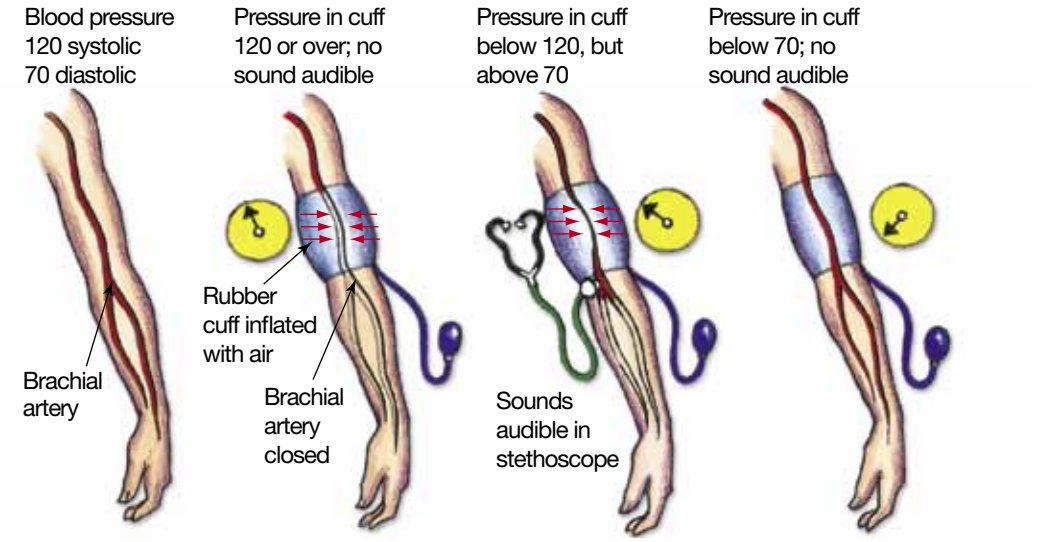


Figure 4.42: Measuring blood pressure with a sphygmomanometer

Air continues to be released from the cuff until there is no obstruction to the blood flow in the artery and the thudding sounds can no longer be heard. The position of the mercury in the gauge is noted when the sounds disappear. This reading represents the diastolic blood pressure.



APPLICATION

Measuring blood pressure

Equipment

Sphygmomanometer

Work in pairs or threes. Using the sphygmomanometer and the procedures outlined in the text, measure the blood pressure of a subject in your group. You will need to inflate the cuff to approximately 160 mm/Hg. Ensure the ear plugs of the stethoscope completely seal the ear passage and prevent outside interference.



INQUIRY

Analysing blood pressure readings

1. Examine the systolic and diastolic values obtained in the application above. Are they within the normal range? If not, suggest why.
2. Discuss the difficulties that you experienced in taking the measurement. How could these affect the reading?
3. Use the internet to conduct a search on blood pressure. Find the meaning of hypertension and suggest reasons why so many people have this condition. Why is hypertension called a 'silent killer' and what can be done about the condition?

APPLICATION

Blood pressure changes with exercise



Figure 4.43: A person on a bicycle ergometer

Aim

To observe changes in blood pressure with changes in exercise intensity.

Equipment

Sphygmomanometers, stopwatches, bicycle ergometers

If a bicycle ergometer is not available, a 30–40 centimetre step-up bench can be used. Initially, the subject can step up and down at a moderate rate (about 24 steps per minute) for the duration of one minute. One step consists of four beats (up left, up right, down left, down right). The workload can be increased for step three by stepping up and down rapidly (about 36 steps per minute).

Procedure

Work in groups of two or three.

1. Using the method described on pages 167–9, calculate blood pressure while the subject is sitting in a chair. Allow the subject to sit for several minutes before taking the blood pressure reading.
2. The subject should now work on a bicycle ergometer at a workload of 300 kp.m/min for one minute. Be ready to establish blood pressure 15 seconds before the finish. Pump the cuff up to past 250 mm/Hg. Stop the test. Measure blood pressure and record the reading in the table below.
3. The subject now works at a workload of 900 kp.m/min on the ergometer for one minute. Using the same method as in step two, measure blood pressure immediately the exercise finishes. Record the reading in the table.
4. Wait one minute for recovery. Measure blood pressure again and record the reading.

Workload	Systolic pressure	Diastolic pressure
Rest		
300 kp.m/min		
900 kp.m/min		
Recovery		

INQUIRY

Examining changes in blood pressure

1. What does the systolic blood pressure reading represent?
2. What does the diastolic blood pressure reading represent?
3. What was the effect of moderate exercise (300 kp.m/min) on blood pressure?
4. What was the effect of strenuous exercise (900 kp.m/min) on blood pressure? What accounts for this difference?
5. Why do the results for the different workloads vary? Explain with reference to both systolic and diastolic blood pressures.
6. Which blood pressure measurement is nearest to resting levels during recovery? Explain why.

INQUIRY The cardiorespiratory system and movement

Copy and complete a mind map similar to figure 4.44, to respond to the question:

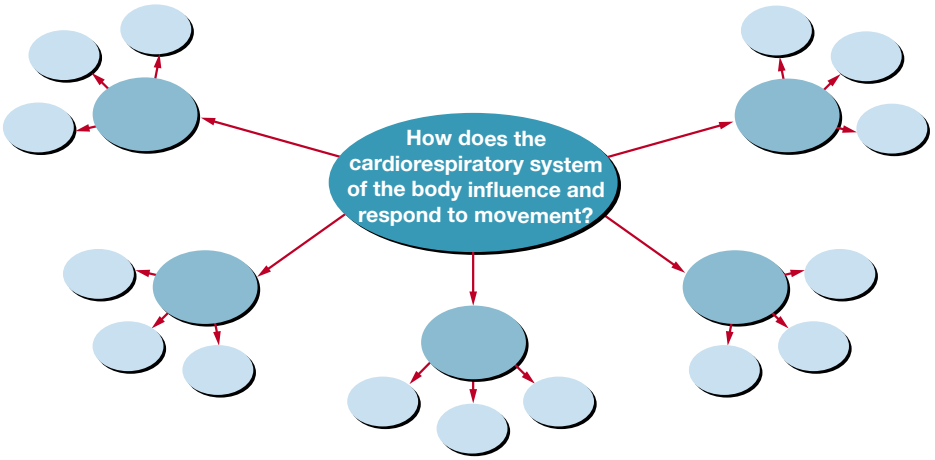


Figure 4.44: Sample mind map

SUMMARY

- The body has 206 bones of varying shapes and sizes. They provide important functions such as protecting vital organs and enabling movement.
- Bones involved in movement are usually long, meeting at joints such as the knee and elbow joints. Muscles surrounding these joints pull on bones making many different types of movement possible.
- Joints are places where two or more bones meet. Some joints allow more movement than others. Synovial joints allow maximum movement.
- The knee joint is a typical synovial joint. It contains important structures including tendons, ligaments, cartilage and synovial fluid.
- Synovial joint movements can be described in terms of flexion, extension, abduction, adduction, inversion, eversion, rotation, circumduction, pronation, supination, dorsiflexion and plantar flexion.
- Muscles enable us to move. There are more than 600 muscles in the body. The most important muscles that enable us to move include the deltoid, biceps brachii, triceps, latissimus dorsi, trapezius, pectorals, erector spinae (sacrospinalis), gluteus maximus, hamstrings, quadriceps, gastrocnemius, soleus, tibialis anterior, rectus abdominis and external obliques.
- Muscles perform roles according to the movement required. They can act as agonists (prime movers), antagonists (the lengthening muscle on the opposing side), or stabilisers (muscles that fix a joint while other actions are occurring). During movements such as running, the roles are constantly being reversed.
- The types of muscle contraction are concentric, eccentric and isometric. In a concentric contraction, the muscle shortens while under tension; in an eccentric contraction it lengthens while under tension and, in an isometric contraction, there is no change in length despite the muscle being under tension.

- The major components of the respiratory system include the bronchi, bronchioles, lungs and alveoli. The alveoli are microscopic sacs surrounded by capillaries. It is here that oxygen is exchanged for carbon dioxide.
- Inspiration and expiration are automatic processes controlled by the contraction of the diaphragm and intercostal muscles.
- The immediate effect of exercise on the lungs is to increase the rate and depth of breathing. This provides more oxygen to blood that is being moved rapidly around the body.
- The role of circulation is to transport oxygen and nutrients to the body's cells, carry hormones to target sites and collect carbon dioxide and waste.
- Blood consists of plasma and formed elements consisting of red and white cells, as well as platelets.
- The heart is a pump consisting of four chambers. The right chambers receive blood from the body and pump it to the lungs. The left chambers receive blood from the lungs and pump it to the body.
- Arteries and arterioles deliver blood to capillaries where oxygen exchange takes place. Venules and veins return the deoxygenated blood to the heart.
- Pulmonary circulation refers to the circulation of blood from the heart to the lungs and back to the heart again. Systemic circulation is circulation from the heart to the body tissues and back to the heart.
- Blood pressure refers to the force exerted by the blood on the walls of the blood vessels. Blood pressure is measured using a sphygmomanometer. It indicates peak pressure, when blood is forced into the arteries (systolic pressure) and lowest pressure (diastolic pressure), when the heart is filling.

QUESTIONS

Revision

1. **Identify** the location and type of the major bones involved in movement. (P7) (3 marks)
2. Using the knee joint as an example, **discuss** the role of ligaments, tendons, cartilage and synovial fluid. How do these structures assist movement? (P7) (5 marks)
3. Using an example, **outline** the difference between each of the following joint actions — flexion and extension, inversion and eversion, pronation and supination, rotation and circumduction, dorsiflexion and plantar flexion, adduction and abduction. (P7) (5 marks)
4. For each of the following movement descriptions, give an example of a sporting movement or activity that **demonstrates** the movement.
   (a) flexion at the knee
   (b) flexion at the elbow
   (c) abduction of the leg
   (d) dorsiflexion of the ankle
   (e) wrist flexion (P7) (5 marks)
5. (a) **Describe** the joint action of each of the following muscles — deltoid, trapezius, biceps brachii, quadriceps, soleus and latissimus dorsi. (6 marks)
   (b) **Describe** a movement from any sport or activity where the action of each of the listed muscles can be observed in the movement. (P7) (6 marks)
6. Using an example, **discuss** the role of agonists and antagonists in movement. (P7) (4 marks)
7. Using exercises from weight-training programs as examples, **outline** the difference between concentric, eccentric and isometric contractions. (P7) (3 marks)
8. Use a diagram to indicate the major components of the lungs. Briefly **state** the function of each component. (P7) (4 marks)
9. **Describe** the process of inspiration and expiration. What is its function in making body movement possible? (P7) (5 marks)
10. Using a diagram, **describe** how the exchange of gases takes place in the lungs. (P7) (5 marks)

(continued)

11. (a) **Identify** and **discuss** the functions of the various components of blood. (4 marks)
    (b) Which component is most important in enabling a person to move? Why? (P7) (2 marks)
12. Use a diagram to **describe** how the heart pumps blood. Indicate the direction of blood flow through the heart. **Discuss** the importance of the heart in transporting blood around the body. (P7) (5 marks)
13. **Outline** the difference between coronary, pulmonary and systemic circulation. How could a narrowing or blockage in any part of these systems affect our health? (P16) (3 marks)
14. Consider the following facts and **propose** a reason for each.
    (a) The wall of the left ventricle is thicker and more muscular than the right ventricle.
    (b) Arteries have thicker and more muscular walls than veins.
    (c) Capillary walls are extremely thin.
    (d) Veins contain valves. (P16) (4 marks)
15. Briefly **describe** how the respiratory and circulatory systems coordinate the supply and transport of oxygen to the cells and removal of carbon dioxide from the blood. **Discuss** the importance of this process to physical performance. (P7) (5 marks)
16. What is blood pressure and how is it measured? (P7) (2 marks)
17. **Discuss** the importance of blood pressure to health. (P16) (3 marks)
18. 'It is obvious that the higher the blood pressure, the harder the heart must work.' **Discuss** this statement with particular reference to
    (a) the effect of high blood pressure on the heart itself
    (b) the effect of high blood pressure on the blood vessels. (P16) (4 marks)

Extension

1. Locate two pieces of soft wood approximately 2 centimetres × 4 centimetres that are each 20 centimetres long. Join the two pieces at one end using a small hinge. Use your model to **demonstrate** the following movements to the class:
   (a) flexion
   (b) extension
   (c) abduction
   (d) adduction
   (e) dorsiflexion
   (f) plantar flexion.

   Using two drawing pins, attach a thick elastic band to both pieces to simulate a muscle. Use your model to **demonstrate**
   (g) muscle origin
   (h) muscle insertion
   (i) a concentric contraction
   (j) an eccentric contraction
   (k) an isotonic contraction
   (l) an isometric contraction.

   Using more bands and tissue paper, **demonstrate** the role of tendons, ligaments and cartilage in a joint. **Discuss** how forces such as tackles can easily damage the joint. (P7, P16) (10 marks)
2. A spirometer is an instrument commonly used to measure aspects of lung functioning. Use the **Spirometer** weblink in your eBookPLUS to complete the following.
   (a) Learn more about spirometry and how to use it to measure lung function.
   (b) **Predict** your lung function using height, age and gender.
   (c) **Propose** why your values might differ from others in the class. (P7, P16) (6 marks)

eBookplus

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

eBookplus

Digital docs
A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

CHAPTER 5
Physical fitness, training and movement efficiency



OUTCOMES

On completion of this chapter, you will be able to:

- explain how body structures influence the way the body moves (P7)
- describe the components of physical fitness and explain how they are monitored (P8)
- plan for participation in physical activity to satisfy a range of individual needs (P10)
- assess and monitor physical fitness levels and physical activity patterns. (P11)

OVERVIEW

HEALTH-RELATED COMPONENTS OF PHYSICAL FITNESS
Cardiorespiratory endurance
Muscular strength
Muscular endurance
Flexibility
Body composition

SKILL-RELATED COMPONENTS OF PHYSICAL FITNESS
Power
Speed
Agility
Coordination
Balance
Reaction time

AEROBIC AND ANAEROBIC TRAINING
Aerobic training
FITT principle
Anaerobic training

IMMEDIATE PHYSIOLOGICAL RESPONSES TO TRAINING
Heart rate
Ventilation rate
Stroke volume
Cardiac output
Lactate levels



HEALTH-RELATED COMPONENTS OF PHYSICAL FITNESS

Physical fitness is important in establishing and maintaining total body health. Physical fitness has a number of essential components, all of which contribute to total body fitness. Some fitness components have a direct impact on health. A variation in one or a number of these components can significantly affect our total health and well-being.

Health-related fitness components include:

- cardiorespiratory endurance
- muscular strength
- muscular endurance
- flexibility
- body composition.

Other fitness components relate more specifically to skills required for sports performance. These include:

- power
- speed
- agility
- coordination
- balance
- reaction time.

A brief overview of components of fitness together with tests that can be used to measure these components can be viewed in table 5.1. There is a range of well recognised tests available to measure each of the components. The tests listed below are easy to administer in most school environments and include norms or averages relevant to your age group.

Table 5.1: Components of fitness overview

	Component	Definition	Suitable tests
Health-related components	Cardiorespiratory endurance	The ability of the working muscles to take up and use oxygen	Bicycle ergometry The multistage fitness test
	Muscular strength	The ability to exert force against a resistance	Handgrip dynamometer test
	Muscular endurance	The ability of the muscles to endure physical work for extended periods of time	Sit-up test
	Flexibility	The range of motion about a joint	Sit and reach test
	Body composition	The percentage of fat as opposed to lean body mass in a human being	Body fat measurements using skin fold callipers
Skill-related components	Power	The ability to combine strength and speed in an explosive action	Vertical jump
	Speed	The ability to perform body movements quickly	Sprint test
	Agility	The ability to move the body from one position and direction to another with speed and precision	Agility test
	Coordination	The ability to harmonise the messages from the senses with parts of the body to produce movements that are smooth, skilful and well controlled	The stick flip test

	Component	Definition	Suitable tests
	Balance	The ability to maintain equilibrium while either stationary or moving	Balance board test
	Reaction time	The time taken to respond to a stimulus	The ruler drop test

Hypokinetic disease is a term given to modern lifestyle diseases associated with inactivity.

An improvement in health-related fitness components improves personal health and lifestyle, including lowering the risk of **hypokinetic disease**. Hypokinetic disease includes such conditions as:

- heart disease
- obesity
- high blood pressure
- insomnia
- diabetes
- depression.

Health-related fitness components respond positively to physical exercise. For example, exercise can help us lose weight, improve muscle tone and assist in the prevention of lower back pain. However, exercise should not be considered in isolation. Other factors such as heredity, environment and nutrition, together with lifestyle practices such as drug use and stress management, play an important role in contributing to total body health.

Cardiorespiratory endurance

Cardiorespiratory endurance refers to the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to muscle cells.

Cardiorespiratory endurance is by far the most important health-related fitness component. It is commonly referred to as aerobic power. The word aerobic means 'with oxygen', suggesting that this system is powered by oxygen, which is readily available in the cells and breaks down the body's fuels, producing energy.

The importance of cardiorespiratory endurance is evident in endurance events such as cycling, triathlons and marathons. A well-trained cardiorespiratory system ensures:

- the delivery of adequate quantities of blood (high cardiac output)
- a functional ventilation system (respiratory system)
- a good transport system (circulatory system) to ensure efficient and speedy delivery of oxygen and nutrients to the cells.



Figure 5.1: Cardiorespiratory endurance is important in the performance of aerobic activity.

APPLICATION

A laboratory test of cardiorespiratory endurance — bicycle ergometry

Equipment

Bicycle ergometers, stopwatches, Repco calculator, weighing scales, heart rate measuring device (stethoscope/exersentry/pulse rate meter or others)

Procedure

To perform this test, the subject should exercise at a workload (WL) that will raise the heart rate (HR) to a level anywhere between 120 and 170 beats per minute (bpm) where it will 'settle down' (will not fluctuate). This should happen after about two to three minutes of exercise. If the HR fails to make 120 bpm, the WL (resistance or stress applied) must be increased. Similarly, if the HR is above 170 bpm the WL must be decreased.

Adjustments to WL can be made any time, but a period of established HR to a specific WL must follow for about three to four minutes. HR must level out between 120–170 bpm, otherwise the test will be invalid. This is because researchers have established linear values between HR and WL within these ranges. Outside these ranges, the values are inaccurate.

1. Form groups of three. The first person is the subject, the second person checks HR, the third person records HR and WL. The subject should not have exercised strenuously for two hours prior to the test.
2. Weigh the subject and record their weight.
3. Adjust saddle height of the bike if necessary. The knee should be almost fully extended when the pedal is at the bottom of its circle.
4. Attach the HR measuring device. Be sure contact is firm. The HR may well be higher than anticipated due to anxiety. If taking it manually be sure that you can feel the pulse.
5. The suggested workload is 600 kp.m for boys and 450 kp.m for girls. Begin pedalling and start the stopwatch. HR and WL must be recorded every minute, using table 5.2.

Table 5.2: Record of aerobic power using bicycle ergometer

Test characteristics	Minute	Workload (kp.m)	Heart rate (bpm)
HR 116–128	1		
	2		
Adjust WL if necessary	3		
	4		
HR settling down	5		
	6		
HR settled	7		
	8		
Recovery	9		
	10		

6. After one minute, HR should be between 116–128 bpm. After three minutes, HR must start to settle down to between 120–170 bpm. If the value is much lower than 120 bpm and settling down, increase the workload. If much higher than 170 bpm, the workload must be decreased.
7. Continue the test for seven minutes, recording HR and WL every minute. Continue for an extra minute or two if HR fails to 'settle down'; that is, be within a couple of beats of the previous reading.

8. To obtain a final result, average the sixth and seventh minute HR and note the WL.
9. To assess aerobic capacity, using the Repco calculator, line up age with body weight, then HR and WL and read aerobic power in mL/kg/min. Alternatively, use the **Astrand cycle test** weblink in your eBookPLUS and use the online calculator under the 'Assessment' heading to establish your maximal aerobic power (VO_2 max).
10. Use the **VO_2 max** weblink in your eBookPLUS to establish your rating by examining the normative data for VO_2 max in 2005.

INQUIRY

My cardiorespiratory fitness level using bicycle ergometry

1. What is oxygen uptake?
2. What is meant by a test of maximal aerobic power?
3. What is a submaximal test?
4. Why do we test fitness levels using submaximal tests?
5. What are the possible disadvantages of using bicycle ergometry?
6. Copy and complete the graph (figure 5.2) for yourself as a subject by plotting your heart rate for each minute of exercise. Indicate where your heart rate levelled out.

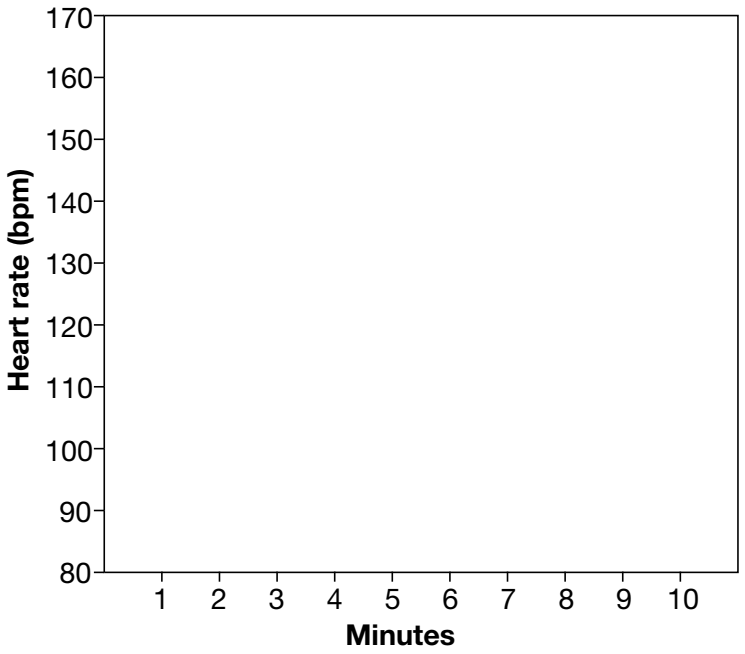


Figure 5.2: Graph of heart rate

7. What was your rating?
8. Were you satisfied with this rating? Why or why not?
9. Design a simple fitness program aimed at improving your aerobic power.

APPLICATION

A field test of cardiorespiratory endurance — the multistage fitness test

Equipment

CD player, multilevel fitness test CD, firm surface with two lines marked 20 metres apart

Procedure

1. Form a group of no more than 10 subjects to one supervisor.
2. Divide the group into two. Half the group is to perform the test while the remaining half observes and records the results.
3. Use a general purpose warm-up including leg stretching exercises before commencing this test.
4. The subjects in group one should move to the start line and listen to the introductory remarks on the CD, which tell them when to start and how to judge pace.

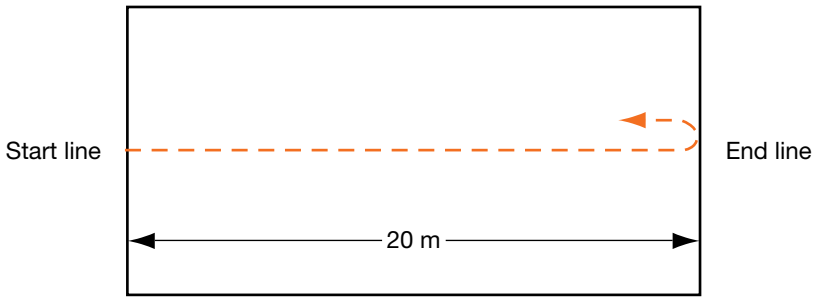


Figure 5.3: Lines for multistage fitness test

5. Subjects begin by walking to the end line, aiming to reach it on the 'beep'. Both feet must cross the line. They then turn and walk back aiming to reach the start line on the next 'beep'. Gradually the tempo is increased necessitating a jog and then a run to reach the other line by the sound of the 'beep'. When subjects fail to stay in time with the 'beep' they are given a warning. Failure to catch up or a second warning means the subject must stop the test.
6. Recorders should note the level at which their subject was unable to continue the test. Record the level and note the oxygen uptake in the table below.
7. Relate the oxygen uptake level to the aerobic capacity rating in table 5.3 to establish the rating for your cardiorespiratory endurance.

Table 5.3: Oxygen uptake according to levels

Level	Oxygen uptake
4	26.0–29.9
5	30.0–32.9
6	33.0–36.9
7	37.0–39.9
8	40.0–43.9
9	44.0–46.9
10	47.0–49.9
11	50.0–53.9
12	54.0–57.9
13	58.0–60.9
14	61.0–64.9

Level	Oxygen uptake
15	65.0–67.9
16	68.0–71.9
17	72.0–74.9

INQUIRY

My cardiorespiratory fitness level using the multistage fitness test

1. What was your rating for the cardiorespiratory endurance test? If you have completed another of the tests of aerobic capacity, how did your readings compare? Were there any factors that limited your performance?
2. What was your heart rate and breathing rate at the end of the test? Describe how your legs felt during the last few shuttles and immediately following completion of the test. Can you suggest why you felt this way?
3. Discuss the advantages and disadvantages of this test for use in a team training situation.

Muscular strength

Muscular strength is the ability to exert force against a resistance in a single maximal effort.

Body requirements of **muscular strength** vary between sport, activity and general living. There is considerable variation in strength requirements within particular sports, with some playing positions requiring more strength than others. Strength is particularly important in activities such as weight-lifting and gymnastics, and games such as rugby. High levels of overall body strength improve performance and reduce the risk of injury.

Muscular hypertrophy relates to an increase in the size of the muscle resulting from an increase in the cross-sectional area of the individual muscle fibres.

When we increase our strength, there is also an increase in the size of the muscle. This is referred to as **muscular hypertrophy**.



Figure 5.4: Muscular strength improves performance and reduces the risk of injury.

APPLICATION

Determining muscular strength



Figure 5.5: Position for grip strength test

Equipment

Hand dynamometer

Procedure

1. Pick up the dynamometer and push the arrow back to zero.
2. Let your arm hang vertically with the dynamometer comfortably gripped in the hand.
3. Gradually lift the dynamometer to shoulder height, squeezing the grip as hard as you can with the arm extended.
4. Read the result and record it in table 5.4. Repeat with the left hand.
5. Allow three tests on each hand, and record the best. Determine your rating, using table 5.5.



Figure 5.6: Gripping the hand dynamometer

Table 5.4: Results for muscular strength using a hand dynamometer

	Result (kg)	Rating
Right		
Left		
Best		

Table 5.5: Ratings for muscular strength using a hand dynamometer

	Strongest hand	
Classification	**Boys**	**Girls**
Super	>65.0 kg	>40.0 kg
Excellent	60.0–64.9	36.0–39.9
Good	53.0–59.9	32.0–35.9
Average	48.0–52.9	29.0–31.9
Fair	44.0–47.9	25.0–28.9
Poor	38.0–43.9	20.0–24.9
Very poor	<37.9	<19.9

Source: Adapted from D. Davis, T. Kimmet and M. Auty, *Physical Education Theory and Practice,* Macmillan, Melbourne, 1986. Reproduced by permission of Macmillan Education Australia.

INQUIRY

Activity, training and muscular strength

1. Is strength important in the type of sport or activity in which you participate?
2. Were you satisfied with your muscular strength rating? Why?
3. Do you feel this test reflected your overall body strength? Explain.
4. Do you use strength training to complement your sport or activity? Explain the strength training program you use.
5. What type of contraction was performed in the application above?
6. Why is adequate strength important in daily life?
7. As a class, discuss any differences between the strength results of girls and boys in this application.

Muscular endurance

Muscular endurance is the ability of the muscles to endure physical work for extended periods of time without undue fatigue.

The development of **muscular endurance** is very important in activities where contraction of the same muscle or group of muscles is repeated for periods of time without rest. It is a measure of the ability of the muscle to contract repeatedly over a period of time, thereby delaying the onset of fatigue.

Muscular endurance is local in that it is specific to a muscle or a group of muscles. It depends on the condition of the muscle that is performing the repeated contractions; for example, the rectus abdominis during continuous sit-ups. Muscular endurance is improved by programs that focus on maximum repetitions with low to moderate levels of resistance.

Muscular endurance is important in activities such as cycling, cross-country running, skiing, sports carnivals, bushwalking and rowing. In each of these activities, specific muscle groups must contract repeatedly to perform the skill. If the muscle group tires, the ability to continue to perform the skill is adversely affected.



Figure 5.7: Muscular endurance is important in activities where the same muscle group is involved in repetitive movements.

APPLICATION

Measuring muscular endurance

Equipment

Stopwatch, recording sheet

Procedure

1. Work in pairs. Nominate who will be the first subject and who will be the first counter.
2. The subject should lie on the floor with knees bent and feet flat on the floor. Arms are folded across the chest. Palms are open and rest on the front of the shoulders. Elbows are close together. The counter should hold their partner's feet firmly on the floor. The angle at the knees should not be less than 60°. In the sit-up, the trunk is raised and the elbows brought to a position between the knees. The body then returns to the floor. The total movement counts for one sit-up.

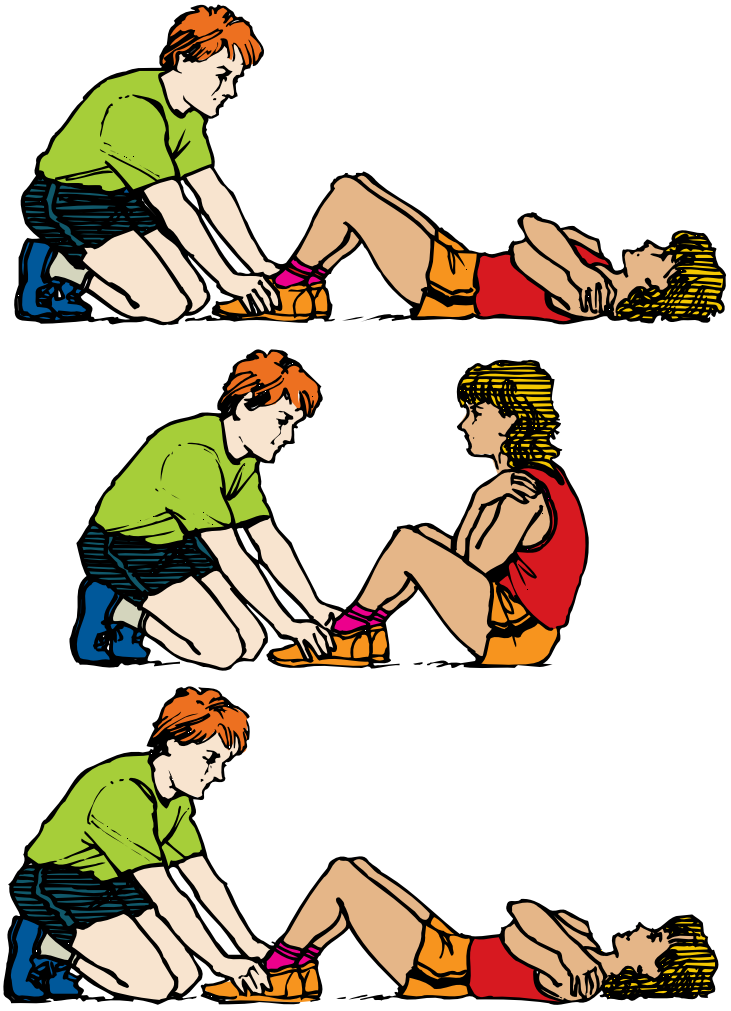


Figure 5.8: Sit-up test

3. Have a number of practices to warm up and ensure the technique is correct. Disallow any sit-ups performed incorrectly.
4. Perform the test, counting the number of correctly executed sit-ups in two minutes for boys and in one minute for girls.
5. Change roles and repeat the process.
6. Determine the rating for each person, using table 5.6.

Table 5.6: Muscular endurance ratings for sit-ups

Classification	Number of sit-ups	
	Boys	Girls
Excellent	>79	>38
Very good	69–78	33–37
Good	62–68	28–32
Average	52–61	23–27
Fair	44–51	17–22
Poor	35–43	12–16
Very poor	<35	<12

Source: Adapted from D. Davis, T. Kimmet and M. Auty, op. cit.



INQUIRY

Activity and muscular endurance

1. Are you satisfied with your rating in the sit-up test?
2. What problems did you incur with this type of test?
3. How can you improve muscular endurance?
4. In what type of activities would you expect to see a relationship between muscular endurance and cardiovascular endurance?
5. List five sports where a significant amount of muscular endurance is essential for a good performance.
6. What activities in our normal lifestyle require muscular endurance?

Flexibility

Flexibility is the range of motion about a joint or the ease of joint movement.

Isometric exercises are muscular contractions where tension is created in the muscle, but its length remains the same; for example, trying to lift a weight that is too heavy to be moved.

Maintenance of joint **flexibility** not only helps sport performance, but contributes significantly to quality of life. Flexibility is joint specific; that is, the level of flexibility found in one joint will not necessarily be uniform throughout the body. In other words, a person who is quite flexible in the shoulders may not be quite as flexible in other joints throughout the body.

Flexibility is an important health-related fitness component because it directly affects personal health and athletic performance, both now and in the future. For example, it is known that muscle length decreases with age, progressively decreasing our range of movement. Routine flexibility programs delay and restrict the effects of this process. Flexibility is improved by safe stretching programs which, in addition to increasing mobility, also:

- help prevent injury
- improve posture
- improve blood circulation
- decrease the chance of lower back pain later in life
- strengthen the muscle if combined with **isometric exercises**.



Figure 5.9: Improved flexibility allows us to participate in a greater range of activity with less discomfort and less chance of injury.

APPLICATION

Measuring flexibility

Equipment

Sit-and-reach measuring device, box for mounting

Procedure

1. Divide into pairs. Set up the box with a sit-and-reach measuring device placed horizontally on top.

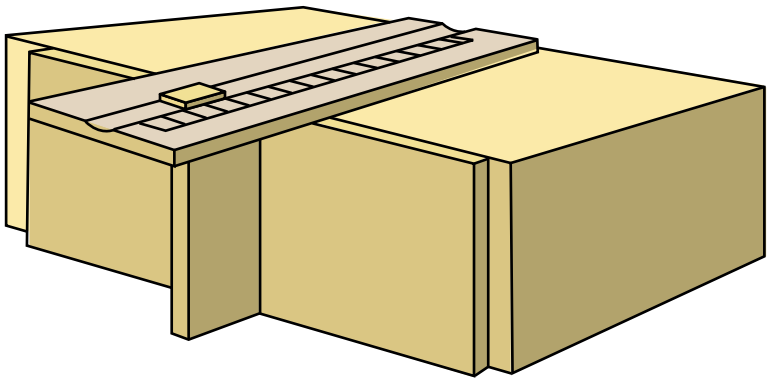


Figure 5.10: Setup for sit-and-reach test

2. The first subject sits on the floor with both legs straight, as in figure 5.11.
3. The second subject holds the first subject's knees firmly on the floor and sets the markers. Feet level corresponds to zero on the measurement rule.
4. The first subject should reach forward slowly (no jerky movements allowed) and push the markers forward as far as possible with the fingers. Fingers remain extended with palms down.

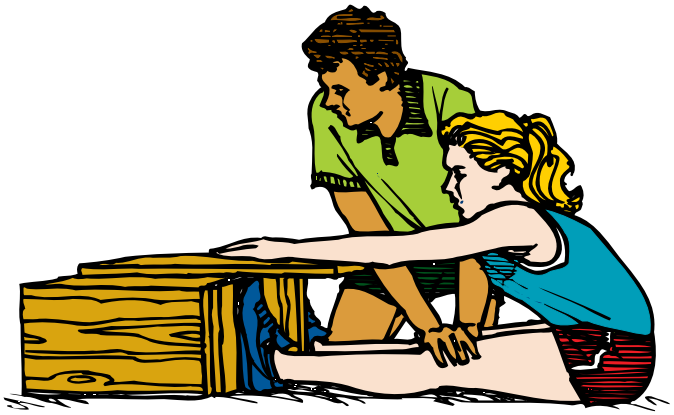


Figure 5.11: Sit-and-reach test for flexibility

5. The best of three attempts should be recorded.
6. Determine the rating for each person, using table 5.7.

Table 5.7: Sit-and-reach ratings

Classification	Boys 16–17 years	Girls 16–17 years
Excellent	>10+	>15+
Good	6–9	13–14
Average	2–5	11–12
Fair	–5–1	6–10
Poor	<–5	<5

Source: Adapted from B. Leelarthaepin, *Assessment of Physical Fitness*, Leelar Biomediscience, 1985.

INQUIRY

Activity and flexibility

1. List three sports or activities that take up a lot of your recreational or training time (for example, surfing).
2. List three joints that undergo a full range of motion in performing the skills associated with the sports or activities listed in question one (for example, the shoulder joint).
3. Do you think your flexibility rating is good enough to avoid injury considering the demands made on your joints?
4. How would additional flexibility be an advantage?
5. Why is flexibility important in all sport and game situations?

Body composition

Body composition refers to the percentage of fat as opposed to lean body mass in a human being.

Body composition is an important health-related component because it takes account of the level of storage fuel required for muscle activity. Having too little or too much storage fuel (fat) can significantly affect health and physical performance.

All people need a certain amount of body fat. This is called *essential fat* and surrounds vital organs such as kidneys, heart, muscle, liver and nerves. Absence of fat in these areas would lead to chronic health problems because fat in these regions helps to protect, insulate and absorb shock to these organs. Additional fat is called storage fat and it too has an important role, mainly as a source of stored energy. Storage fat is used for fuel during times of rest and sleep and in extended exercise of more than an hour or so, when our supplies of **blood glucose** are exhausted.

Blood glucose is blood sugar. It represents the immediate supply of fuel for the working muscles.

Lean body mass is often called fat-free mass and comprises all of the body's nonfat tissue, including bone, muscle, organs and connective tissue. While the characteristics of body tissue are genetically determined, the size of the muscle can change with the use of resistance training (weight training) programs.

Body composition can be changed by diet and exercise. For example, a lifestyle that combines regular high activity and resistance training with a well-balanced, but not excessive, food intake will result in a significant decrease in body fat and improved body tone. The recommended amount of body fat as a percentage of body composition is 15 to 20 per cent for men and 20 to 25 per cent for women.



Figure 5.12: Exercise patterns and eating habits largely determine our body composition.

APPLICATION

Determining body composition

Equipment

Skin fold callipers or slide measure, recording sheets

Procedure

There are four sites on the body at which body fat is measured using callipers. Subjects should wear T-shirts and relax while measurements are being taken. Flexing the muscles does not decrease the amount of fat, it simply makes measurement more difficult.

1. Divide into pairs, threes or fours, depending on the number of callipers available.
2. Take the callipers in the preferred hand (usually the right) and practise opening the arms of the instrument. Repeat until you can do this both comfortably and smoothly. If using a slide measure, practise pushing the slide and letting it come back.
3. Take a vertical (that is, skinfold will be up and down) skinfold measurement at the four sites — (i) biceps, (ii) triceps, (iii) subscapular and (iv) suprailiac.
   (a) The biceps is located on the front of the arm in the middle of the biceps muscle (that is, halfway between the elbow and shoulder — see figure 5.13(a)).
   (b) The triceps is located on the back of the arm halfway between the elbow and shoulder (see figure 5.13(b)). The vertical skinfold should be taken from the middle of the triceps muscle (see figure 5.14).

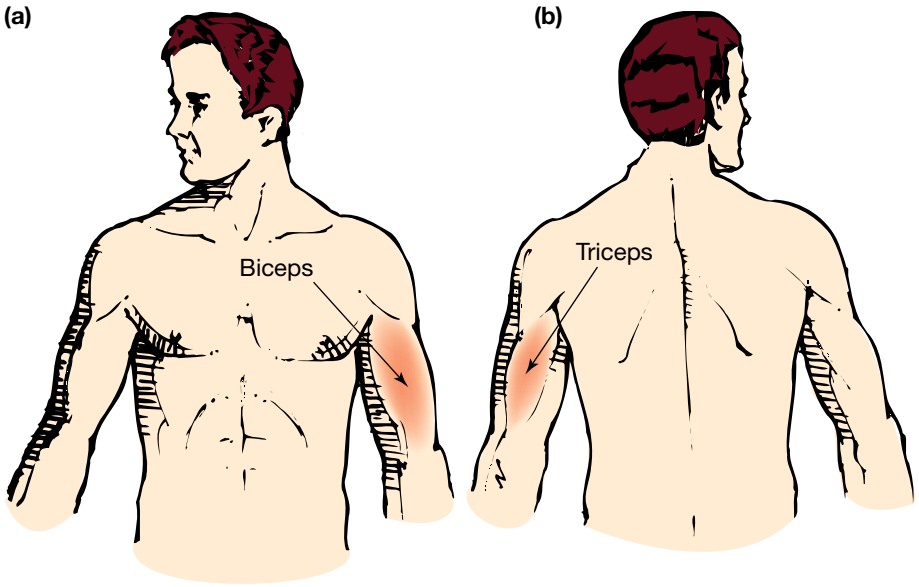


Figure 5.13: Location of **(a)** biceps, **(b)** triceps

   (c) Push your arm up your back and the shoulder blade (scapula) will protrude. Locate this bone and then have the subject drop the arm. Take a vertical skinfold approximately two centimetres below the bottom tip of the bone (subscapular — see figure 5.15).
   (d) Feel the hip bone. The top is the iliac crest. Take a vertical measurement approximately two centimetres above this point (suprailiac — see figure 5.16).
4. The first subject should stand and let his/her arms hang loosely.
5. With callipers in the preferred hand, the assistant gently pinches the skin between their index finger and thumb using the other hand. Then, slide off the muscle that can be felt underneath and gently hold the skinfold. Place the



Figure 5.14: Skinfold test on the triceps



Figure 5.15: Skinfold test on the subscapular



Figure 5.16: Skinfold test on the suprailiac

callipers over the fold and let the arms of the calliper close in (see figures 5.14, 5.15 and 5.16).

6. The assistant then reads the skinfold measurement. The callipers should not be left on for too long as fat cells will compress, causing inaccuracies.
7. Callipers should be removed and the pinch of skin gently relaxed.
8. Repeat the measurement twice. If two readings are the same, record the reading. If all are different, record the mean (average) reading in table 5.8.

Table 5.8: Measurement of body fat

Site	Measurement (mm)
Biceps	
Triceps	
Subscapular	
Suprailiac	

9. Repeat for each subject.
10. Total the measurements from the four sites for each individual and check your body composition rating using tables 5.9, 5.10 and 5.11.

Table 5.9: Body composition rating

Sum of four skinfolds (mm)	Percentage body fat from sum of four skinfolds (age 16–17 years)	
	Boys	Girls
10	4.8	6.3
15	8.6	11.6
20	11.4	15.3
25	13.5	18.2
30	15.2	20.6
35	16.7	22.6
40	17.9	24.3
45	19.0	25.9
50	20.2	27.2
55	20.9	28.5
60	21.8	29.6
65	22.5	30.6
70	23.2	31.6
75	23.9	32.5
80	24.5	33.3
85	25.1	34.1
90	25.6	34.9
95	26.1	35.6
100	26.6	36.1
105	27.1	36.6
110	27.5	37.3
115	27.9	38.0
120	28.3	38.6

Table 5.10: Ordinary rating scale for body fat composition

Classification	Boys 16–17 years (%)	Girls 16–17 years (%)
Lean	12	24.1
Acceptable	12.1–19.6	24.2–28.4
Moderately obese	19.7–23.2	28.5–33.3
Obese	23.3+	33.4+

Table 5.11: Athletes' rating scale for body fat composition

Classification	Males (%)	Females (%)
Lean	6.9	11.0
Acceptable	7.0–14.9	12.0–24.9
Obese	15	25.0

Source: Adapted from B. Leelarthaepin, op. cit.



INQUIRY

Evaluating body composition

1. What percentage of body fat should you aim for?
2. How can a desirable amount of body fat be achieved and maintained?
3. What are the advantages of having a desirable percentage of body fat?
4. What problems could be incurred in calculating percentage of body fat using the skinfold measurement method?



SKILL-RELATED COMPONENTS OF PHYSICAL FITNESS

Muscular power is the ability to combine strength and speed in an explosive action.



Figure 5.17: Power is important in activities that require explosive movements.

Skill-related components of physical fitness do not impact specifically on health but are important in the performance of activities, games and recreational pursuits. An improvement in skill-related components improves performance in activities that utilise that skill. For example, effective rebounding in basketball requires an ability to jump high. The fitness component required to jump high is leg power.

Power

Muscular power is determined by the amount of work per unit of time. People who are strong are not necessarily powerful.

The amount of power relative to the amount of strength varies according to the type of activity. *Speed-dominated* power is power generated through a greater emphasis on speed and is essential in activities such as sprinting and throwing. *Strength-dominated* power is power generated through a greater emphasis on strength. It is important in activities such as weight-lifting and throwing the shot or javelin. Effective programs aim to develop the required amounts of strength and power in each individual according to the needs of the sport.



APPLICATION

Measuring muscular power

Equipment

Vertical jump board or tape measures attached to wall

Procedure

1. Divide into pairs. One person is the subject and the other is the recorder.
2. The subject should dip their middle finger in chalk dust, face the wall, extend both hands upwards and make a mark. Record the height of the mark in centimetres.

3. The subject should then turn sideways to the wall, spread their feet, take a deep squat and jump vertically (see figure 5.18). No feet movements are allowable in preparation for the jump.
4. At the height of the jump, the subject should mark the wall adjacent to the tape. Record the difference between the first and second marks.
5. Allow three jumps and record the best.
6. The subject and recorder should now change roles and repeat steps 2–5.
7. Take the best jump for each person and determine their power rating using table 5.12.



Figure 5.18: Vertical jump test

Table 5.12: Muscular power rating

Classification	Height (cm)	
	Boys	Girls
Super	64.1	44.1
Excellent	60.1–64.0	41.0–44.1
Good	57.1–60.0	35.1–40.9
Average	53.1–57.0	31.1–35.0
Fair	49.1–53.0	28.0–31.0
Poor	44.6–49.0	22.1–27.9
Very poor	<44.5	<22.0

Source: Adapted from D. Davis, T. Kimmet and M. Auty, op. cit., pp. 146–7.



INQUIRY

Evaluating muscular power

1. Were you satisfied with your muscular power rating in the previous application? Why or why not?
2. How might you increase your power to improve your performance in a re-test of the vertical jump?
3. List three movements in your preferred sport or activity for which power is essential; for example, jumping in basketball.

4. Is your power sufficient to be able to perform these movements as well as you would like?
5. In what aspects of daily life is power an advantage?

Speed

Speed is the ability to perform body movements quickly.

Because it is largely an innate quality determined by fibre type, **speed** is not as responsive to training as other fitness components such as cardiorespiratory endurance, strength and power. This explains why some people naturally appear to be 'quick' while others, no matter how much they train, do not make significant gains.

Sprinters still need to train to improve speed. However, while some improvements will be made as a result of increased power, considerable changes result from improvements in technique, including reaction time at the start, form, alignment, balance and the utilisation of energy for a powerful finish.



APPLICATION

Measuring speed

Equipment

Tape measures, stopwatches

Procedure

1. Measure a 45.7 metre straight on flat ground.
2. Divide into pairs. Choose who will be the first runner and who will be the first timer.
3. Have a general warm-up with emphasis on leg stretches.
4. Practise 'on the mark', 'set', 'go', allowing about two seconds between 'set' and 'go'.
5. Practise starting the stopwatch on the 'go' movement; that is, the first movement forward. As sight is quicker than sound, this will give a more accurate reading.
6. The starters should now go to the starting line and the timers to the finish line.
7. Start the runners and time them over the distance.
8. Allow three runs and select the best time.
9. The subjects and recorders should change over and repeat steps four to eight.
10. Take the best time for each person and determine their speed rating using table 5.13.

Table 5.13: Speed rating

Classification	Boys	Girls
Excellent	<6.0	<7.0
Very good	6.1–6.3	7.1–7.4
Good	6.4–6.5	7.5–7.6
Average	6.6–6.7	7.7–8.0
Fair	6.8–7.4	8.1–8.9
Poor	>7.4	>8.9

Source: Adapted from P. Hunsicker and G. Reiff, *AAHPER Youth Fitness Manual*, AAHPER, Reston, Virginia, 1976.

INQUIRY

Evaluating speed

1. Why is speed an advantage in sport?
2. Were you satisfied with your rating in the application above? Why or why not?
3. How could you improve your speed?
4. List three sports that you play or have played that involve use of speed. How important is speed to good performance in these sports?
5. Where might speed be important in normal life?

Agility

Agility is the ability to move the body from one position and direction to another with speed and precision.

Agility combines a number of fitness components including balance, coordination and speed. Because agility comprises a number of components, any test that measures agility will be performed at speed and will reflect a degree of balance and coordination. Improved fitness in any one of these aspects subsequently improves agility and the ability to resist fatigue. Elements or aspects of any agility training program should include the ability to be aware of, and control, body parts and to recognise patterns of skills and react or respond quickly to stimuli. Drills to improve footwork and to start and change direction will also be beneficial in developing agility. Activities that require a high degree of agility include skiing, most team games and ice skating. Field hockey and soccer, for example, are multi-directional sports, both requiring quick changes of direction and fast acceleration or deceleration. An agile player is able to respond quickly to an opposing player, making agility equally as or even more important than speed.



Figure 5.19: Agility is the ability to move with speed and precision.

APPLICATION

Testing agility

Equipment

Tape measure, six markers (chairs or witches' hats), stopwatches, recording sheets

Procedure

1. On a football field or suitable flat surface, mark two parallel lines 10 metres apart. Place four witches' hats 3.3 metres apart as per figure 5.20. Place two witches' hats 1.83 metres each side of the first line marker.
2. Divide into pairs. One person is to complete the course and the other is to time and record the results. Ensure that you warm up and stretch before completing the course.
3. The first subject from each pair must lie face down flat on the ground in a push-up position just behind the line at the start.
4. On the instruction 'go', the first subject runs to the end line and back, then in and out of the markers, to the end line again, then back to the finish (see figure 5.20).
5. During the run, each end line must be crossed. The marker cannot be jumped or knocked.

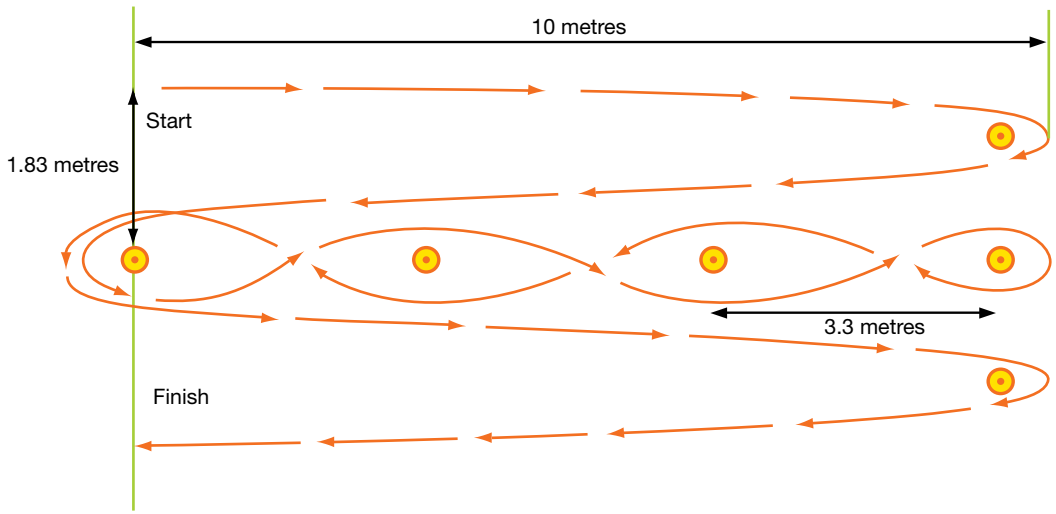


Figure 5.20: Field for agility test

6. The second subject records the time for completion of the course.
7. Allow two attempts, with recovery time between each. Then repeat the test for the second subject.
8. Check your agility rating, using table 5.14.

Table 5.14: Agility rating

Rating	Boys 16–17 years	Girls 16–17 years
Excellent	<15.2	<17.0
Very good	16.1–15.2	17.9–17.0
Average	18.1–16.2	21.7–18.0
Poor	18.3–18.2	23.0–21.8
Very poor	>18.3	>23.0

INQUIRY

Evaluating agility

1. Why do you think the test in the previous application may or may not be a good test of agility?
2. What other components of fitness will contribute to a good agility score?
3. Write a list of activities that you could use to improve your agility.
4. Are you satisfied with your rating?
   (a) If not, what do you believe contributed to this performance?
   (b) If so, to what do you attribute your success?
5. List five activities in daily life where agility is essential.
6. List five sports or activities in which above average levels of agility are essential.

Coordination

Coordination is the ability to harmonise the messages from the senses (such as sight, feel and sound) with parts of the body to produce movements that are smooth, skilful and well controlled.

Coordination requires good interaction between the brain and the muscles, resulting in efficient body movement. Coordination is important in games, in movements that require throwing and activities such as dancing. It is not a specific skill such as power or speed. Rather, we see it in the way a motor skill is executed. Performers whom we consider to be skilled, such as professional tennis players, exhibit excellent coordination. This contributes to the aesthetic quality of movement.



Figure 5.21: Good coordination helps us to learn new motor skills quickly.

People who are well coordinated acquire new movements readily. As a result, they adapt quickly to learning new sports and activities. Well-coordinated players are less prone to accidents and injury when involved in physical activity.

APPLICATION

Determining coordination

Equipment

Sticks (three per person per test), approximately 60 centimetres long, two centimetres in diameter and painted at one end

Procedure

The half-flip stick test

1. Work in pairs.
2. The first subject holds a stick in each hand at waist level so that the sticks are horizontal.
3. The second person places the third stick across the two hand-held sticks (figure 5.22(a)).
4. The first subject attempts to flip the stick so that it turns one half of a rotation and lands again balanced on the two hand-held sticks (figure 5.22(b)).

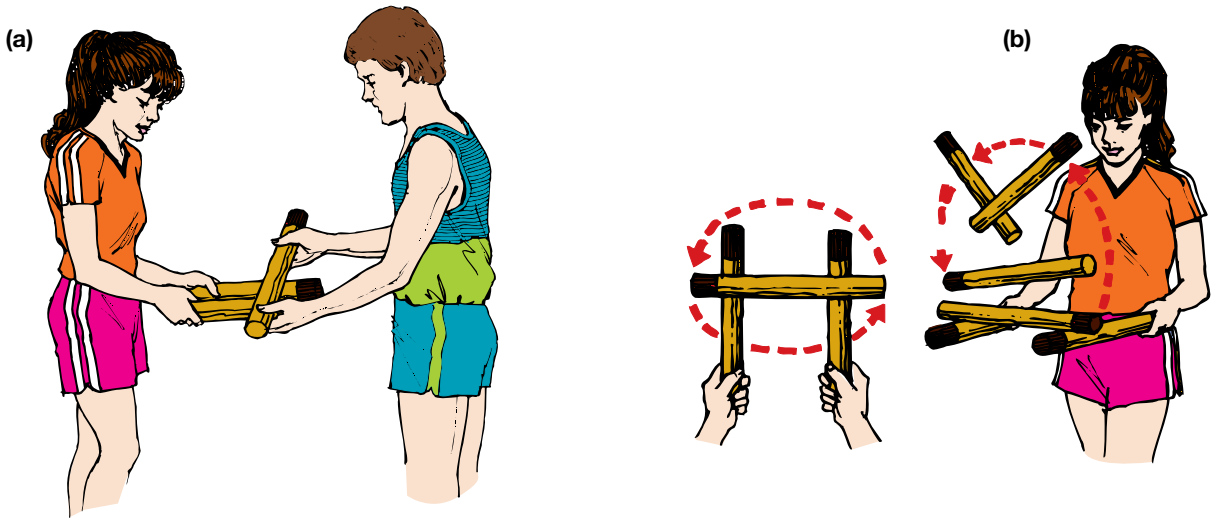


Figure 5.22: **(a)** Setting up the half-flip stick test; **(b)** flipping the sticks



Figure 5.23: Full-flip stick test

5. Allow three practice attempts.
6. In the test, the subject should attempt five half-flips. One point is scored for each successful attempt. The flip is unsuccessful if the stick is not flipped through the half rotation or is dropped.
7. Record the results of this test in table 5.15.
8. Repeat the test for the second subject.

Table 5.15: Record of flip test

Test 1	half flip	No. of successes from five attempts × one point: _____ × 1 = _____
Test 2	full flip	No. of successes from five attempts × one point: _____ × 1 = _____

The full-flip stick test

1. Repeat steps one, two and three of the half-flip stick test.
2. In this second test, a full flip is attempted. The stick must go through a full rotation and land balanced across the other two sticks (see figure 5.23).
3. Allow three practice attempts. Attempt five full flips and award two points for each successful attempt. Record your results.
4. Repeat the test for the second subject.
5. Tally your results for the two tests and find your coordination rating, using table 5.16.

Table 5.16: Stick test rating

Classification	Boys	Girls
Excellent	14–15 points	13–15 points
Very good	11–13 points	10–12 points
Fair	5–10 points	4–9 points
Poor	3–4 points	2–3 points
Very poor	0–2 points	0–1 point

INQUIRY

Evaluating coordination

1. Why do you think the stick test may or may not be a good test of coordination?
2. What other fitness components (for example, speed) may have contributed to your score?
3. In what way did you benefit (or not benefit) from the pre-test practice?
4. What is the relationship between practice and improved coordination?
5. List five sports or activities where coordination is important.
6. In what aspects of daily living is coordination important?

Balance

Balance is the ability to maintain equilibrium while either stationary or moving.

Balance is our ability to maintain equilibrium. It depends on our ability to blend what we see and feel with our balance mechanisms, which are located in the inner ear.

There are two types of balance: *static* and *dynamic*. Static balance means maintaining equilibrium while the body is stationary. Dynamic balance means maintaining equilibrium while the body is moving.

We use balancing skills virtually every moment of our lives. For instance, we are balancing while walking and running. However, in some situations, a higher degree of balance is required for the proper execution of the skill. The gymnast performing a handstand, the ballerina on her toes and the skier all need exceptional balance to execute their sporting skills.

Balance can be improved by practice. As a person learns to control their centre of gravity both when moving (as in running) and with a narrow base of support (as in a pirouette or handstand), balance improves. When the centre of gravity falls outside the base of support with stationary activities, balance is lost.



Figure 5.24: Balance is the ability to maintain equilibrium while standing or moving.

APPLICATION

Static balance

Equipment

Stopwatch, recording sheet

Procedure

1. Divide into pairs, one to perform the test and the other to time, judge and record the attempt.
2. The first subject removes his/her shoes and stands erect on a flat surface with hands on head.
3. One foot is then lifted and placed behind the calf of the other leg. At this point, the stopwatch starts.
4. The stopwatch is stopped when one or more of the events below occur:
   - the time on one leg exceeds 20 seconds
   - the foot comes away from the calf of the other leg
   - the hands come away from the head
   - the supporting foot changes position on the floor
   - the subject jumps.
5. Allow one minute's practice. Then record the best of three attempts on the right leg followed by the best of three attempts on the left leg. Record the total time.
6. Repeat the test for the second subject.
7. Determine your static balance rating using the **Static balance** weblink in your eBookPLUS.

eBookplus

INQUIRY

Evaluating balance

1. What is the difference between static and dynamic balance?
2. Were you satisfied with your ratings in the two balance applications?
3. What problems did you have in trying to maintain balance in each of the tests?
4. Describe an activity in your daily life where balance is essential.
5. List three skills from a sport or activity that you participate in or have participated in that require a degree of balance.

Reaction time

Reaction time is the time taken to respond to a stimulus.

Reaction time is very important in sports such as sprinting, shooting and swimming. The stimulus could be a sound such as a starter's gun, a movement, or a target fired into the air. In each case, there is a period of time between the mind realising the presence of the stimulus and the body making the appropriate response.



The time taken between stimulus and response is called reaction time. It will vary from one person to another. Reaction time can be improved with practice and concentration. The average reaction time in human beings is 170 milliseconds. Successful athletes in sprint events will probably have faster reaction times due to practice.

Interestingly, Usain Bolt, the fastest human being ever recorded, has a longer reaction time to the starter's gun than many of his competitors. In



Figure 5.25: Reaction time is the time taken to respond to a stimulus.

the Beijing Olympic 100m sprint final, his reaction time was 165 milliseconds, with five of the other competitors in the race having a shorter reaction time. This suggests that if he could reduce his reaction time, he may be able to run even faster than his current world record speeds.



Determining reaction time — vision and hearing

TEST ONE

Equipment

One 1-metre ruler, desk and chair, recording sheets

Procedure

1. Divide into pairs. Nominate one person as the subject and the other to conduct the experiment and record the result.
2. The subject sits at the desk and places his or her preferred forearm across the desk so that the hand extends beyond the edge of the desk. Fingers and thumb point away and have a gap between them, approximately two centimetres wide.
3. The recorder stands beside the subject's hands and suspends the ruler just beyond the far edge of the desk. The bottom edge of the ruler should be level with the thumb and index finger of the subject.
4. After the recorder says 'ready', the ruler is dropped.
5. The subject should try to catch the ruler. The score is read in centimetres and is the point at which the thumb and index finger grasp the ruler.
6. Allow three trials prior to testing. Then record three attempts and use the average value for assessment.
7. Repeat the test for the second subject.

8. Use table 5.17 to determine your reaction time rating.

Table 5.17: Reaction time rating

Classification	Ruler reading (cm)
Excellent	<7.5
Very good	7.5–15.9
Satisfactory	15.9–20.4
Fair	20.4–28.0
Poor	>28

TEST TWO

Equipment

As for test one

Procedure

As for test one. However, this time the subject's eyes are closed and the test is performed once for each hand. The recorder should say 'ready' and then 'go' within a period of 10 seconds.

TEST THREE

Equipment

As for test one

Procedure

As for test one. However, this time the subject's finger and thumb are placed just against the side of the ruler with absolutely no pressure on the ruler itself. The recorder drops the ruler as in test one, and the subject responds when the movement is felt.

TEST FOUR

Equipment

As for test one, with the addition of an extra 1-metre ruler

Procedure

As for test one. However, this time the subject's eyes are closed, both arms are extended and he/she responds to the words 'right' or 'left', describing which ruler is to be dropped. The subject has to interpret these data and respond by reacting with the correct hand.



INQUIRY

Evaluating reaction time

1. What is reaction time? How did your reaction time vary from one test to another?
2. List three sporting events where reaction time is important.
3. Describe three situations in your daily life where reaction time is important.
4. How can you improve your reaction time?
5. Why is reaction time important?
6. Good reaction time can play a significant part in avoiding car accidents. What may be the effect of the following conditions on reaction time:
   - a small amount of alcohol (say 0.04 per cent)?
   - a large amount of alcohol (say 0.10 per cent)?
   - a lack of sleep?
   - influenza?
   - caffeine?

INQUIRY

Fitness test comparisons

eBookplus

Use the **Fitness tests** weblink your eBookPLUS to access a website showing some well-known tests of fitness.

Scroll to *Tests for fitness components*. Open the link to each of the recognised tests and input your own results in the assessment area. Was your assessment much the same as those you calculated yourself? If there was considerable variation, explain why this might occur.

INQUIRY

Fitness components

1. Summarise what you have learned about the components of physical fitness by copying and completing a web diagram similar to the one in figure 5.26.
2. For each component of physical fitness, give an example illustrating how it applies to a particular physical activity or sport.

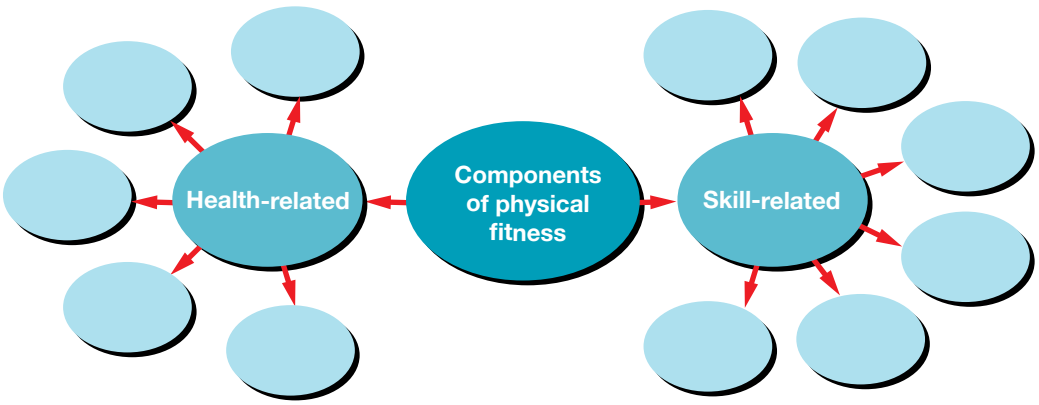


Figure 5.26: Web diagram for the components of physical fitness

APPLICATION

Compiling my physical fitness profile

Equipment

Results and classification of each physical fitness component tested in the applications on pages 178–201, recording sheet (figure 5.27, page 203)

Procedure

1. In red pen, place a circle in the appropriate column on the recording sheet that best indicates your rating for each of the physical fitness tests. Join the circles, thus plotting a graph.
2. Using another coloured pen, assess your chosen sport or activity and graph the fitness requirements for it from the information you have learned in this chapter.
3. Compare the two graphs and answer the questions in the following inquiry.

INQUIRY

My physical fitness profile

1. (a) Which fitness components fall below the requirements of your chosen sport or activity?
   (b) Which fitness components for which you tested were better than the basic fitness requirements for your chosen sport or activity?

2. Analyse the differences (if any) between the two graphs. What do you think this profile is attempting to show?
3. Design a program to:
   (a) maintain the fitness components that meet the requirements of your sport or activity
   (b) improve those areas that fell below the requirements of your chosen sport or activity.



Fitness as a predictor of performance

Use the following table to assist you in examining the question: 'To what degree is fitness a predictor of performance?'

The fitness components are listed in the left column and a range of activities are listed in the centre column. Examine each of the listed activities and identify the amount of each fitness component that you believe to be necessary for movement efficiency (smoothness/aesthetically pleasing/coordinated) and good performance.

Your answer in the right column will include your selection of the most important fitness components for each activity and an analysis of why each component has been selected.

Fitness components	Activity	Your analysis
Cardiorespiratory endurance Muscular strength Muscular endurance Flexibility Body composition Power Speed Agility Coordination Balance Reaction time	Surfing	
	Marathon running	
	Weight lifting	
	High jumping	
	Sprinting	
	Basketball — guard	



The purpose and benefits of testing physical fitness

Use the ranking chart on page 204 to explore the benefits of testing physical fitness. Ten benefits are listed below. Rank the benefits by writing them in the column on the left. Use the right column to explain each benefit and justify its ranking.

Benefits:

- predict future performance
- place in appropriate training group
- indicate strengths
- indicate weaknesses
- identify special talents
- monitor progress
- measure improvement
- training program evaluation
- provide incentives
- motivate the athlete

Physical fitness profile

Name ..... Chosen sport .....

	Very low/ very poor	Low/poor	Medium/average	High/very good	Very high/excellent
HEALTH-RELATED FITNESS					
Cardiorespiratory endurance					
Bicycle ergometry					
Multistage fitness					
Muscular strength					
Hand dynamometer					
Muscular endurance					
Sit-up test					
Flexibility					
Sit and reach					
Body composition					
Body fat percentage					
SKILL-RELATED FITNESS					
Power					
Vertical jump test					
Speed					
Sprint test					
Agility					
Agility test					
Coordination					
Stick test					
Balance					
Static balance					
Dynamic balance					
Reaction time					
Reaction time test					

Figure 5.27: Recording sheet

Ranking	Explanation of benefit and justification of ranking



AEROBIC AND ANAEROBIC TRAINING

An **energy pathway** is a system that converts nutrients to energy for exercise.

Anaerobic means 'in the absence of oxygen'.

Aerobic means 'with oxygen'.

Training programs aim to develop a range of fitness components together with skill development, moves and strategies. To develop an effective training program it is necessary to identify the correct **energy pathway** or body system that converts nutrients to energy.

- If we perform short sharp movements as in jumping and lifting, the body uses the **anaerobic** pathway (oxygen is absent) to supply energy.
- If movements are sustained and of moderate intensity, the **aerobic** pathway (with oxygen) supplies the bulk of energy needs.

We therefore need to closely examine the exact type of movements that will be performed in the game or activity for which we are training. This allows us to select training activities that develop the correct energy source, be it aerobic, anaerobic or a combination of both.

Aerobic training

The word aerobic means 'with oxygen'. Aerobic exercise refers to exercise that is dependent on oxygen utilisation by the body to enable muscular work. Activity that is of low to moderate intensity and continues for 90 seconds or more is generally termed aerobic because oxygen becomes available to the cells of working muscles for energy generation. Walking, marathon running and the 1500 metres in swimming are examples of activities that require a high degree of aerobic fitness.

To improve aerobic fitness we need to:

- engage in activities that are continuous and of long duration. Cross-country running, sand-hill running, cycling and jogging are examples of activities that develop our aerobic energy system.
- use the **FITT** (frequency, intensity, time, type) principle to provide guidance in developing an aerobic program to suit our needs. The principle provides guidelines for individuals who aim to improve cardiorespiratory fitness and some forms of resistance training.

FITT is an acronym for frequency, intensity, time and type. It embodies a fitness principle that ensures a program has the quantity and quality of movement necessary to produce the desired physical improvement.



Figure 5.28: Sustained effort at moderate intensity underlies aerobic training.

FITT principle

Frequency

For improvements to occur, individuals must train on at least three occasions per week. This can be increased to five, but the benefit to be gained from sessions in excess of this is minimal.

The aim is for a training session to sufficiently stress body systems, causing a response called an **adaptation**. This is an adjustment (for example, better utilisation of oxygen by cells) made by the body as a result of exposure to progressive increases in the intensity of training. For resistance training, three sessions are sufficient while four is maximal, allowing rest days in between for muscle fibres to regenerate.

An **adaptation** refers to an adjustment made by the body as a result of exposure to progressive increases in the intensity of training.

Intensity

Intensity refers to the amount of effort required by an individual to accrue a fitness benefit. The most accurate way of measuring intensity during aerobic exercise is by calculating your target heart rate and using this as a guide. The target heart rate together with the area above and below is called the **target heart rate zone**. When exercising, the level of intensity needs to be sufficient to keep the heart rate within the target heart rate zone for the required period of time. This is illustrated in figure 5.29. Here a person progresses from rest, through a warm-up and into the target heart rate zone where a steady state level of intensity is maintained for an extended period of time.

Intensity refers to the amount of effort required by an individual to accrue a fitness benefit.

Target heart rate zone is an area surrounding the target heart rate and is calculated using percentages of maximal heart rate.

The level of intensity is established in terms of heart rate, which is calculated in beats per minute (bpm). There are two important steps that need to be taken to calculate your target heart rate zone.

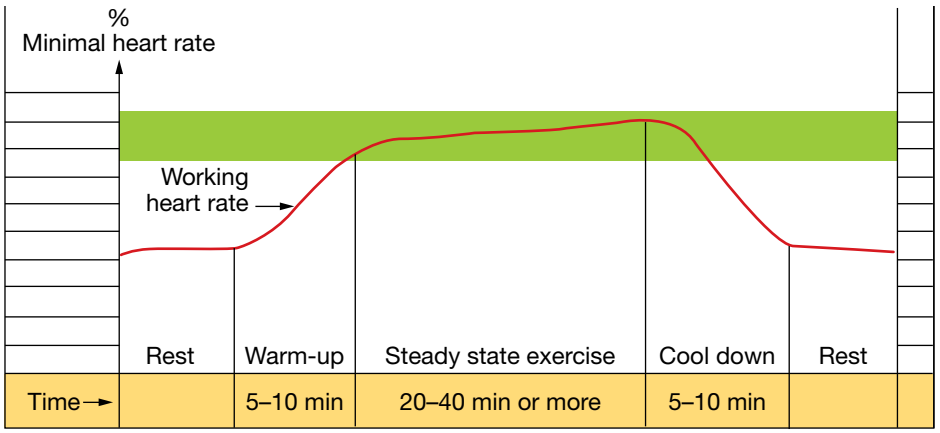


Figure 5.29: The intensity of exercise when applying FITT is moderate, sustained and within the target heart rate zone.

1. *Determine your maximum heart rate.* To do this, simply subtract your age from 220. Hence, a 20-year-old person would have a maximum heart rate of 200 beats per minute.
2. *Determine the percentage of your maximal heart rate relevant to your fitness.* If your fitness is poor, work at 50 to 70 per cent of your maximum heart rate. If your fitness is good, work at 70 to 85 per cent of your maximum heart rate. If uncertain, work at the lower level and gradually increase the level of intensity.

As an example, take a 20-year-old person of average fitness who wants to establish their training zone. Their maximal heart rate is 200 bpm, calculated by subtracting their age from 220. Using the figure 200 bpm, they calculate their lower level of intensity which is 140 bpm (70 per cent of 200) and an upper level which is 170 bpm (85 per cent of 200). The training zone is the area in between, which is from 140 bpm to 170 bpm. Figure 5.30 shows the target

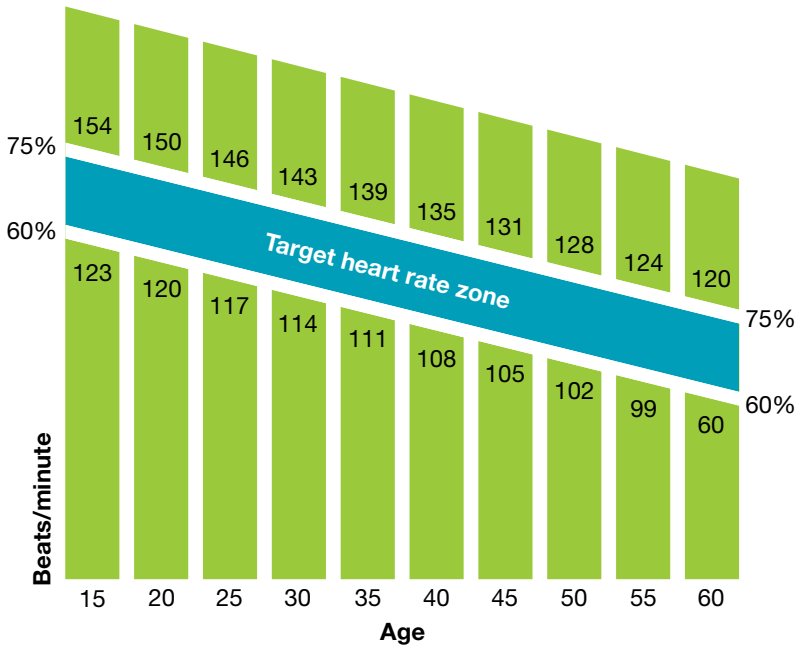


Figure 5.30: The target heart rate zone varies according to age.

heart rate zone for various age groups, based on 60 to 75 per cent maximal heart rate.

In resistance training programs, intensity is established in a number of ways but usually by varying the load, the number of times you perform an exercise (repetitions), the sets (a number of repetitions in succession) or the rest period.

Time

For people in good health, a session in which the heart rate is held in the target heart rate zone should last from 20 to 30 minutes and increase to 40 minutes or more if possible. There is little sense in exercising for periods longer than 60 minutes or to exhaustion as this carries the risk of overtraining and the possible development of overuse injuries (elite athletes excepted). For those beginning a program or those with lower levels of fitness, the starting point should be around 15 minutes. Note that this does not include time used to warm up and cool down.

In terms of duration, six weeks is the minimal period for the realisation of a training effect; that is, for adaptations to have taken place. In resistance training programs, 30–45 minutes is generally sufficient and will depend on the intensity of exercise.

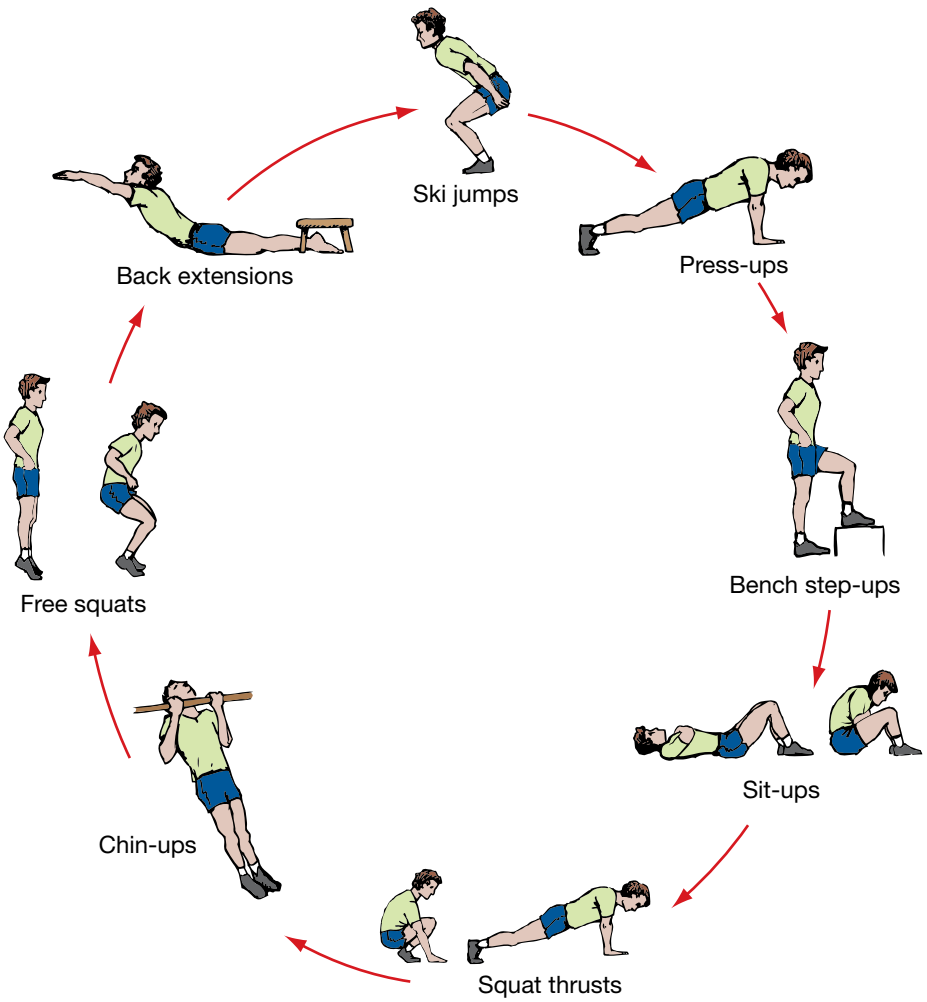


Figure 5.31: Circuits are an excellent way of improving aerobic fitness.

Type

The best type of exercise is continuous exercise that uses the large muscle groups. Running, cycling, swimming and aerobics are examples of exercises that utilise large muscle groups. These draw heavily on our oxygen supply, necessitating an increased breathing rate, heart rate and blood flow to the working muscles. Our aerobic fitness improves as the cardiorespiratory system adapts in response to the demands being made on it.

For resistance training, low resistance with high repetitions is preferable and this can be provided using many activities such as **circuit training** and resistance bands.

Circuit training requires participants to perform set exercises at a number of stations, working through the course in the shortest period of time.

To see examples of how *type* can be varied to improve all-round fitness, use the **Circuit training** weblink in your eBookPLUS.



APPLICATION

Aerobic training and the FITT principle

Choose any aerobic activity, particularly a sport or game that you play. Design a training session for this sport or activity based on the FITT principle. Ensure your session addresses the following:

- warm-up
- fitness work (show activities that incorporate FITT. Draw a chart similar to the one in figure 5.29 to show how you anticipate your heart rate to respond to your fitness activities.)
- skills and strategies (small section)
- cool down.

You can find examples of aerobic activities by using the **Aerobics** weblink in your eBookPLUS.

Discuss your session with the class. Then have the class choose one session that would be challenging, interesting and convenient to run. Allow the student who designed this session to conduct it with the class.

Evaluate how well you think the session applied the principles of intensity, time and type.

Anaerobic training

Anaerobic means 'in the absence of oxygen'. In anaerobic activity, the intensity level is much higher and the effort period much shorter than required in aerobic activity.

In general, activity that lasts for two minutes or less and is of high intensity is called anaerobic because muscular work takes place without oxygen being present. When we sprint for example, the muscles respond instantly and quickly exhaust any fuel reserves in the working muscles. Our increased breathing rate delivers more oxygen to this area, but it is some time before it arrives as there is a limit to the speed of blood flow and therefore oxygen transport. Fortunately these muscles are able to use a restricted amount of stored and other fuel until oxygen becomes available.

Anaerobic exertion requires specialised training to generate the adaptations necessary for muscular work without oxygen. Training enhances the ability of muscle cells to improve their use of fuel reserves and be more efficient in converting blood sugar to energy during intense exercise.

It should be noted that anaerobic training generally requires an aerobic foundation, particularly in activities like sprinting and swimming. Other more spontaneous activities such as diving, vaulting and archery require a minimal aerobic base.



Figure 5.32: Explosive movements are enhanced through quality anaerobic training programs.



Figure 5.33: Specific activities to improve anaerobic fitness include weight training.

To improve anaerobic fitness, we need to:

- work hard at performing and enduring specific anaerobic movements such as lifting weights, throwing or jumping
- practise the required movements at or close to competition speed to encourage the correct adaptations to occur
- use activities such as interval training where periods of intense work are interspersed with short rests to train the anaerobic system to supply sufficient fuel
- utilise resistance (weight) training exercises to further develop the muscles required for the movement
- train to improve the body's ability to recharge itself; that is, to decrease recovery time after short periods of intense exercise
- train to improve the body's ability to tolerate higher levels of lactic acid, a performance use crippling substance that builds up in the muscles following intense exercise
- gradually develop the body's ability to utilise and/or dispose of waste that is created by intense exercise.

Table 5.18 summarises the basic differences between aerobic and anaerobic training programs.

Table 5.18: Differences between aerobic and anaerobic training programs

Feature	Aerobic	Anaerobic
Goals	Improved stamina, endurance, lung capacity, cardiorespiratory endurance	Development of force, power, body mass and speed
Warm-up	General, short, low intensity exercise. Cool down essential	Sustained (20 minutes or more), gradual increase in intensity, must be specific to muscles required in activity
Activities	Targets endurance type activities: marathon running, cycling, 1500 metre swimming, power walking, kayaking, triathlon together with the sustained phases of games	Targets explosive type activities: track 100, 200 and 400 metre, swimming 50 and 100 metre, diving, weight-lifting, discus, javelin, shot-put and the sprint phases in games
Targeted fitness components	Cardiorespiratory endurance, muscular endurance, body composition	Speed, power, agility
Resistance training	High repetition, weights with low resistance, circuits	Low repetition weights, high resistance, fast plyometrics
Physical benefits	Improved cardiovascular system and ability to endure performance	Strength, power and speed gains, increased local muscle recovery ability
Health benefits	High	Low to medium
Liabilities	Possibly decreased muscle mass, speed and power	Possibly decreased cardiorespiratory function unless supported by an aerobic program
Foundation	Does not require anaerobic foundation	Requires an aerobic foundation, but varies according to sport

A quality training program should encompass fitness activities that directly address the requirements of the selected sport or activity. Some sports require a high level of aerobic fitness and a general level of anaerobic fitness while the reverse is true of others. Games such as touch football, soccer and netball are characterised by periods of moderate intensity interspersed with periods of high intensity.

While the amount of aerobic/anaerobic fitness varies according to the game, it is also affected by the position of the player, each individual's effort and their base fitness level. The sprint in rugby, rally in tennis and man-to-man defence in basketball are all highly demanding, causing muscles to use available fuel and then requiring cells to find other sources for energy supply.

The change between aerobic and anaerobic energy supply is gradual rather than abrupt. When engaged in activity, the body switches between systems according to the intensity of exercise, with one system being predominant and the other always working but not being the major supplier of energy. A sprint during a touch football game requires anaerobic energy due to the instant and heavy demands made on the muscles involved in the movement. During this period, the aerobic system is still functioning, but is not the major energy supplier. When we think aerobic or anaerobic training, we therefore need to think in terms of which system will predominate and the time for which it will be engaged.



INQUIRY

Aerobic versus anaerobic training

1. Listed below are six sports that may be predominantly aerobic or predominantly anaerobic. Complete the following table by comparing features that make training for each sport different. Think in terms of warm-up, time, distance, resistance work, activity types, duration, intensity, sessions per week and so forth.

Aerobic training	Anaerobic training
Triathlon • • • • •	Sprinting • • • • •
Soccer • • • •	Gymnastics • • • •
1500 metre swim • • • •	Javelin throw • • • •

2. Compare the relative importance of aerobic and anaerobic training for different sports.



IMMEDIATE PHYSIOLOGICAL RESPONSES TO TRAINING

Immediate physiological responses are the changes that take place within specific body organs and tissue during exercise. These changes are particularly observable in capacities directly related to performance, including heart rate, cardiac output, stroke volume, lactate levels and ventilation rate. When we increase our level of activity during training, the body makes specific changes

to ensure that adequate oxygen and nutrients are being supplied to the muscles to meet the increase in demand. For example, aerobic exercise can require an increase in blood flow of 20 per cent or higher to the working muscles. The important responses to training are: heart rate, ventilation rate, stroke volume, cardiac output and lactate levels. These are discussed below.

Heart rate

Heart rate is the number of times the heart beats per minute (bpm).

Changes in **heart rate** are the most obvious and easy to measure. Our *resting heart rate* is our heart rate when we are completely at rest. While the average resting heart rate is 72 bpm, readings of 27 to 28 bpm have been recorded in champion endurance athletes. A low resting heart rate is indicative of a very efficient cardiovascular system.

Heart rate increases with exercise. This is our *working heart rate*. Our heart rate increases according to the intensity of our exercise effort. Maximal heart rates are observed during exhaustive exercise.

During short-term (five to 10 minutes), moderate exercise or when moving from an inactive to an active state, our heart rate rises sharply. This is illustrated in figure 5.34.

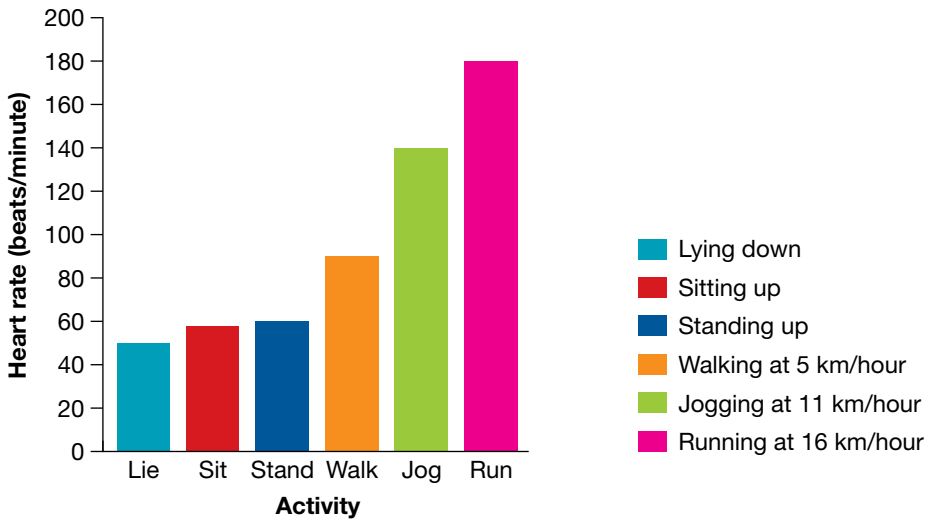


Figure 5.34: The effect of varying activities on heart rate (*Source:* J. H. Wilmore and D. L. Costill, *Physiology of Sport and Exercise,* 3rd edn, 2004, p. 230, figure 7.15a © 2004 by Jack H. Wilmore and David L. Costill. Adapted with permission from Human Kinetics, Champaign, IL.)

Steady state is a period of time during which oxygen uptake remains at a uniform level, such as swimming at a constant speed.

In a fit person, heart rate levels off during protracted exercise, reaching a **steady state**. For an unfit person, heart rate continues to rise gradually as exercise is prolonged. For both groups, cessation of exercise causes a quick decline in heart rate, followed by a slower decline as it returns to the pre-exercise level. This decline is rapid in a fit person. However, for an unfit person, it may take some time, even hours. Heart rate is therefore a good indicator of the intensity of exercise and may be used as a fundamental measure of a person's cardiovascular fitness.

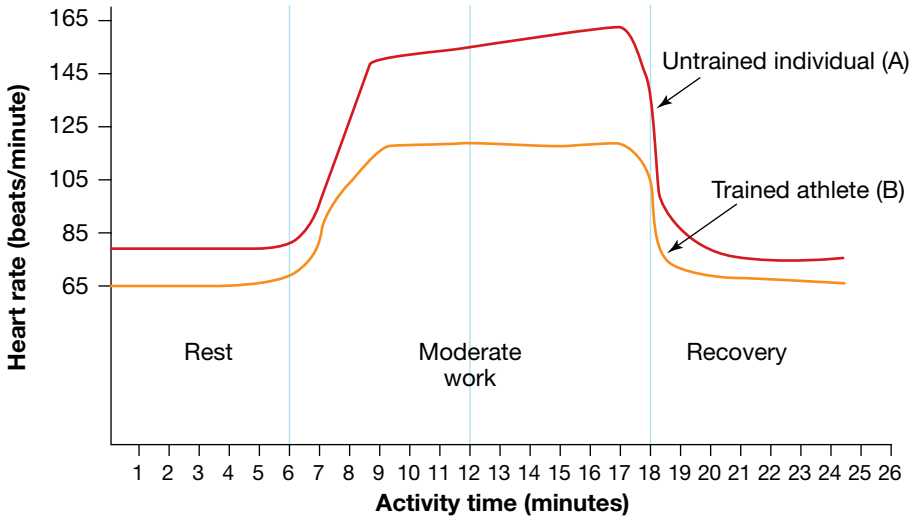


Figure 5.35: Heart rate response before, during and after moderate exercise



Heart rate graph

On a graph, plot the heart rate (HR) for a 16-year-old subject with a resting HR of 55 bpm who performs the following activities over one hour: rests for 10 minutes, runs for 30 minutes at 70 per cent maximal heart rate (MHR), followed by three 100-metre sprints at 90 per cent MHR with intervals of five minutes between each. Using the data you have plotted, describe how the heart responds to changes in exercise intensity.

Ventilation rate

Ventilation refers to our depth and rate of breathing and is expressed in breaths per minute.

When we begin to exercise, the demand for more oxygen by the muscle cells causes a **ventilation** response. Ventilation has two phases — *inspiration*, or breathing air into the lungs, and *expiration*, or the expulsion of air from the lungs. Ventilation rates are measured over a time period, usually one minute. A term commonly used is *minute ventilation* — that is, the amount of air that can be breathed in one minute. For most people this is around six litres.

During rest, the ventilation rate is about 12 breaths per minute, causing the lungs to consume around 500 millilitres of air per breath. Exercise causes many immediate adjustments in the workings of the respiratory system. The rate and depth of breathing increases moderately, even before exercise begins, as the body's nervous activity heightens in anticipation of exercise. Once exercise starts, the rate and depth of breathing intensifies. This is matched by an increase in oxygen consumption and carbon dioxide production, triggering elevated respiratory activity. At the end of exercise, breathing remains rapid for a short period of time, then gradually abates, finally returning to resting levels. Changes in ventilation rates between rest and steady state exercise are illustrated in figure 5.36.

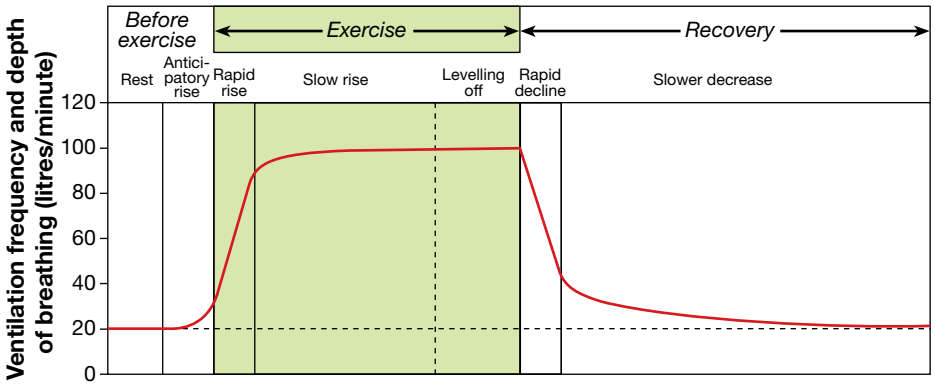


Figure 5.36: Changes in ventilation rate during moderate exercise (*Source:* D. K. Mathews and E. L. Fox, *The Physiological Basis of Physical Education and Athletics,* W. B. Saunders, Philadelphia, 1976, p. 168. Reprinted with permission, McGraw-Hill Companies.)

Stroke volume

Stroke volume is the amount of blood ejected by the left ventricle of the heart during a contraction. It is measured in mL/beat.

When exercise increases, the amount of blood that the heart discharges increases considerably. Much of this is due to an increase in **stroke volume**.

Stroke volume is determined by:

- the ability to fill the ventricles by blood volume
- the ability to empty the ventricles as a result of ventricular contractions.

Stroke volume increases during exercise, with most of the increase being evident as the person progresses from rest to moderate exercise intensity. As intensity increases to a high level, there is less change in stroke volume. The magnitude of the increases is depicted in figure 5.37.

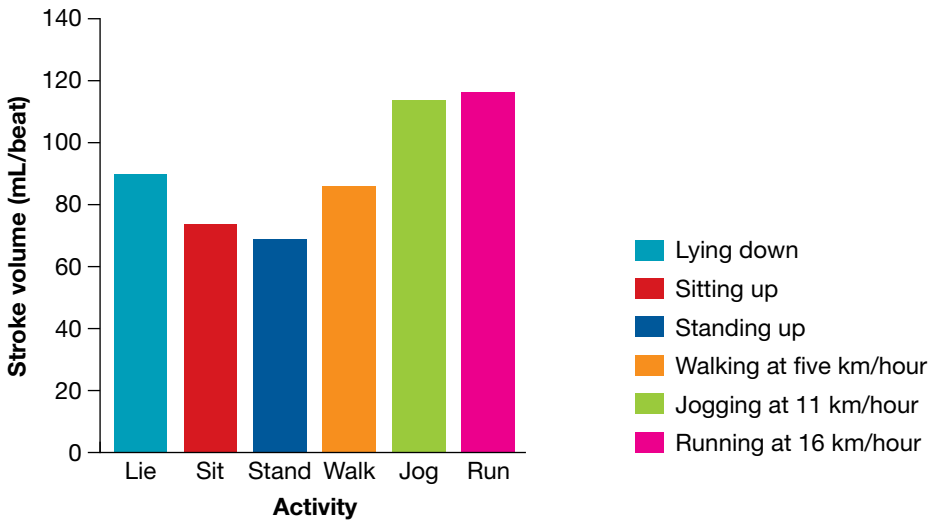


Figure 5.37: Stroke volume increases as activity increases. (*Source:* J. H. Wilmore and D. L. Costill, op. cit., figure 7.15b, p. 230.)

There is a significant difference in stroke volume between fit and unfit people. Whereas the sedentary person will maintain a stroke volume of 60 to 80 mL/beat, the well-trained athlete will reach 160 mL/beat at submaximal workloads. This large increase in the availability of oxygenated blood to the working muscles explains their superior performances. The differences are illustrated in table 5.19.

Table 5.19: Typical stroke volumes for different states of training

Subjects	SV rest (mL)	Maximum SV (mL)
Untrained	50–70	80–110
Trained	70–90	110–150
Highly trained	90–110	150–>220

Source: J. H. Wilmore and D. L. Costill, op. cit., p. 277.

It should be noted that the increase in stroke volume occurs as a result of more blood returning to the heart. This promotes a more forceful contraction and a more complete emptying of the left ventricle with each beat. A fit person usually has a greater stroke volume at rest and a significantly greater stroke volume during exercise than an unfit person. The relationship between increases in heart rate (intensity) and stroke volume is illustrated in figure 5.38.

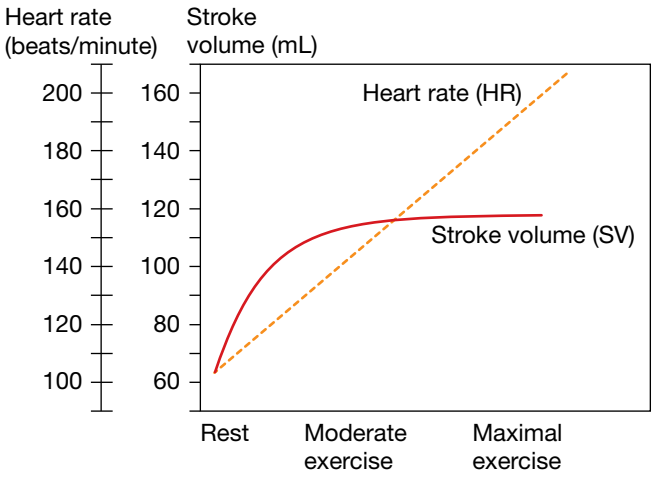


Figure 5.38: Increases in stroke volume and heart rate as a result of exercise (*Source*: Based on information from *Sports Physiology*, 2nd edition, Edward L Fox, Saunders College Publishing, pp. 184–5, Figs 8.12 and 8.13.)



INQUIRY

Heart rate and stroke volume

Examine figure 5.38. Using the information, discuss the effects of an increase in exercise on both heart rate and stroke volume.

Cardiac output

Cardiac output is the amount of blood pumped by the heart per minute.

Cardiac output increases with exercise in the same way as stroke volume. Cardiac output is a product of heart rate and stroke volume. It can be calculated in the following way:

Cardiac output (CO) = heart rate (HR) × stroke volume (SV).

If an athlete's HR is 60 bpm and their SV is 100 mL/beat, their CO is worked out in the following way:

CO = 60 bpm × 100 mL/beat
= 6000 mL/min (6 litres/min).

Cardiac output increases in response to physical demands being made on the body. Figure 5.39 shows how progressing from lying down to running causes significant increases in cardiac output.

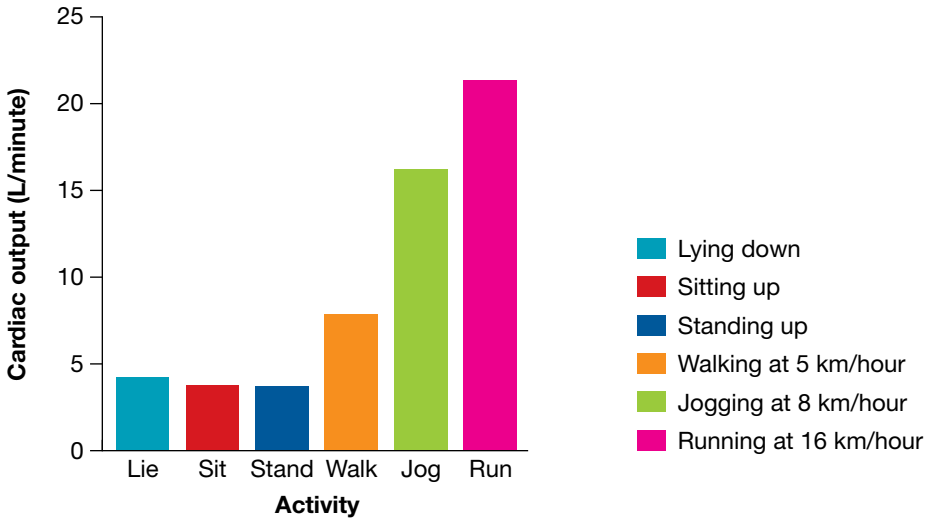


Figure 5.39: Cardiac output increases as exercise demands increase. (*Source:* J. H. Wilmore and D. L. Costill, ibid., figure 7.15c, p. 230.)

The working muscles' demand for additional oxygen causes blood flow to be redistributed within the body. While at rest, cardiac output is directed to physically inactive muscles. However, the demands of exercise mean that the body's blood must be redirected to the muscles that are now active. As shown in figure 5.40, muscles can demand around 84 per cent of blood flow during exercise.

Cardiac output for both trained and untrained people is approximately five litres per minute. This is despite trained athletes having lower resting heart rates and therefore not ejecting blood from the heart as frequently as untrained people. While the heart rate of the trained athlete is lower, their stroke volume is substantially higher.

Examine the figures in the table at the top of figure 5.40. While trained and untrained people have similar cardiac output, differences are evident in the lower heart rate and higher stroke volumes of trained athletes.

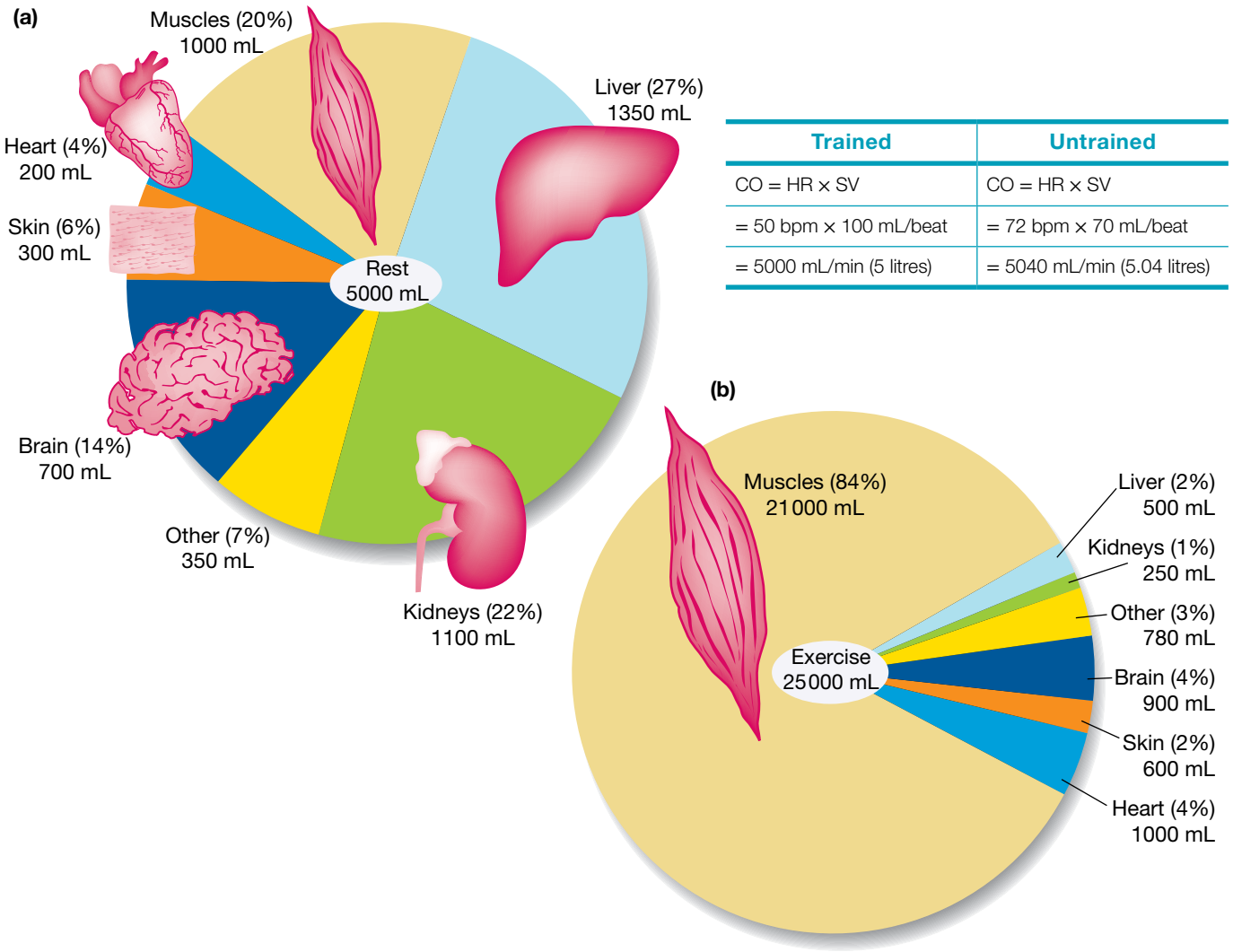
The immediate response to training indicates noteworthy differences between the two groups. While untrained people are able to increase cardiac output to around 20 to 22 litres per minute during exercise, highly trained endurance athletes will have an increase in the vicinity of 35 to 40 litres per minute. In addition, this increase is achieved at a slightly lower maximal heart rate.



APPLICATION

Calculating cardiac output

Calculate the cardiac output at maximal exercise for a person with a heart rate of 190 bpm and a stroke volume of 180 mL/beat. Draw a chart to illustrate cardiac output and comment on the lifestyle of the subject. Do they have a sedentary lifestyle or are they a trained athlete?



Trained	Untrained
CO = HR × SV	CO = HR × SV
= 50 bpm × 100 mL/beat	= 72 bpm × 70 mL/beat
= 5000 mL/min (5 litres)	= 5040 mL/min (5.04 litres)

Figure 5.40: As we move from **(a)** rest to **(b)** exercise, cardiac output is redirected to active muscles. (*Source:* W. McArdle, F. Katch and V. Katch, *Exercise Physiology*, Lippincott, Williams and Wilkins, 2006, p. 357. Reproduced by permission.)

Lactate levels

Lactate is a salt formed from lactic acid that accumulates during intense anaerobic activity.

Lactate is a chemical formed during the breakdown of carbohydrates in the absence of sufficient oxygen. There is always a small amount of lactate circulating in the blood — about 1–2 millimoles/litre. This lactate is continually being resynthesised by the liver to form glycogen and so is of benefit in providing the body with energy.

Generally, lactate flows freely in the blood and its concentration increases as the workload is increased. With each molecule of lactate formed, one **hydrogen ion** is also formed. It should be noted that it is the hydrogen, and not lactate, that is responsible for increasing the acidity of blood and subsequently making it difficult for muscles to function properly.

Hydrogen ion (or H+) is a hydrogen atom that has lost its electron, the concentration of which determines the pH of a solution.

Vigorous physical exercise causes increases in levels of lactate. Lactate levels relate to the pH value of blood, which is affected by physical activity. Neutral pH is 7.0. A higher reading indicates elevated alkalinity, while readings lower than 7.0 reveal gradations of acidity. At rest, blood has a pH value of about 7.4, which means that it is slightly alkaline. However, as

exercise intensity increases, the pH level drops and acidification of muscles increases.

High levels of lactate are produced when we exercise and there is insufficient oxygen available to the muscle cells. It accumulates rapidly when we exercise above the **lactate inflection point (LIP)**, which occurs at about 80–90 per cent MHR for trained athletes. The point is much lower for untrained athletes.

The **lactate inflection point (LIP)** is a point beyond which a given power output cannot be maintained. It is characterised by lactic acid accumulation and decreased time to fatigue.

Table 5.20 illustrates that lactic acid concentrations increase as exercise intensity is raised. High levels of lactate make it increasingly difficult for muscle fibres to contract. Once the LIP is reached, further exercise results in fatigue and the subsequent inability to maintain the higher work output. If intensity is increased beyond the LIP, such as by a sprint finish at the end of an endurance event, the onset of fatigue will be even more rapid.

Table 5.20: The effect of increasing intensity on blood lactate levels

Lactic acid concentrate (mmol)	Training for:	Heart rate	Percentage of maximum intensity
20.0	Maximum anaerobic power	200	
		200	
12.0		200	85–90%
8.0	Lactate inflection point	190–200	80–90%
		180	
		170	
		160	(60)–70–85%
4.0		150	
		140	
2.0	Aerobic threshold	130	60%
		120	50%
	Lactate threshold	110	
		100	
1.1	Resting state	>80	

Source: Adapted from T. Bompa, *Theory and Methodology of Training*, 3rd ed, Kendall/Hunt Publishing, Iowa, 1994, p. 305.

Although present, lactate does not cause fatigue prior to the LIP being reached. Lactate is a source of energy at low to moderate levels of intensity. However, once the LIP is reached, lactate contributes to fatigue because it cannot be removed from the bloodstream faster than it enters. The high concentration of lactate together with other factors, including high levels of hydrogen ions and the physical demands of the work being performed, contribute to fatigue and the subsequent inability to continue to work in the same manner as before the LIP was reached.



eBookplus

Changing patterns of respiration and heart rate

1. Use the **Home Step** weblink in your eBookPLUS to download the procedures for the Home Step Test.
2. Divide into groups of three. Choose one student to perform the test, the second to monitor and record heart rate and the third to monitor and record ventilation rate. The heart rate and ventilation rates for each student will be required before, at the conclusion of and then three minutes following the test. This should be recorded in table 5.21.

3. Students should perform the test on a rotational basis, swapping roles between performer and recorder. At the required times, measure heart rate and ventilation rate for 15 seconds and multiply by four to establish rates per minute.
4. Use the website to establish your fitness level and then use the additional information in the table to discuss questions in the following inquiry.

Table 5.21: Heart and ventilation rates

	Before test	End of test	Three minutes following test
Student 1			
Heart rate (bpm)			
Ventilation rate			
Student 2			
Heart rate (bpm)			
Ventilation rate			
Student 3			
Heart rate (bpm)			
Ventilation rate			



INQUIRY

Changing patterns of respiration and heart rate

1. Use the information in table 5.21 to draw a graph that illustrates your pattern for ventilation and heart rate.
2. Discuss reasons for the changing patterns of respiration and heart rate during this submaximal test.
3. Discuss the relationship between your fitness level as established by the test and how quickly your heart rate and ventilation rate returned to normal.

SUMMARY

- Physical fitness implies the ability to work or play without experiencing undue fatigue while having enough energy in reserve for basic movements, emergencies and activities of interest.
- Health-related components of physical fitness include cardiorespiratory endurance, muscular strength, muscular endurance, flexibility and body composition. An improvement in the health-related components will assist personal health and lifestyle, including lowering the risk of hypokinetic disease (diseases related to lifestyle).
- Cardiorespiratory endurance refers to the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to the cells. It is important in endurance events such as cycling and marathon running.
- Muscular strength is the ability to exert force against a resistance in a single maximal effort. It is important in sports such as weight-lifting and wrestling.
- Muscular endurance is the ability of the muscles to endure physical work for extended periods of time without undue fatigue. Running for long periods of time requires considerable muscular endurance because the same muscle groups are contracting repeatedly.

- Flexibility is the range of motion about a joint or the ease of joint movement. It is important for injury prevention and in slowing muscle shrinkage as a result of the ageing process.
- Body composition refers to the percentage of fat as opposed to lean body mass in a human being. A certain amount of fat is essential to protect and insulate vital organs. Excess fat is called storage fat and is useful as a source of fuel in endurance events. High levels of excess fat hinder athletic performance in most events.
- Skill-related components of physical fitness include power, speed, agility, coordination, balance and reaction time.
- Muscular power is the ability to combine strength and speed in an explosive action. It is important in events such as running, throwing and jumping.
- Speed is the ability to perform body movements quickly. It is very important in sprint events and most team games.
- Agility is the ability to move the body from one position and direction to another with speed and precision. It is important in most team games.
- Coordination requires good interaction between the brain and the muscles, resulting in the smooth and efficient coordination of body parts. It is important in most team games.
- Balance is the ability to maintain equilibrium while either stationary or moving. There are two types of balance: static and dynamic. Static balance implies maintaining equilibrium while the body is stationary. Dynamic balance means maintaining equilibrium while the body is moving. Balance is important in most team games, but it is especially important in activities such as diving and gymnastics.
- Reaction time is the time taken to respond to a stimulus. Its importance is most evident in starts in athletics and swimming.
- The components of fitness can be measured using simple tests. By compiling the results of testing for each of the components, we gain an overall impression of our level of fitness. We call this a fitness profile.
- The two basic types of training are aerobic (with oxygen) and anaerobic (without oxygen).
- Aerobic training involves exercise that is sustainable and of low to moderate intensity. The FITT principle, (frequency, intensity, time, type) is used to adapt aerobic training programs to individual needs. Marathons, 400 metre swimming and triathlons are examples of activities that draw their energy from aerobic metabolism.
- Anaerobic training involves activities where the level of intensity is high but is maintained for short periods of time; for example, sprinting and high jumping.
- Most team games require energy utilising both the aerobic and anaerobic pathways. It is therefore important to establish the main sources of energy as a prerequisite in the development of training programs.
- Training causes an immediate physiological response seen in changes to heart rate, ventilation rate, stroke volume, cardiac output and lactate levels.
- Heart rate is the number of times the heart beats per minute. When we begin to exercise our heart rate increases and reaches a steady state during sustained moderate activity such as jogging.

- Breathing or ventilation rate increases during activity to deliver more oxygen to muscles.
- Stroke volume refers to the amount of blood ejected by the heart during a contraction. It increases significantly in response to exercise.
- Cardiac output, the total amount of blood pumped by the heart per minute, increases with exercise. When muscles work, blood is drawn from many parts of the body and redistributed to muscles.
- Lactate or lactic acid increases in the blood during exercise. If exercise is vigorous, lactate increases rapidly and inhibits performance if levels rise too high.

eBookplus

Digital docs
A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

QUESTIONS

Revision

1. **Discuss** the difference between health-related and skill-related components of fitness. (P8) (4 marks)
2. Choose a test that measures cardiorespiratory endurance. **Describe** how you would conduct it on a group of soccer players at a preseason training session and suggest what the results mean. (P8) (5 marks)
3. **Discuss** the difference between strength and power. **Describe** a simple test to measure each component. (P11) (4 marks)
4. **Discuss** the importance of body composition to both personal health and athletic performance. (P16) (4 marks)
5. You are the coach of a basketball team. Select the three most important skill-related components and **describe** how you would test these at training. (P11) (3 marks)
6. What is agility? What other components of physical fitness, if improved, would result in an improvement in agility? (P8) (3 marks)
7. What is reaction time? **Outline** a simple test to measure reaction time and suggest measures as to how this component could be improved. (P8) (3 marks)
8. **Discuss** the difference between static and dynamic balance. **Propose** three activities where static balance is more important than dynamic balance. (P8) (3 marks)
9. **Explain** the difference between aerobic and anaerobic training. (P7) (2 marks)
10. **Discuss** how the FITT principle is used to improve aerobic performance. (P10) (4 marks)
11. Work out the target heart rate zones for two people of average fitness aged 18 and 40. **Explain** why they are different. (P11) (4 marks)
12. **Explain** how anaerobic training can be enhanced. (P10) (4 marks)
13. Choose a team game such as soccer, basketball or touch football. **Explain** how you would establish a training program that would ensure appropriate fitness for the sport. Include examples of activities that could be used to enhance fitness for that sport. (P8) (6 marks)
14. **Explain** how the heart responds to an increase in exercise. (P7) (3 marks)
15. **Explain** why ventilation rate rises with increases in exercise intensity. (P7) (3 marks)
16. **Outline** the difference between stroke volume and cardiac output. Why might their levels be different in trained and untrained athletes? (P7) (3 marks)
17. **Explain** the effect of increased lactate levels on performance. (P7) (4 marks)

Extension

Choose a sport or activity. List the six most important fitness components required. **Describe** where and how these components are used. Finally, **propose** or skills to develop each of these components. (P8) (10 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

CHAPTER 6
The biomechanics of human movement



OUTCOMES

On completion of this chapter, you will be able to:

- explain how body structures influence the way the body moves (P7)
- describe biomechanical factors that influence the efficiency of the body in motion. (P9)

OVERVIEW

INTRODUCTION TO BIOMECHANICS

MOTION
Linear motion
Velocity
Speed
Acceleration
Momentum

BALANCE AND STABILITY
Centre of gravity
Line of gravity
Base of support

FLUID MECHANICS
Flotation
Centre of buoyancy
Fluid resistance

FORCE
How the body applies force
How the body absorbs force
Application of force on an object

INTRODUCTION TO BIOMECHANICS

Biomechanics is a science concerned with forces and the effect of these forces on and within the human body.

The word **biomechanics** originates from two words. 'Bio' means life. Mechanics is a branch of science that explores the effects of forces applied to solids, liquids and gases.

Biomechanics is very important to understanding techniques used in sport. It is of value to both coach and player because it is concerned with the efficiency of movement. A knowledge of biomechanics helps us to:

- choose the best technique to achieve our best performance with consideration to our body shape. For instance, an understanding of the biomechanical principles that affect athletic movements, such as the high jump, discus throw, golf swing and netball shot, improve the efficiency with which these movements are made. This improves how well we perform the skill.
- reduce the risk of injury by improving the way we move
- design and use equipment that contributes to improved performance.

MOTION

Motion is the movement of a body from one position to another.

In biomechanics, the term **motion** is used to describe movement and path of a body. Some bodies may be animate (living), such as golfers and footballers. Other bodies may be inanimate (nonliving), such as basketballs and footballs.

We see motion in all forms of physical activity. Part of a person's body (for example, the arm) may be moved from one position to another. The entire body may be moved from one place to another as in cycling, running and playing basketball.

There are a number of types of motion: *linear*, *angular* and *general* motion. How motion is classified depends on the path followed by the moving object. We will focus on linear motion in a range of sporting activities and apply the principle to enhancing performance.

Linear motion

Linear motion takes place when a body and all parts connected to it travel the same distance in the same direction and at the same speed.

Linear motion occurs when a body and all parts connected to it travel the same distance in the same direction and at the same speed. An example of linear motion is a person who is standing still on a moving escalator or in a lift. The body (the person) moves from one place to another with all parts moving in the same direction and at the same time.



Figure 6.1: This skier is experiencing linear motion.

The easiest way to determine if a body is experiencing linear motion is to draw a line connecting two parts of the body; for example, the neck and hips. If the line remains in the same position when the body moves from one position to another, the motion is linear. This is shown in figure 6.2.

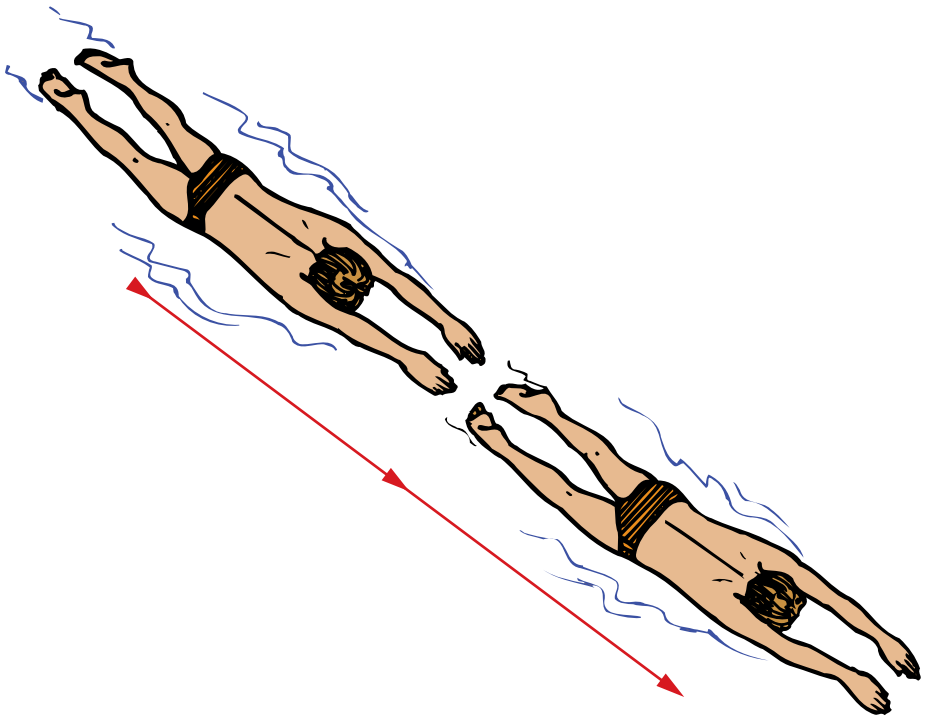


Figure 6.2: When the lines remain parallel and equal, the motion is linear.

Examples of linear motion include swimming and sprint events where competitors race following a straight line from start to finish. Improving performance in activities that encompass linear motion usually focuses on modifying or eliminating technique faults that contribute to any non-linear movements. Excessive up and down, rotational and lateral movements are examples of faults that erode performance directed towards achieving the shortest, most efficient pathway. Sprinters who rotate their arms across their bodies and swimmers who use an irregular arm pull that results in a zigzag movement pattern along the pool surface are examples of poor application of linear motion.



Linear motion and swimming performance

The 50 metre sprint in swimming is an example of the application of predominately linear motion in a sporting event. Poor swimming technique can result in wasted energy and poor performance. The aim in sprinting is to direct all body action directly up the pool by eliminating excessive rotational and lateral movements.



Use the **Freestyle** weblink in your eBookPLUS to read an article about correct freestyle technique.

Read the technique points and watch each of the short videos.

1. List 10 points that you consider to be fundamental to better freestyle technique.
2. On an excursion to a swimming centre, take turns with a partner in swimming a distance of about 20 metres. Focus on trying to swim efficiently, being mindful of the points you have listed on better technique. The observer should provide feedback from your list about your technique following each swim.

INQUIRY

Application of linear motion to swimming

Discuss how the application of linear motion principles can enhance swimming performance.

Velocity

Velocity is equal to displacement divided by time.

Velocity is equal to **displacement** divided by time.

$$\text{Velocity} = \frac{\text{displacement}}{\text{time}}$$

Velocity is used for calculations where the object or person does not move in a straight line. An example is a runner in a cross-country race, or the flight of a javelin, the path of which has both distance and incline/decline. Activities to improve speed may also relate to velocity. Improving the velocity of implements such as javelins or arrows requires specialised training, as does improving the performance of athletes in non-linear events such as marathons.

Displacement is the movement of a body from one location to another in a particular direction, or an 'as the crow flies' measurement.

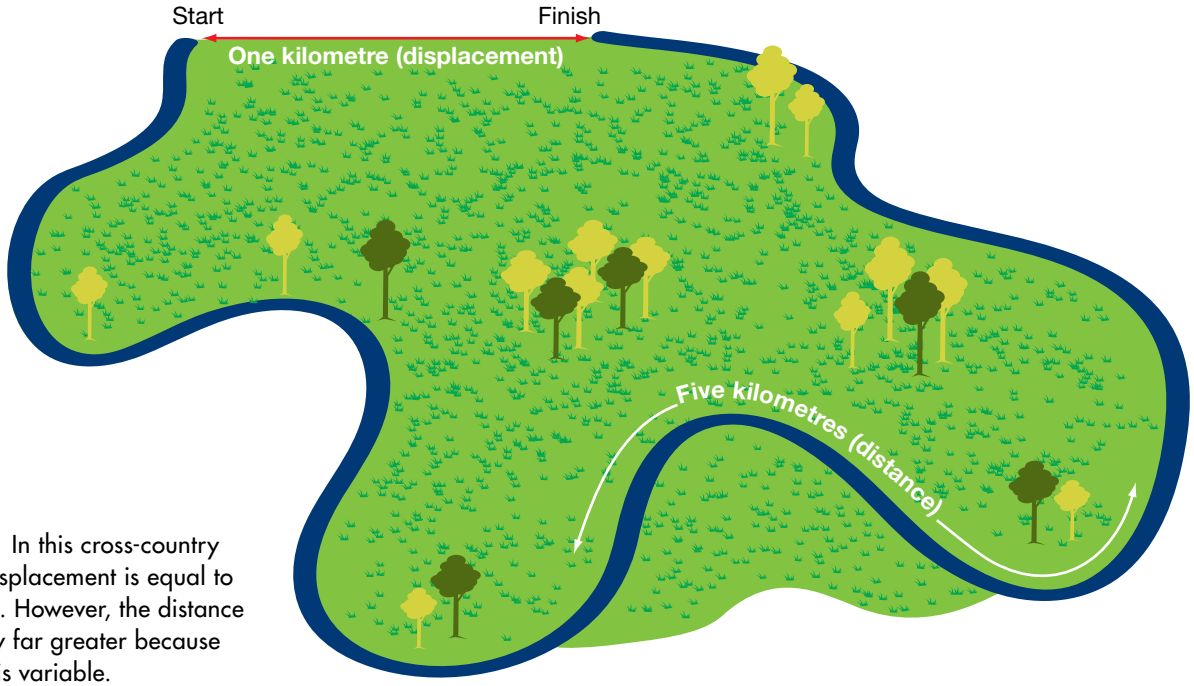


Figure 6.3: In this cross-country course, the displacement is equal to one kilometre. However, the distance run is actually far greater because the direction is variable.

Speed

Speed is equal to the distance covered divided by the time taken to cover the distance.

When an object such as a car moves along a road, or a person runs in a race, we often refer to how fast each is moving. This is called **speed**. If the runner covers a 100 metre track in 12 seconds, speed is determined by dividing the 100 metre distance by the time:

$$\frac{100}{12} = 8.3 \text{ metres per second } (\text{m/s})$$

Speed is important in most sports and team games. The player who can move quickly has a distinct advantage in games such as touch football, rugby and soccer because not only is that player difficult to catch, but he/she can use their speed to gather opponents quickly in defence.

Much of our potential for speed is genetic and relates to the type of muscle fibre in our bodies. However, individuals can develop their speed as a result of training and technique improvements, the basis of which is the development of power and efficiency of movement.



Figure 6.4: Speed can be developed through application of biomechanical principles.

APPLICATION

Improving speed

This application requires students to perform the 30 metre flying speed test.

eBookplus

1. Use the **30 metre flying speed test** weblink in your eBookPLUS to establish how the test is conducted.
2. Record your times for the first 30 metres and the entire 60 metre sprint. Use the inbuilt calculator to predict your 100 metre time.

eBookplus

3. Use the **Momentum Sports** and **Perfect Condition** weblinks in your eBookPLUS to establish the characteristics of good technique in running.
4. Work in pairs with one person observing while the other performs short sprints for analysis. You could develop a rating scale using the points listed in table 6.1 to show progress in acquiring better technique through feedback from practice.

Table 6.1: Rating scale for progress in acquiring better technique through feedback from practice

Technical point	Excellent	Good	Needs improvement	Advice from observer
Toe up				
Heel up				
Knee up				
Reach out				
Claw back				
Core stability				

When, in the opinion of the observer, technique has improved sufficiently, re-run the test and compare times with the previous effort.

1. Comment on the effect that better running technique made to speed improvement over a short distance.
2. Discuss the importance of good technique in other sporting activities such as surfing, downhill skiing and speed skating where speed with stability is crucial to success.

Acceleration

Acceleration is the rate at which velocity changes in a given amount of time.

The powerful sprinter, like a car, is able to increase speed quickly. This is called **acceleration**.



Figure 6.5: A sprinter aims to develop a technique that enables maximum acceleration.

When a person or object is stationary, the velocity is zero. An increase in velocity is referred to as positive acceleration, whereas a decrease in velocity is called negative acceleration. For instance, a long jumper would have zero velocity in preparation for a jump. The jumper would experience positive acceleration during the approach and until contact with the pit, when acceleration would be negative.

Like speed, acceleration is a skill that is highly valued not only in sprinting but in many individual and team sports. The long jumper needs to accelerate quickly, reaching maximal speed at the take-off board. Football, softball, baseball and cricket players all need to accelerate quickly to cover short distances in beating the ball or opponents. The ability to accelerate depends largely on the speed of muscular contraction, but use of certain biomechanical techniques, such as a forward body lean, can significantly improve performance of the skill.



APPLICATION

Speed, acceleration and performance

eBookplus

Use the **Run faster** weblink in your eBookPLUS and watch the video *How to run faster: Speed and acceleration specifics* (5 minutes). As you view the video, note the five laws that relate to improved acceleration. As a class, select students to demonstrate the laws during short sprints as illustrated in the video. All the laws mentioned relate to the development of power through better technique.



INQUIRY

Speed, acceleration and performance

1. List and explain six principles that assist in improving acceleration.
2. Discuss the relationship between better technique and improved acceleration.

Momentum

Momentum (biomechanics) refers to the quantity of motion that a body possesses.

Momentum (biomechanics) is a term commonly used in sport. For instance, we sometimes refer to the way in which momentum carried a player over the line in a game of football.

Momentum is a product of mass and velocity. It is expressed as follows:

$$\text{momentum} = \text{mass} \times \text{velocity} \quad (M = mv)$$

Mass refers to the amount of matter in a body.

The application of the principle of momentum is most significant in impact or collision situations. For instance, a truck travelling at 50 kilometres per hour that collides with an oncoming car going at the same speed would have a devastating effect on the car because the **mass** of the truck is much greater than that of the car. The car would be taken in the direction that the truck was moving.

The same principle can be applied to certain sporting games such as rugby league and rugby union, where collisions in the form of tackles are part of the game. However, collisions between players in sporting events tend to exhibit different characteristics to that of objects due to a range of factors, including:

- *the mass differences of the players* — in most sports, we do not see the huge variations in mass that we find between cars, bicycles and similar objects
- *elasticity* — the soft tissue of the body, which includes muscle, tendons and ligaments, absorbs much of the impact. It acts as a cushion.
- *evasive skills of players*, which often result in the collision not being 'head-on'. In some cases there may be some entanglement just prior to collision, such as a palm-off or fend. This lessens the force of impact.

Linear momentum is a property of a body that is moving. It is equal to (or a product of) its mass × velocity.

The momentum described in the previous situation is called **linear momentum** because the object or person is moving in a straight line. However,

Angular momentum is the quantity of angular motion in a body or part of a body

there are numerous instances in sport where bodies generate momentum but they do not travel in a straight line; for example, a diver performing a somersault with a full twist, a tennis serve, football kick, discus throw and golf swing. In each of these cases, the body, part of it, or an attachment to it such as a golf club or tennis racquet, is rotating. We call this **angular momentum**.

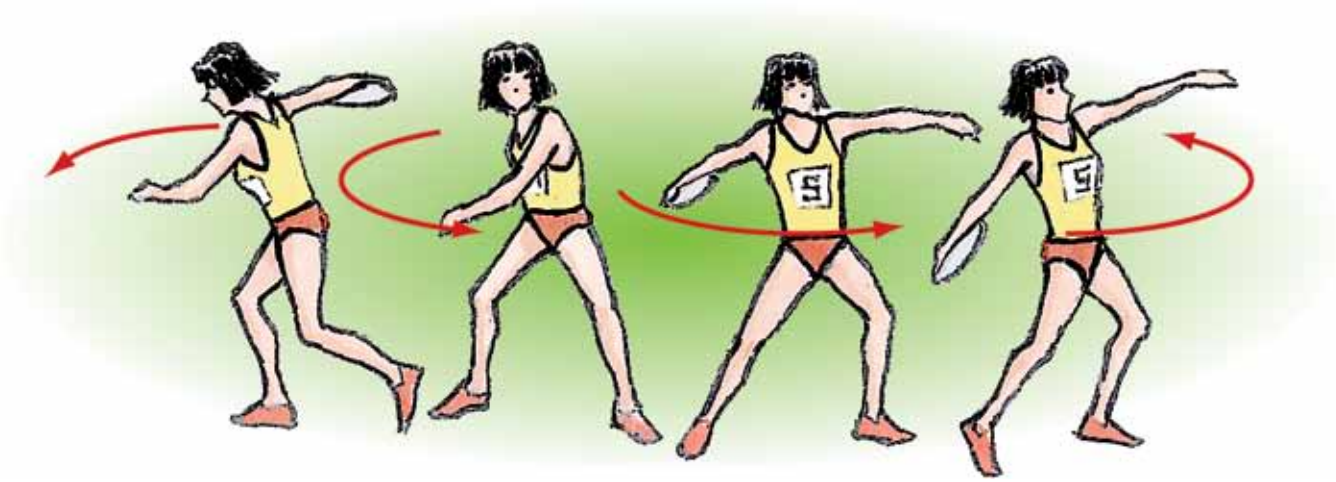


Figure 6.6: When moving bodies do not travel in a straight line, it is called angular momentum.

Angular momentum is affected by:

- *angular velocity.* For example, the distance we can hit a golf ball is determined by the speed at which we can move the club head.
- *the mass of the object.* The greater the mass of the object, the more effort we need to make to increase the angular velocity. It is relatively easy to swing a small object such as a whistle on the end of a cord. Imagine the effort that would be needed to swing a shot-put on a cord.
- *the location of the mass in respect to the axis of rotation.* With most sport equipment, the centre of mass is located at a point where the player is able to have control and impart considerable speed. Take baseball bats and golf clubs for example. Here, the centre of mass is well down the shaft on both pieces of equipment. This location enables the player to deliver force by combining the mass of the implement at speed in a controlled manner, thereby maximising distance.



APPLICATION

Angular momentum in stick games

1. Choose two pieces of sporting equipment used for hitting, such as golf clubs or hockey sticks. Select the type of ball normally hit with this type of equipment. Shorten the shaft of one of the sticks (you may have a piece of damaged equipment that could be used, or move your hands well down the shaft of the equipment).
2. Place the ball on the ground and hit each of the balls as far as possible. Measure the distance that each of the balls was hit.
3. What were the distances of each of the respective hits?
4. Explain the difference in terms of the ability to generate angular momentum.
5. Sportspeople such as golfers and hockey players sometimes need to 'shorten the shaft' to play a particular shot. Use sporting examples to explain why this change of technique might be necessary and the implications for momentum on performance.

INQUIRY

Principles of motion

Copy the mind map in figure 6.7 into your workbook and then complete it by identifying specific principles that support the motion principles identified.

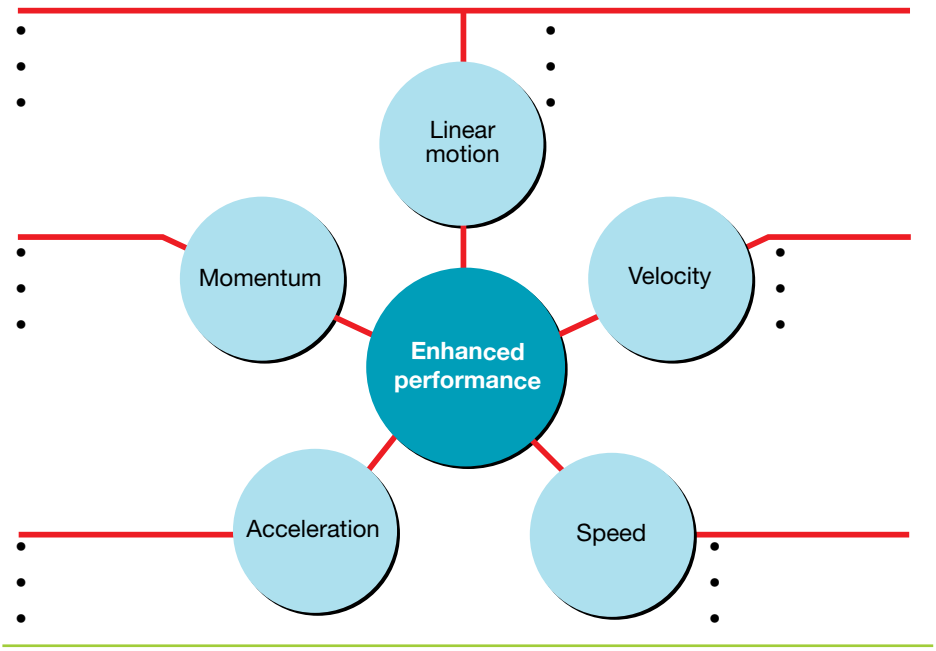


Figure 6.7: Mind map to summarise the principles of motion

BALANCE AND STABILITY

The **centre of gravity** of an object is the point at which all the weight is evenly distributed and about which the object is balanced.

Centre of gravity

Knowing the position of the **centre of gravity** is very important to improving sport performance. In a rigid object such as a cricket ball or billiard ball, the centre of gravity is in the centre of the object. This means that the mass is equally distributed around this point; that is, the weight is equally balanced in all directions. If the object has a hollow centre, such as a tennis ball or basketball, the centre of gravity is located in the hollow centre of the ball (see figure 6.8(a)).

However, some objects commonly used in sport are not exactly spherical or have an evenly distributed mass; for example, the tenpin bowling ball or the lawn bowl. Both have a 'bias'; that is, a slight redistribution of the mass to one side of the object. When the object is rolled on a flat surface, it gradually moves in the direction of the side with the greater mass (see figure 6.8(b)).

In the human body, the position of the centre of gravity depends upon how the body parts are arranged; that is, the position of the arms and legs relative to the trunk. Because the

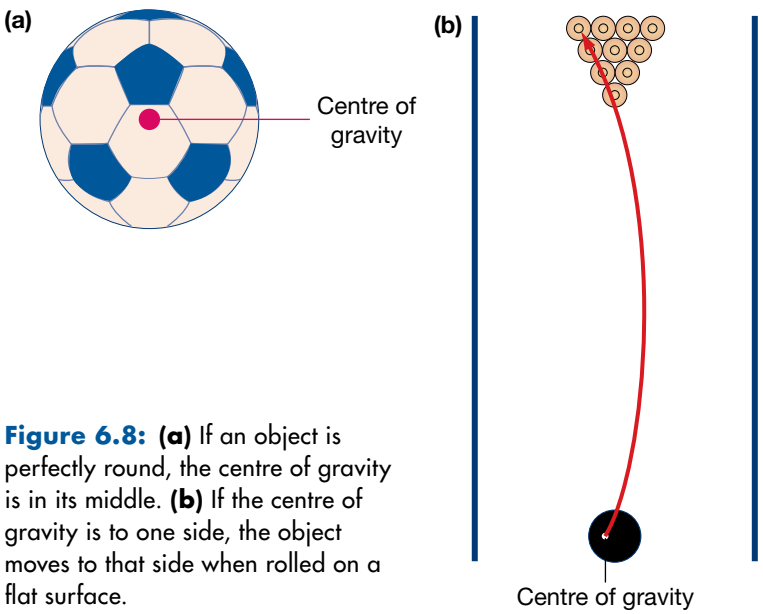


Figure 6.8: **(a)** If an object is perfectly round, the centre of gravity is in its middle. **(b)** If the centre of gravity is to one side, the object moves to that side when rolled on a flat surface.

human body is flexible and can assume a variety of positions, the location of the centre of gravity can vary. It can even move outside the body during certain movements (see figure 6.9).

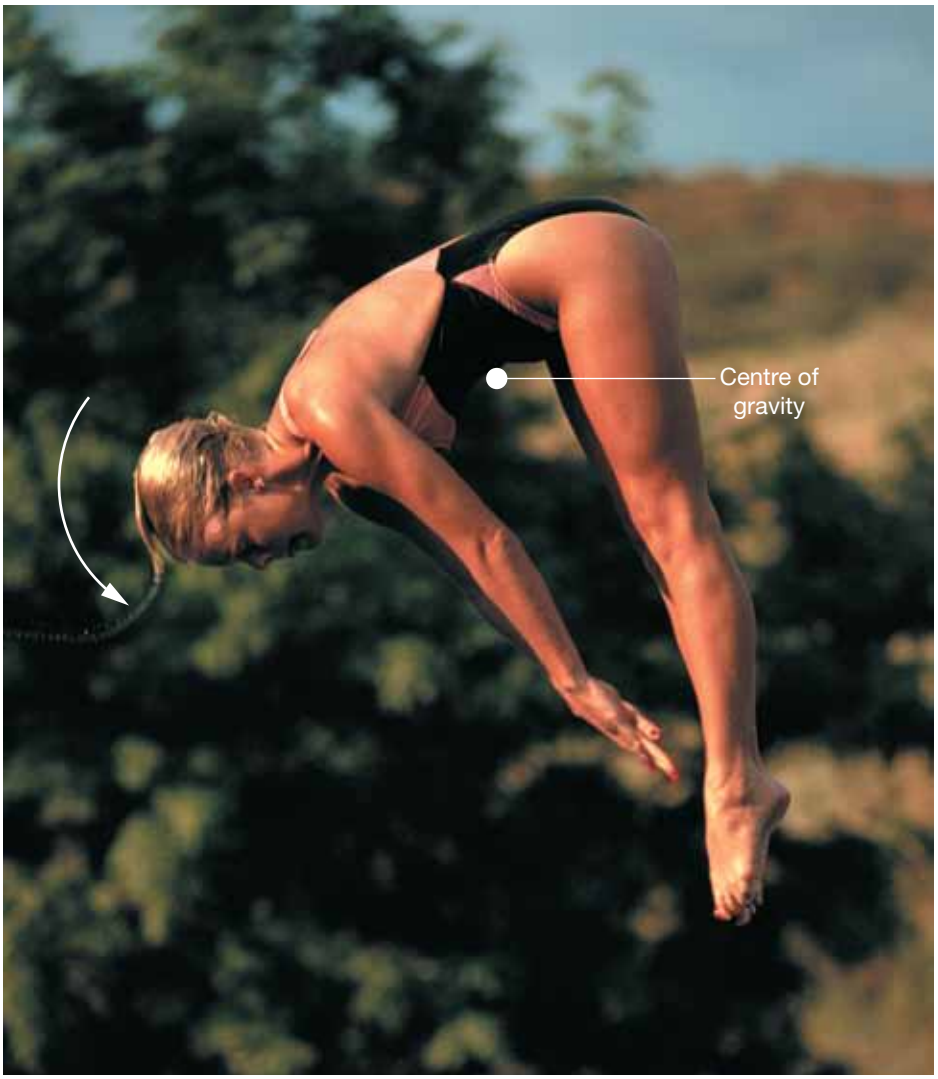


Figure 6.9: The point of the centre of gravity in the human body varies according to the position of the body.



Varying the centre of gravity to enhance performance

Use a range of commonly used starting positions for the 100 metre sprint. Vary the centre of gravity so that, in some starts, it is well forward, others about centre and the remainder, well back. Use both crouch starts and upright starts. Time each of the starts over 10 metres and record your information.

1. How were the times affected by varying the position of the centre of gravity?
2. Which position was the most successful in terms of time?
3. You are to teach the start to a group of young students. Suggest the biomechanical principles that you consider to be most important in generating a good start.

Varying the centre of gravity in the execution of a skill can enhance performance. Skilled high jumpers and long jumpers both lower the centre of gravity in the step or steps immediately preceding take-off. This enables them to propel their body over a slightly longer vertical path than would otherwise be possible.

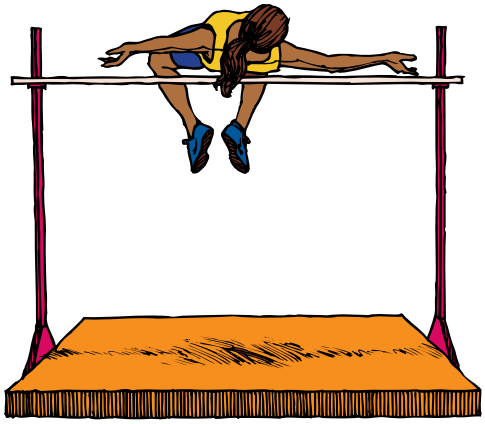


Figure 6.10: In jumping events, the closer the centre of gravity is kept to the bar while still clearing it, the more efficient the movement.

In high jump events, the athlete needs to clear the bar for the jump to be successful. Most jumpers currently use the Fosbury flop technique to do this (see figure 6.10). The 'flop' is a more efficient method because the centre of gravity does not need to clear the bar by the same margin as is required in conventional jumps, such as the scissors. The lower the centre of gravity remains in relation to the bar (but with the body still making a clear jump), the more efficient the movement because the jumper requires less effort to clear the bar. Using the scissors technique, the jumper propels his or her body considerably higher because the centre of gravity is located higher in the body at the moment the bar is being cleared.

Static balance activities such as headstands and handstands require precise manipulation of the centre of gravity. To balance on your hands as in a handstand, or on your head and hands as in a headstand, the centre of gravity must be controlled by the base of support. If it moves away from a perpendicular position directly over the base, the gymnast falls.

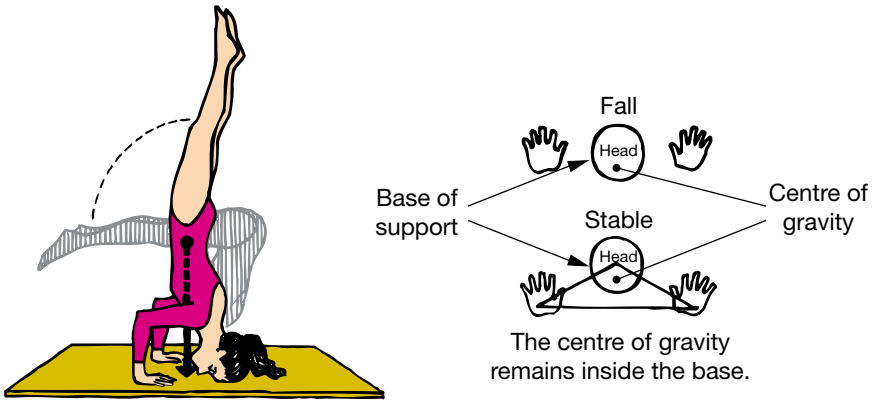


Figure 6.11: Manipulating the centre of gravity is important in balance activities.

Most learners find it difficult to assume headstand and handstand positions because when they prepare to kick up, they do not push their centre of gravity far enough forward prior to the kick. As a result, the body falls back in the direction of the centre of gravity unless it is stopped by a push from the legs. As shown in figure 6.11, the centre of gravity, which is located approximately about the waist, needs to be pushed well forward during the kick-up phase and then moved back above the base of support to balance.

Manipulating the centre of gravity requires considerable skill and contributes to the difficulty of skills such as the headstand and handstand.

APPLICATION

Observing control of the centre of gravity

On mats and with appropriate support and assistance, try to perform headstands and handstands. Observe the movements in both successful and unsuccessful attempts.

1. Discuss why some attempts were successful and others unsuccessful.
2. What advice could you give to improve the success rate?

APPLICATION

Observing and controlling the centre of gravity

Divide the class into half, with group one being the observers and group two the subjects. Those in group one are to run and, at the sound of a whistle, stop quickly

and maintain balance. Group two is to observe and record group one's success in achieving balance immediately the whistle is blown.

1. Discuss the level of success or otherwise in achieving balance quickly.
2. In what way were the arms, legs and feet manipulated in order to improve the chances of success?

Like static balance, dynamic balance activities also require skilful control of the centre of gravity. In many moving activities, such as skiing and surfing, there is a fine line between the balance necessary for control and loss of balance resulting in a fall.



APPLICATION

Manipulating the centre of gravity to improve performance

Select two or three students to perform a range of evasive movements, such as a swerve, sidestep and change of direction, on a flat surface. Observe the angle of the body in each movement as the direction is changed. Repeat the movements a number of times and record your information using a series of stick figures.

1. Plot the approximate location of the centre of gravity on each of the stick figures. Then draw three or four lines through each stick figure, dividing it into equal segments. Can you detect any changes in the location of the centre of gravity?
2. Discuss how the centre of gravity was being relocated to enable the change of direction to occur.
3. Explain how controlled manipulation of the centre of gravity can enhance performance.

The **line of gravity** is an imaginary vertical line passing through the centre of gravity and extending to the ground.

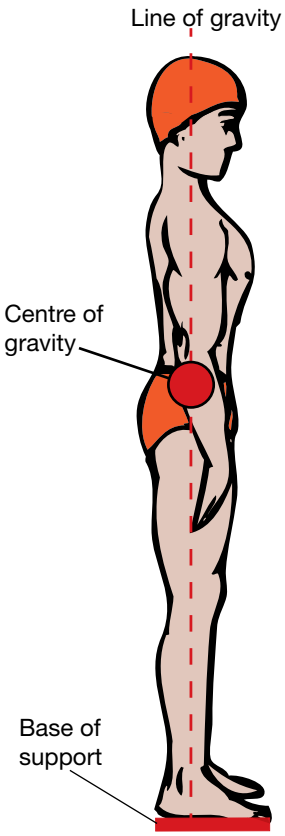


Figure 6.12: We are perfectly balanced when the line of gravity dissects the centre of gravity.

Line of gravity

The **line of gravity** is an imaginary vertical line passing through the centre of gravity and extending to the ground. It indicates the direction that gravity is acting on the body. When we are standing erect the line of gravity dissects the centre of gravity so that we are perfectly balanced over our base of support (the base of support is discussed more fully in the next section). This is illustrated in figure 6.12.

Our base of support has a limited area. Widening our stance increases the size of the base of support. However, rules of some sports and competitions limit the size of the base of support; for example, the starting blocks for competitive swimmers. The closer the line of gravity moves to the outer limits of the base of support, the less stable we become.

Movement occurs when the line of gravity changes relative to the base of support. Movement results in a momentary state of imbalance being created, causing the body to move in the direction of the imbalance. In specialised sporting movements, such as the start in athletics, diving and rhythmic gymnastics, the precision with which the line of gravity moves in relation to the base of support directly affects the quantity and quality of movement.

During practice of specialised skills, athletes progressively develop a feel for the line of gravity relative to the base of support, enabling the controlled

instability required for movement. This means that less force is required to initiate the desired movement. For example, swimmers on the blocks bend forward, moving the line of gravity to the edge of the base of support so that less force is required to execute the dive. Springboard divers do likewise by moving the line of gravity to the front edge of their base of support, enabling frontward movement with the take-off. This is illustrated in figure 6.13.

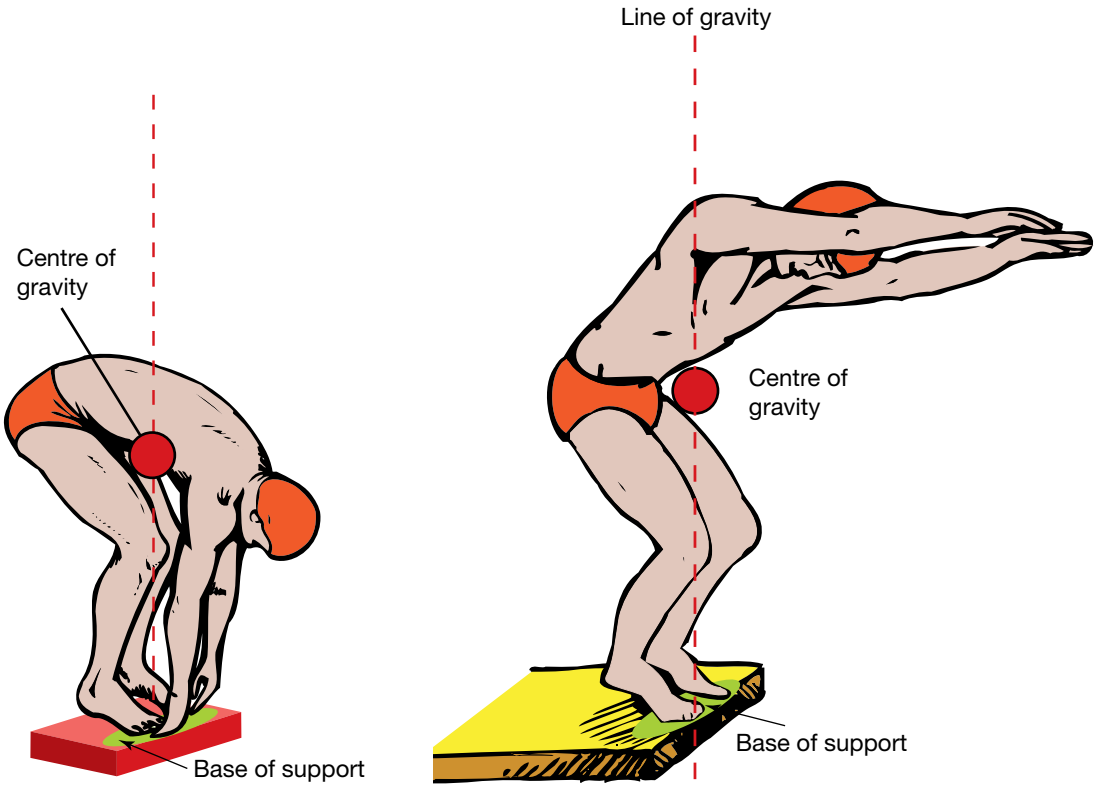


Figure 6.13: The line of gravity relative to the base of support moves to initiate movement.



INQUIRY

Line of gravity and the sprint start

eBookplus

Use the **Sprints** weblink in your eBookPLUS to observe the seven photographs and read the technique points for the standing, crouch four point, 40 yard dash, three point and block starts. Print the information sheet and draw a thick line that identifies the exact position of the base of support in each of the photographs. Try to locate the centre of gravity for individuals in each of the photographs. Then draw the line of gravity through the centre of gravity and extend to the base of support. Comment on how far the line of gravity is relative to the extreme edge of the base of support and if you think this would enable a more efficient start. Justify your answer.

Base of support

The **base of support** refers to an imaginary area that surrounds the outside edge of the body when it is in contact with a surface.

Sustaining the balance of all individuals and objects is a **base of support**. It affects our stability or our ability to control equilibrium. A narrow base of

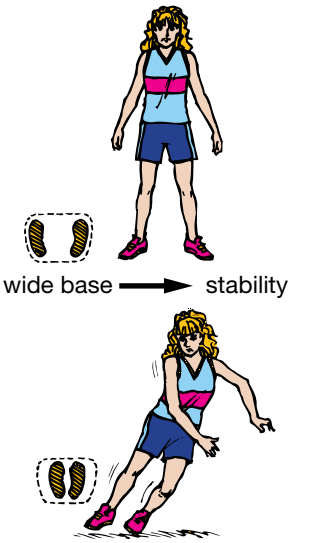


Figure 6.14: A wide base of support promotes stability.

support allows the centre of gravity to fall close to the edge of the base of support. Only a small force is needed to make the person lose their balance (see figure 6.14). A wide base of support is essential for stability because the centre of gravity is located well within the boundaries.

The relative position of the centre of gravity to the base of support is important for stability. The further the centre of gravity from the base, the more unstable is the body or object. There are many examples where athletes use the base of support to their advantage.

- The gymnast performing a pirouette has a very narrow base of support and must work hard to ensure that their centre of gravity remains within the base.
- Wrestlers widen their base of support to prevent their opponents from moving them into a disadvantageous position.
- Tennis players lower the centre of gravity and widen the base of support in preparation to receive a fast serve. This enhances balance and enables the centre of gravity to be moved in the desired direction more readily.
- Swimmers on the blocks widen their feet and move the centre of gravity forward to improve their acceleration.
- Golfers spread their feet to at least the width of their shoulders to enhance balance when they rotate their body during the swing.

APPLICATION

Base of support and different positions

Have five students assume a range of positions with varying bases of support; for example, a pirouette, headstand, crouch balance, start and boxing stance. Try to move each student from their position. Record the results.

1. Draw the shape and size of the base of support for each activity above. Compare the amount of effort required to displace each person from their position.
2. Discuss the degree to which the mass of the student affected your ability to dislodge each from their position.

APPLICATION

Base of support and changing stances

Choose a golf club or hockey stick. Hit five balls with your feet together (narrow base of support) and five balls using a normal stance. Measure the distances for each hit and calculate an average distance for each piece of equipment.

1. How much variation was there in average distances between the different stances?
2. Discuss why there was a difference.
3. Suggest five other activities where knowledge of the base of support is important to improving performance.

INQUIRY

Base of support and improving skills

Choose any sport or activity. Discuss how knowledge of the centre of gravity and base of support could enhance performance in a range of skills in that sport.

FLUID MECHANICS

Fluid mechanics is a branch of mechanics that is concerned with properties of gases and liquids.

Fluid mechanics is a branch of mechanics that is concerned with properties of gases and liquids. An understanding of fluid mechanics is important for performance improvement because physical activities such as running, throwing and swimming all take place in fluid environments, be it air, water or a combination of both.

The type of fluid environment we experience impacts on performance. For example, when we throw a javelin, hit a golf ball or swim in a pool, forces are exerted on the body or object and the body or object exerts forces on the surrounding fluid. Knowledge about how to equip ourselves and better execute movements in specific fluid environments improves safety and can significantly enhance performance.



Figure 6.15: Examples of fluid environments in which we perform

Flotation

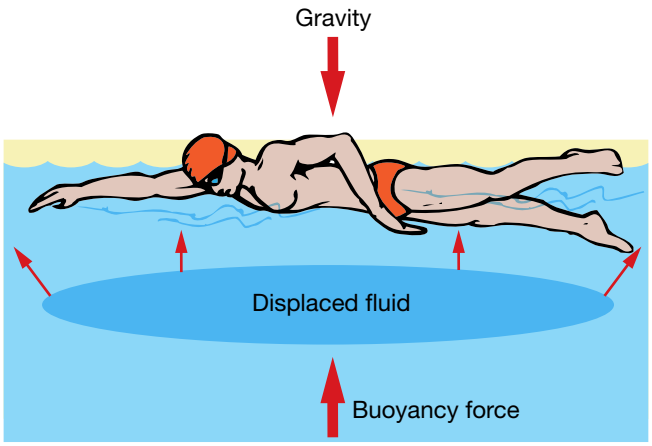
To **float** is to maintain a stationary position on the surface of the water.

You have probably observed that some people appear to **float** better in water than others. Many people are able to push and glide from the pool wall, floating momentarily but then sinking, usually feet first. Others have difficulty getting under the surface of the water during a 'duck dive', their feet kicking and splashing on the surface as they try to submerge.

The ability to float — to maintain a stationary position on the surface of the water — varies from one person to another. Flotation impacts on swimming, survival in water and even our ability to learn to swim. To better understand flotation, we need firstly to understand the impact of forces that act on a floating body or object.

Buoyant force is the upward force on an object produced by the fluid in which it is fully or partially submerged.

Our body floats readily on water when the forces created by its weight are matched equally or better by the **buoyant force** of the water. For an object to float, it needs to displace an amount of water that weighs more than itself. Conversely, if the object displaces a quantity of water that weighs less than itself, it sinks. Hence, wearing a personal flotation device (PFD) increases buoyancy because its size displaces a lot of water with only a minimal increase in weight.



The water displaced by the object does not lie directly below it, as illustrated in figure 6.16, but spreads throughout the pool (or whatever confines the water) and exerts forces on all surfaces of the body or object.

Figure 6.16: The swimmer's weight is resisted by upward forces equal to the weight of the displaced fluid.

The **density** of a body or object refers to its mass per unit volume.

Body **density**, or its mass per unit volume, also impacts on the ability to float. Density is an expression of how tightly a body's matter is enclosed within itself. The density of the human body varies from one person to another. The average weight density of the human body is approximately equal to that of water. If our weight density is high, that is, we are relatively fat free, the body sinks in water. Conversely, if we have higher proportions of less compact tissue such as fat, we tend to float. In other words, a body or object floats if its density is less than that of the fluid. A cork, for example, is less dense than water, allowing it to float, while a solid metal bar has a far greater density and consequently will sink.



INQUIRY

How buoyancy works

eBookplus

Use the **How Stuff Works** weblink in your eBookPLUS to discover more about density and buoyancy.

1. Explain why the bowling ball sank to the bottom of the tank while the basketball stayed close to the surface.
2. Discuss the effect of body composition on flotation.

Specific density is the density of a particular tissue type such as bone or lung tissue.

You have probably observed that the human body does not float evenly if left in the prone position. This is because the density of the human body (body composition) is not uniform as it is composed of different materials. Diverse body tissue including bone, fat and muscle each has a **specific density**. Some materials are considered to be relatively dense, such as teeth and bones, whereas other parts such as lung tissue and intestines have lower densities.

Again, the distribution of organs and tissue throughout the body makes some areas less dense in comparison to others. For example, the upper body contains the lungs (low density tissue), making this area less dense than the lower body, which contains a high percentage of bone and muscle. Because human body density is not uniform, **average total body density** is the determining factor in flotation.

Average total body density is an average of all the specific densities of body components such as bones, teeth and lungs.

The degree of density changes the buoyancy of an object or body. Objects with densities higher than that of water (more mass) sink, while those with densities lower than that of water (less mass) float. However, it is common for people to sink non-uniformly from a horizontal, stationary floating position and this usually begins with the feet. The positioning of tissue such as the lungs relative to the legs impacts on flotation and affects which parts sink first.



INQUIRY

Sink or float

1. Explain why some people float better than others.
2. Why might it be necessary for some people to wear personal flotation devices (PFDs) when performing skills in deep water?
3. Explain why deep inhaling and holding breath might enhance one's ability to float.
4. Why does the sculling arm action allow us to remain on the surface of the water?
5. Explain why you float when you stretch out but sink when you roll your body into a ball.
6. Explain why, when we push and glide, we remain on the surface of the water but begin to sink as our forward movement stalls.

Centre of buoyancy

If our average total body density is higher than that of water, we sink but this does not happen uniformly. To understand why this happens we need to understand the link between the body's centre of gravity and its centre of buoyancy.

Centre of buoyancy is the centre of gravity of a volume of water displaced by an object when it is immersed in that water.

Every floating object has a centre of gravity and **centre of buoyancy**. We saw on page 231 that the centre of gravity is the point around which the body's weight is equally balanced in all directions. While differing body shapes contribute to variations in the exact location of the human body's centre of gravity, even when floating the centre of gravity is generally found about the waist, as illustrated in figure 6.17.

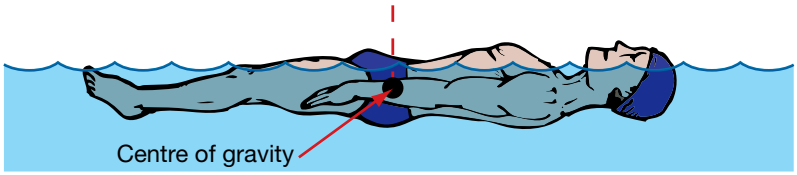


Figure 6.17: The centre of gravity of the human body is located about the waist.

The centre of buoyancy is the centre of gravity of the fluid displaced by a floating object. Around this point, all the buoyancy forces are balanced.

During unassisted horizontal flotation, the human body's centre of buoyancy is not vertically aligned to its centre of gravity. The lungs, which contain a large volume of air, draw the centre of buoyancy towards the chest. As illustrated in figure 6.17, the body's centre of gravity (centre of mass) is located more towards the hips and the exact position varies from one individual to another. During an attempt to float, gravity pulls the lower body downwards (greater mass) while the buoyant forces push the chest and upper body upwards (less mass in this area). The result is that the body rotates until the centre of mass lies directly below the centre of buoyancy. This leaves the body in varying degrees of diagonal positions depending on the position of the centre of mass in each individual. The impact of varying body compositions on flotation is illustrated in figure 6.18.

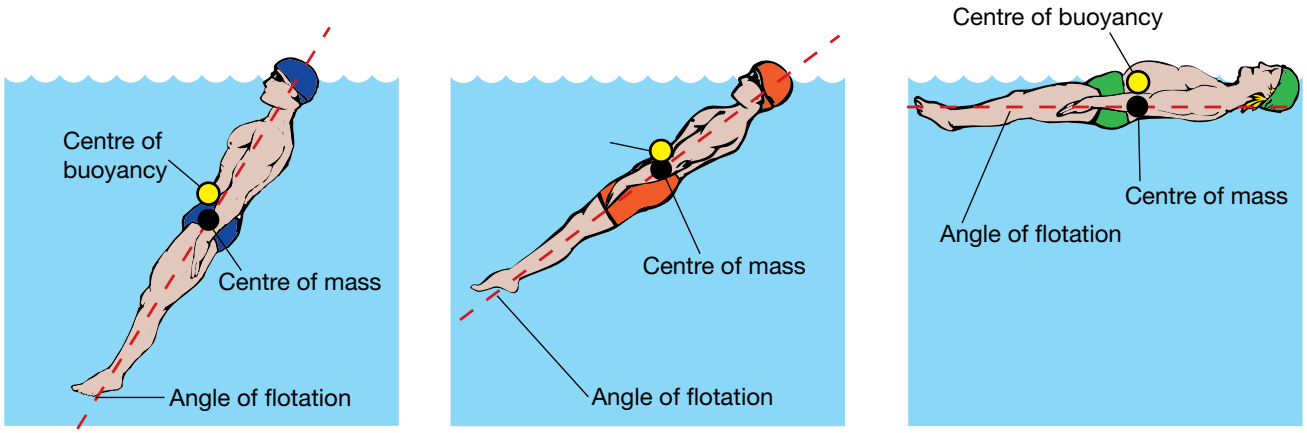


Figure 6.18: Body composition influences the relationship between centre of mass and centre of buoyancy, changing the depth and angle of flotation.



Centre of buoyancy

Work in pairs at a swimming pool with one person observing and the other recording the observations. During the course of the exercise, the person in the water needs to assume positions listed in table 6.2 and hold each for a period of 10–15 seconds.

The recorder observes what happens to the unassisted floating body in terms of buoyancy and rotation and records the information in the second column.

Table 6.2: Buoyancy and rotation of unassisted floating body

Position in water	Flotation and body position changes	Why it happened
Prone float		
Back float		
Knees to chest		
Prone float with arms and legs spread		
Prone float with legs supported by kickboard		
Body vertical, arms by side, feet together		
Side float		
Duck dive (unassisted by hands and feet kick)		



Centre of buoyancy

1. In pairs, use the third column in table 6.2 to explain flotation and body position changes.
2. As a class, discuss the relevance of flotation to performance of survival skills and swimming generally.

Fluid resistance

Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity.

Lift is the component of a force that acts at right angles to the drag.

When a body or object moves, whether it be in air or water, it exerts a force and simultaneously encounters a resisting force from that medium. In sporting competitions such as swimming and athletics, **drag** and **lift** forces are constantly responding to the object or body's thrust. When competitors throw objects such as the discus or javelin, or propel themselves forward, maximum length/speed is generated when drag is minimised. Lift is the force that operates at right angles to the drag.

While in most activities lift is essential in keeping the implement airborne, sometimes negative lift is an advantage. An example of using technology to create favourable negative lift is the use of an inverted wing on Formula 1 cars (see figure 6.19) to maximise downforce and ultimately improve performance.



Figure 6.19: Negative lift helps maximise traction and improve performance.

There are many types of forces exerted by fluids that resist an implement or body trying to move through it. At the same time, technological improvements have enabled us to better use the specific fluid to decrease resistance; for example, better configuration of the dimples on a golf ball can improve its flight performance. This is explored more fully when we examine the Magnus effect (see page 245).

Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity. It is a resisting force because it acts in oppo-sition to whatever is moving through it. Drag forces run parallel to flow direction (airflow, water), exerting a force on the body in the direction of the stream. An example of where we find drag forces in sport is to watch a swimmer push off the pool wall following a turn. The swimmer's forward motion gradually decreases due to resisting forces applied by the water, which makes the swimmer stop unless arm or leg action begins. A body that is streamlined (contoured to reduce resistance) and technically efficient moves through the medium, creating less drag than a body that is not as streamlined. This difference in the amount of drag created by non-streamlined and streamlined bodies is illustrated in figures 6.20 and 6.21.

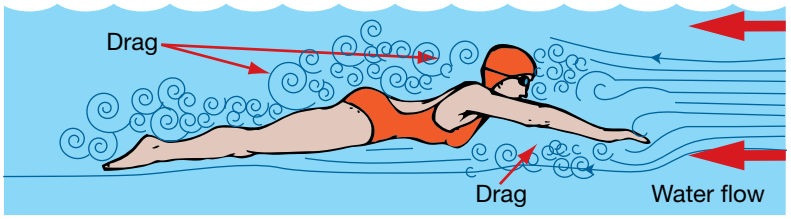


Figure 6.20: When a body is not streamlined, considerable drag is created, making it more difficult to move through the fluid.

The amount of drag experienced depends on a number of factors, including:

- *fluid density.* Because water is denser than air, forward motion in this fluid is more difficult.
- *shape.* If a body or object is streamlined at the front and tapered towards the tail, the fluid through which it is moving experiences less turbulence and this results in less resistance.
- *surface.* A smooth surface causes less turbulence, resulting in less drag.
- *size of frontal area.* If the front of a person or object (area making initial contact with the fluid) is large, resistance to forward motion is increased.

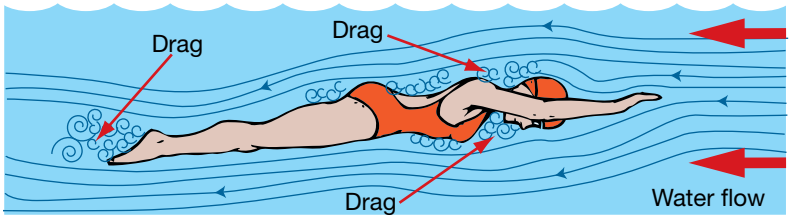


Figure 6.21: The streamlined body creates much less drag allowing it to move more efficiently through the medium.

There are two types of drag forces — surface drag and profile drag. **Surface drag** or **skin friction** refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving. This layer sticks to the next layer and progressively to neighbouring layers. However, attachment to outer layers becomes increasingly weaker until there is no attachment at all.

Surface drag or **skin friction** refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving.

The **boundary layer** is that layer of fluid whose speed is reduced because it is attached to the surface of an object that is moving through it.

The fluid in the immediate vicinity of the surface of a projectile comprises the **boundary layer**. When an object such as a discus is projected into a

Laminar flow is a streamlined flow of fluid with no evidence of turbulence between the layers.

medium, pockets of fluid in the boundary layer become unstable as the object moves through it. The thrust of the object disturbs air that is in **laminar flow** to make way for its mass. This air is then forced to detour around the object but becomes mixed in the process. Some attaches itself to the object and even rotates with it if the object is spinning. Turbulence develops, causing forces known as surface drag to be exerted on the object (and it in turn exerts forces on the fluid), causing forward movement to be slowed.

The coarser or less streamlined the surface of the object, the thicker is the boundary layer. This is illustrated in figure 6.22 where the air ahead of the golf ball is in laminar flow until disturbed by the advancing ball and causing the formation of a boundary layer to develop around the ball. The thick, turbulent air attached to the ball slows its progress.

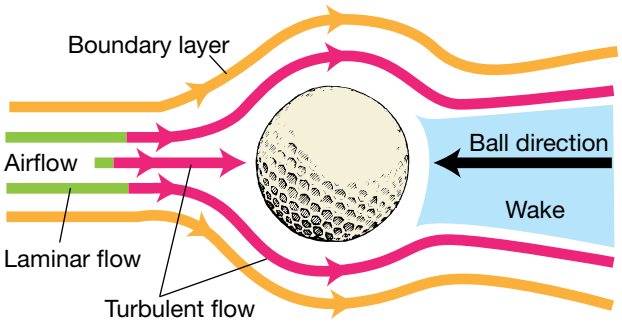


Figure 6.22: The airflow of an object moving through a fluid becomes disrupted and some attaches itself to the object in the boundary layer.

Profile drag (also called **form** or **pressure drag**) refers to drag created by the shape and size of a body or object.

A **wake** is an area of turbulence behind an object moving through a fluid.

Profile drag (also called **form** or **pressure drag**) refers to drag created by the shape and size of a body or object. As they move through fluids, bodies or objects cause the medium to separate, resulting in pressure differences at their front and rear. The separation causes pockets of high and low pressure to form, resulting in the development of a **wake** or turbulent region behind the body or object. Pressure drag is a component of the total drag, all of which combine to slow down the object.

When we swim, for example, fluid pressure at the front of our body is greater than fluid pressure behind our feet. Objects with bigger cross-sectional areas produce more form drag in comparison to streamlined objects which, because of their shape and smoothness, cause less drag. Cyclists try to reduce form drag by reducing the size of their frontal area (bending forward) and by 'drafting' or following closely behind other cyclists to reap the benefits of being in the low pressure area.

Figure 6.23(a) demonstrates an object with a large cross-sectional area causing an extensive wake at its rear. The wake encompasses whirling currents that tend to flow in an upstream direction, giving rise to forces that oppose the forward motion of the body or object. The more streamlined object in figure 6.23(b) causes less interference to airflow, resulting in a smaller low pressure area and subsequently less drag.

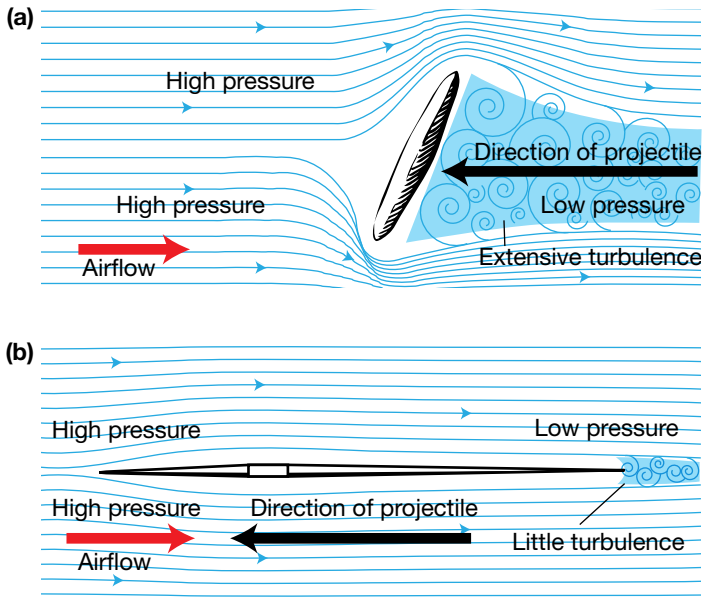


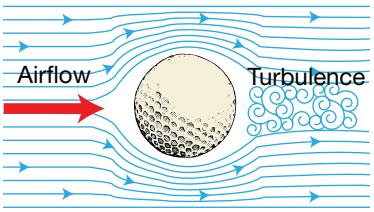
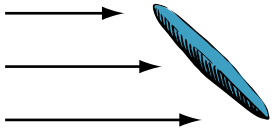
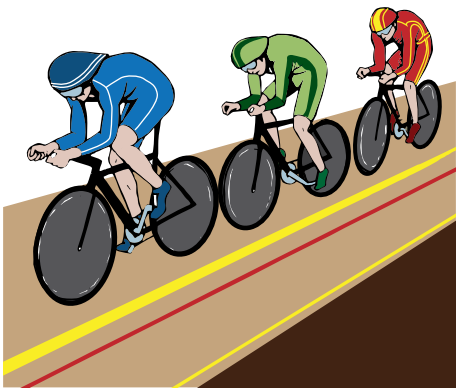
Figure 6.23: The blocking effect of bigger objects causes greater turbulence and more drag than more streamlined objects.

INQUIRY

The effects of drag on performance

Examine the illustrations in the left column of table 6.3. Use the right column to identify types of drag and the effect of this on performance. Discuss your findings with the class.

Table 6.3: Types of drag and effects on performance

Body or object	Types of drag and effect on flight/performance
Golf ball in flight 	
Downhill speed skiing 	
Discus in flight 	
Cycle racing 	

(continued)

Table 6.3: *(continued)*

Body or object	Types of drag and effect on flight/performance
Sprinting 	

Much has been done to try to minimise resistance forces that oppose movement in fluid mediums. Most developments have taken place in regard to technique, tactics, clothing and equipment design. For example:

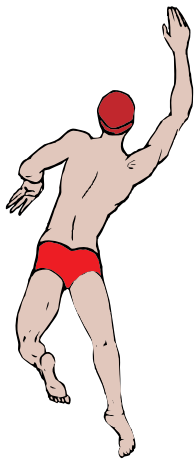
- *technique.* Cyclists, speed skaters and downhill skiers all bend forward at the trunk.
- *tactics.* Distance runners and cyclists follow one another closely where possible.
- *clothing.* Tight bodysuits made of special friction-reducing fabrics are worn by runners, cyclists and swimmers.
- *equipment design.* Designs of equipment such as golf balls, golf clubs, cricket bats, bicycle helmets, footballs and surfboards are continually being modified to make them more aerodynamically efficient.



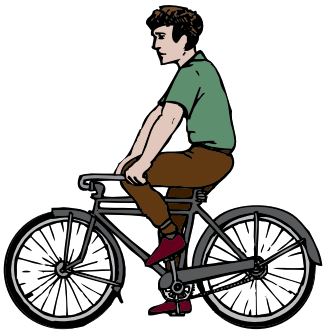
Using biomechanics to improve performance

In table 6.4, compare performance A with performance B for the three activities. Under performance A, identify relevant types of drag and elaborate on the effect this has on performance. Under performance B, identify any technique, equipment, design and other modifications that have influenced performance/design.

Table 6.4: Effects of drag on performance

Performance 1A	Performance 1B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:

Performance 2A	Performance 2B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:

Performance 3A	Performance 3B
	
Types of drag and impact on performance:	Technique/equipment modifications to reduce drag:



INQUIRY

Applying fluid mechanics principles to movement and performance

Choose one sport from the three categories shown in table 6.4. Explain how the principles of fluid mechanics have influenced changes designed to improve movement and performance.

The Magnus effect

The **Magnus effect** explains why spinning objects such as cricket and golf balls deviate from their normal flight paths.

Topspin occurs when a ball or object rotates forward on its horizontal axis causing it to drop sharply.

Backspin is the opposite and occurs when a ball or object rotates backwards causing it to fall slowly at the end of flight.

The **Magnus effect** explains why spinning objects such as cricket and golf balls deviate from their normal flight paths. When an object such as a cricket ball or golf ball is bowled or hit into the air, its spinning motion causes a whirlpool of fluid around it that attaches to the object. According to the direction of spin, the object's movement is affected.

We are familiar with three types of spin. **Topspin** occurs when a ball or object rotates forward on its horizontal axis causing it to drop sharply. **Backspin** is the opposite and occurs when a ball or object rotates backwards, causing it to fall slowly at the end of flight. Both topspin and backspin shorten

Sidespin refers to rotation around a vertical axis causing the ball or object to curve left or right during flight.

the flight of the ball. **Sidespin** refers to rotation around a vertical axis, causing the ball or object to curve left or right during flight.

Spinning causes the formation of pockets of high and low pressure. The size of the pressure pockets depends on the speed of rotation and roughness of the surface. Fast bowlers shine one side of a cricket ball to enhance the streamlining effect while leaving it rougher (through contact with the pitch) on the other side. This assists a properly delivered ball to swing during flight as one side of the ball is able to move through the air with less resistance than the other side. This is illustrated in figure 6.24. The cricket ball experiences a force towards the side of the low pressure causing it to move in that direction. In fact, where pressure differences occur, objects always move from the area of high pressure to low pressure.

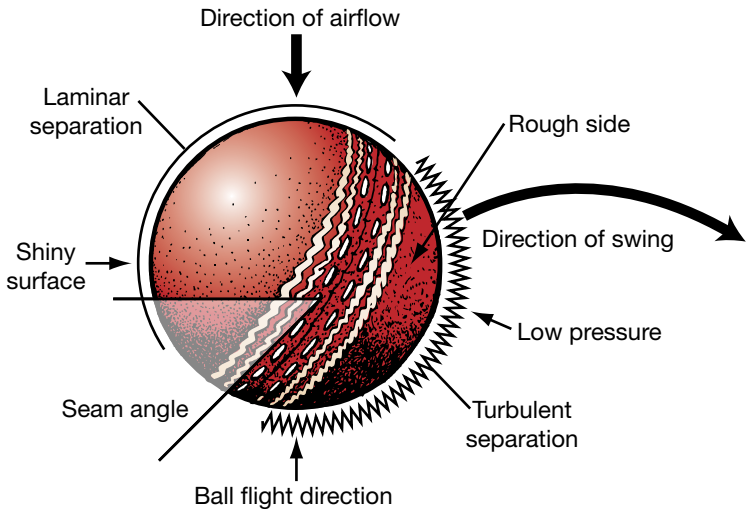


Figure 6.24: The seam alignment, together with surface differences on each half of a worn cricket ball, can be used to enhance its ability to swing.

Two sports that rely heavily on backspin and topspin are tennis and table tennis. While the surface of the table tennis ball is relatively smooth, the dimpled face of the bat allows considerable velocity to be imparted, enhancing the Magnus effect. The comparatively rougher surface of the tennis ball enhances its ability to 'grab' air in the boundary layer and dip quickly when hit over the net with topspin. The impact of topspin and backspin is illustrated in figure 6.25.

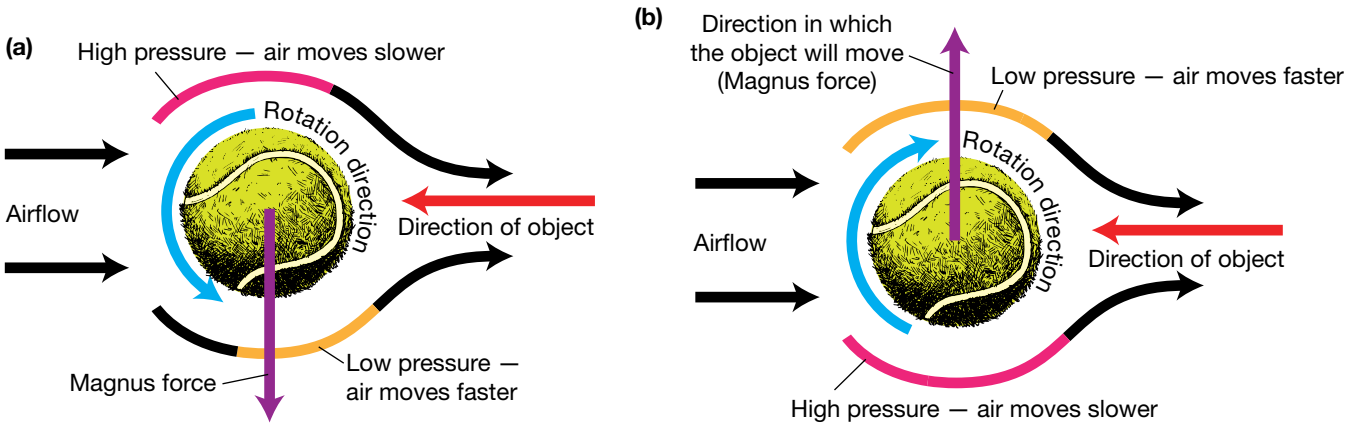
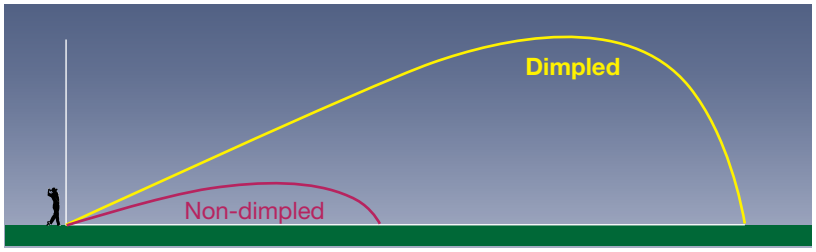


Figure 6.25: **(a)** Topspin and **(b)** backspin. The direction of rotation of an object causes pressure differences that affect ball flight.

INQUIRY

Using fluid resistance principles to advantage

Use the following diagram to explain how the Magnus effect affects the flight of dimpled and non-dimpled golf balls.



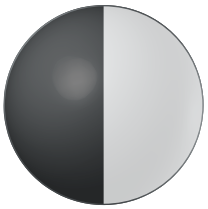
INQUIRY

Using the Magnus force to enhance performance

Choose a sporting skill such as baseball pitching or goal kicking in soccer where the Magnus force influences the flight of the projectile. Investigate what players do to vary the Magnus effect and use it to improve performance. Present your findings in a short PowerPoint presentation.

APPLICATION

Observing the Magnus effect on ball movement



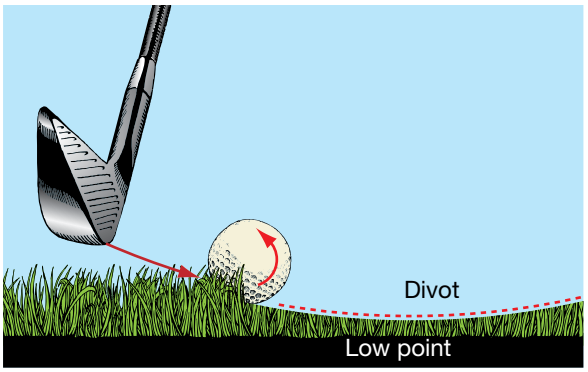
1. Colour one half of a table tennis ball (as illustrated) to enable better vision of its flight path.
2. Have an experienced table tennis player in the class serve a range of balls using different bat surfaces to impart backspin, topspin and sidespin. Observe the flight of the ball with each sequence of serves, noting its swing, rise or dip.
3. Take turns in trying to return serves and note changes in technique to enable a successful return.
4. As a class discuss:
   (a) the techniques/types of surfaces used to impart the various types of spin
   (b) adjustments that need to be made in technique to address each type of spin.



APPLICATION

Applying spin to an object

Using soft plastic golf balls try to impart spin during a hit. You will hear the golf ball spinning if you hit it well enough. To maximise spin, you need to hit the ball into the ground as illustrated in the following diagram.



Use the diagram to explain why a golf ball needs to be hit downwards to make it climb. Use the **Golf physics** weblink in your eBookPLUS to assist you with your explanation.

eBook*plus*



FORCE

Force (biomechanics) is the push or pull acting on a body.

Applied forces are generated by muscles working on joints.

Reaction forces are equal and opposite forces exerted in response to applied forces.

How the body applies force

Players are able to apply **forces (biomechanics)** to objects such as the ground to enable them to run faster, or to a tennis racquet to enable them to hit the ball harder. In doing this, the players are confronted with opposing forces such as gravity, air resistance and friction.

Forces can be internal or external. *Internal* forces are those that develop within the body; that is, by the contraction of a muscle group causing a joint angle to decrease (for example, the contraction of the quadriceps when kicking a football). *External* forces come from outside the body and act on it in one way or another. For example, gravity is an external force that acts to prevent objects from leaving the ground (see figure 6.26).

There are two types of forces — **applied forces** and **reaction forces**. Applied forces are forces applied to surfaces such as a running track or to equipment such as a barbell. When this happens, a similar force opposes it from outside the body. This is called a reaction force. The result is that the runner is able to propel his or her body along the track surface because the applied force generated by the legs is being matched equally by the reaction force coming from the track surface. The greater the force the runner can produce, the greater is the resistance from the track. The result is a faster time for the distance. This is explained by Newton's third law: 'For every action, there is an equal and opposite reaction'. In other words, both the runner and the track each exert a force equal to whatever force is being applied.

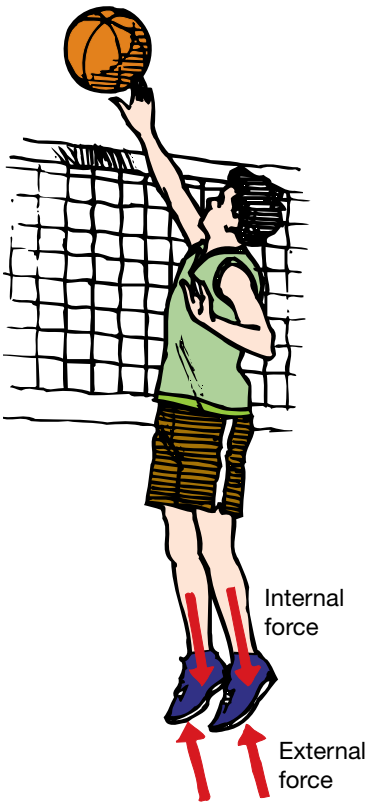


Figure 6.26: Players experience both internal and external forces.

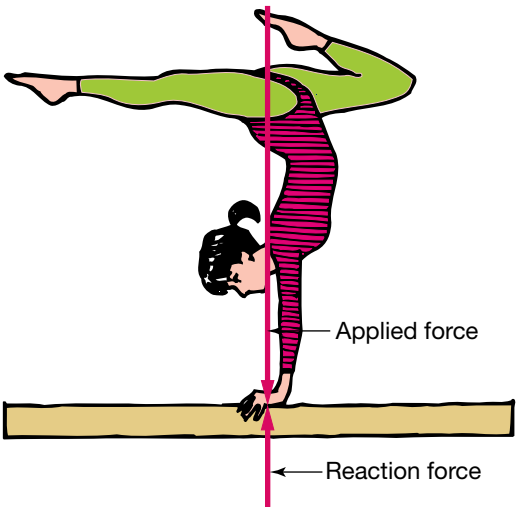


Figure 6.27: Every reaction force is matched equally by an applied force.

We see evidence of the application of force in all physical activity. Consider the following examples: the high jumper, discus thrower, cricket bowler and basketball player all exert forces when executing movement skills. How effective would they be if they were suspended and had nothing to push against?

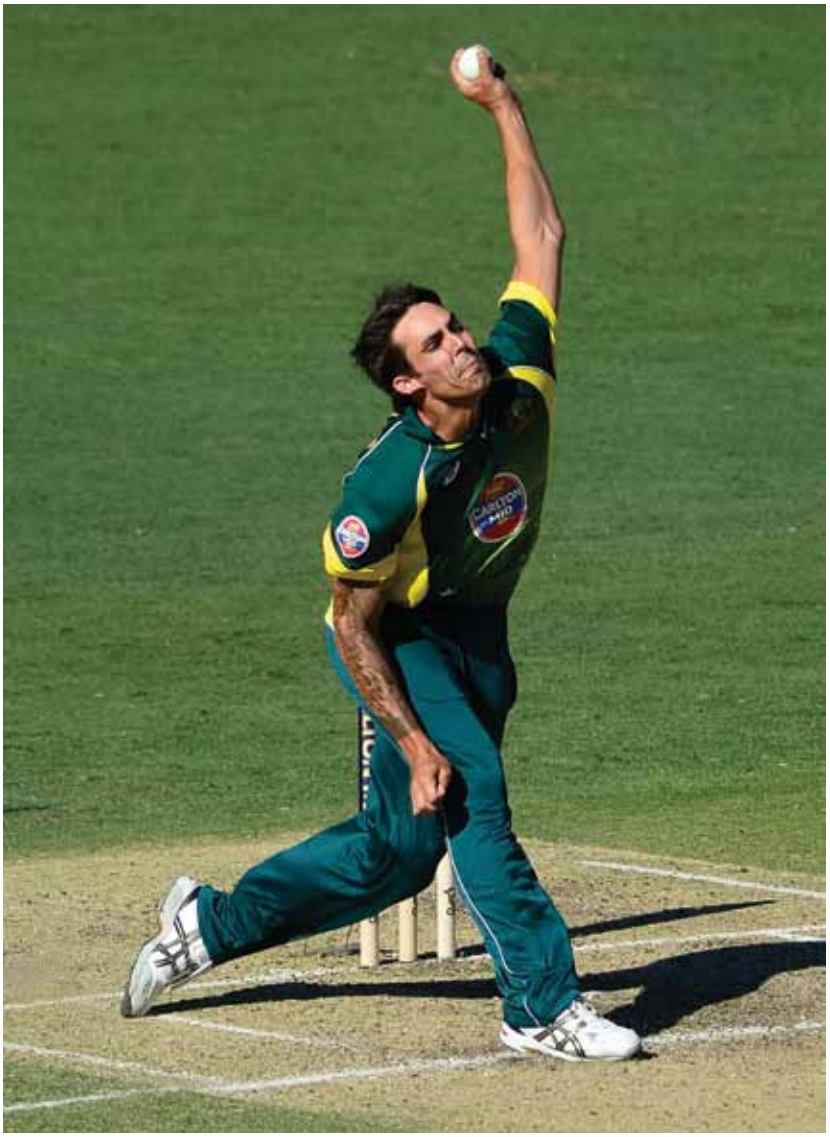


Figure 6.28: Applied and reaction forces increase during the delivery stage of bowling.

INQUIRY

Fast bowlers a 'shoe-in' for injuries

eBookplus

Use the **Bowling** weblink in your eBookPLUS to view an ABC Science article about fast bowlers, injury and footwear.

1. How does the bowler apply force at the time of release during bowling?
2. How are the forces absorbed?
3. What type of injuries can result when forces are applied in this manner?
4. How might improved footwear assist in the absorption of forces?

INQUIRY

The principles of forces

1. Use arrows to indicate the direction of the applied force and the direction of the reaction force in figure 6.29.

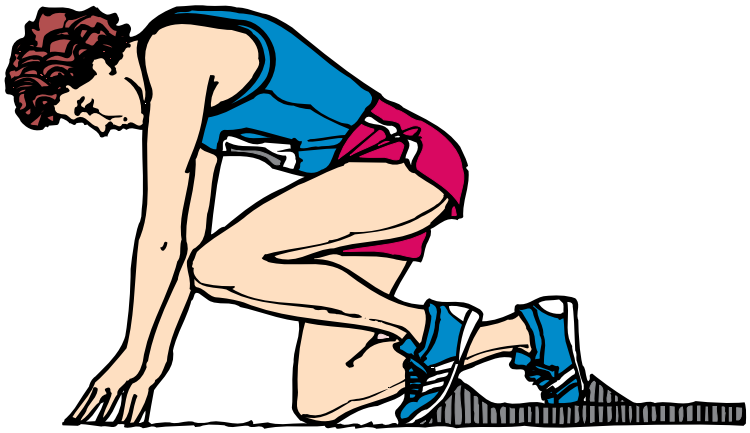


Figure 6.29

2. What would be the effect on the runner's performance if the applied force was increased?
3. Suggest how the principle of forces could be applied to the start in running, generating a more powerful long jump or winning a scrum in rugby with a lower pack weight.

Power (biomechanics) is the ability of muscle groups to contract at speed.

To propel the body higher as in high jumping, faster as in running, or further as in long jumping, we need to develop **power (biomechanics)**. Power is expressed by the formula

$$\text{power} = \frac{\text{work}}{\text{time}}$$

where work is equal to force × distance.

An increase in strength (force) or an increase in the speed at which muscles shorten results in an increase in power. While an increase in both causes an increase in overall power, the athlete must decide which component (strength or speed of muscular contraction) is of greatest benefit. Jumpers and runners need to focus on rapid muscular contraction while controlling the strength aspect. This is called *speed-dominated* power. In contrast, the weight-lifter needs power and must be able to lift the weight. He or she needs to develop *strength-dominated* power. By identifying the specific requirements of the sport, the athlete can be better prepared by developing the type of power required.

How the body absorbs force

Forces exerted on the body are absorbed through the joints, which bend or flex in response to the impact. We see evidence of the body absorbing forces in activities such as rebounding in basketball, landing in high jump and stopping the bounce while on a trampoline (see figure 6.30).

When the body lands on a floor or similar surface, it exerts a force on the surface. In response, the surface exerts a force on the body. If we did not bend the knees and allow a slow, controlled dissipation of the forces by the muscles, the risk of injury to the joint would be increased. In an activity such as the

landing phase of a long jump, the muscles in the front of the thigh (quadriceps) lengthen while absorbing the force (see figure 6.31). Joint flexion helps prevent injury to surrounding tissue.

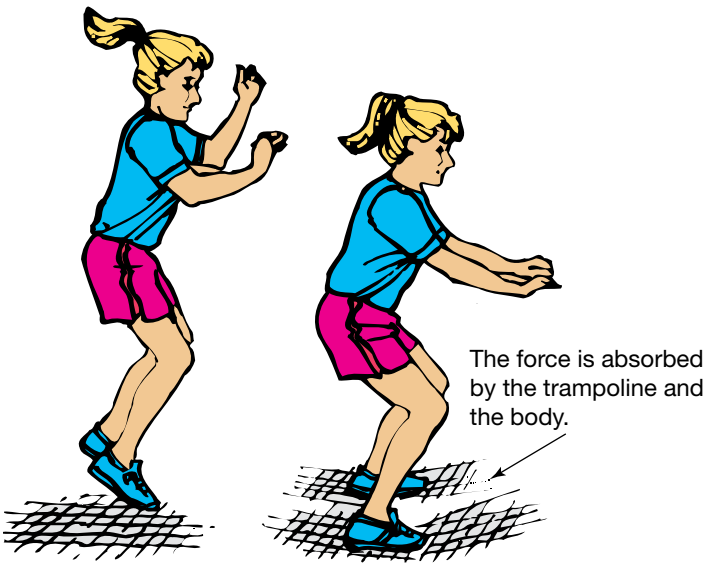


Figure 6.30: There are many instances in sport where the body must absorb force.



Figure 6.31: Joint flexion in absorbing forces helps prevent injury to muscles, tendons and ligaments.



APPLICATION

Observing forces being absorbed

Perform two long jumps — one covering a short distance and the other, the maximal distance that can be jumped. Observe the amount of knee flexion that you experience in each of the jumps.



INQUIRY

Absorbing forces

1. From your observation, was there a difference in the amount of knee flexion required for each jump in the application above?
2. Discuss why flexion is used in a movement of this type and why we may instinctively vary the degree of flexion.
3. To what degree do you think footwear and the landing surface assist in absorbing force?
4. Discuss why hard surfaces could result in more injuries than soft surfaces.

The body also absorbs forces while catching balls or similar objects. In the process of catching, a force is exerted by the ball on the hand and a force is exerted by the hand on the ball. Catching a ball can sting if the force of the ball is not absorbed effectively.

The impact felt by an object being caught is the product of:

- the force of the ball
- the distance through which the hands move while receiving the ball.

Since the force of the ball remains constant, the only variable that can be changed is the distance through which the hands move when catching the ball. To increase the catching distance and thereby absorb the force more effectively, we can use a number of techniques, including:

- the catching arm can be outstretched. When the ball meets the hand, the arm can be drawn quickly to the body.
- smothering the ball with the other hand
- catching with an outstretched arm and moving it past and behind the body to increase the distance over which the ball is caught
- pivoting the body during the catching action.

While some of these principles may help to reduce the impact from objects such as cricket balls, an overemphasis on reducing pain from impact may result in a dropped catch. Correct technique and practice are essential.



Observation of forces being absorbed while catching

Have two students throw an egg underarm to one another. Gradually increase the distance between the two. Closely observe the action of the hands as they receive the egg.

It would take little force to break the egg. From your observations, discuss how the students avoided breaking the egg for a period of time (if they did).



Techniques for absorbing forces when catching balls

1. In pairs and using a range of types of ball (such as cricket balls, softballs and baseballs), practise catching using the techniques suggested above.
2. Do you think any of the techniques suggested helped absorb the force of the balls?
3. If the techniques helped, from which technique did you find the greatest benefit? Why?



Analysing techniques for absorbing forces

1. How can the problem of absorbing force and developing technique be amalgamated in the development of young players?
2. Use the **Biomechanics research** weblink in your eBookPLUS to find out about current research in the science of biomechanics. Choose an area of research and present a short report about it to the class.

eBookplus

Application of force on an object

When applying force to objects, such as to a barbell, cricket bat or netball, there are a number of considerations. First, the quantity of force applied to the object is important. The greater the force, the greater is the acceleration of the object. A small soccer player whose mass and technique allows only small effort production provides little force to the ball in comparison to the same ball being kicked by a bigger player (other factors being equal) (see figure 6.32).

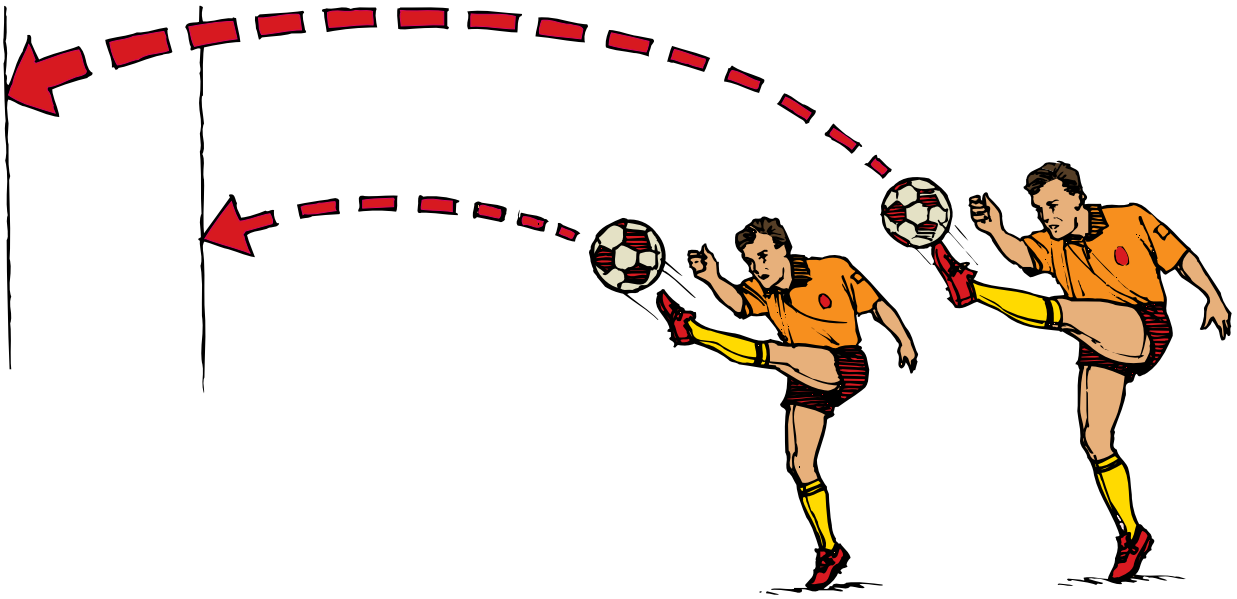


Figure 6.32: The greater the force, the more we are able to accelerate the object.

Second, if the mass of an object is increased, more force is needed to move the object the same distance. For example, if a football becomes heavier as a result of wet conditions, more force is required to pass or kick it (see figure 6.33).

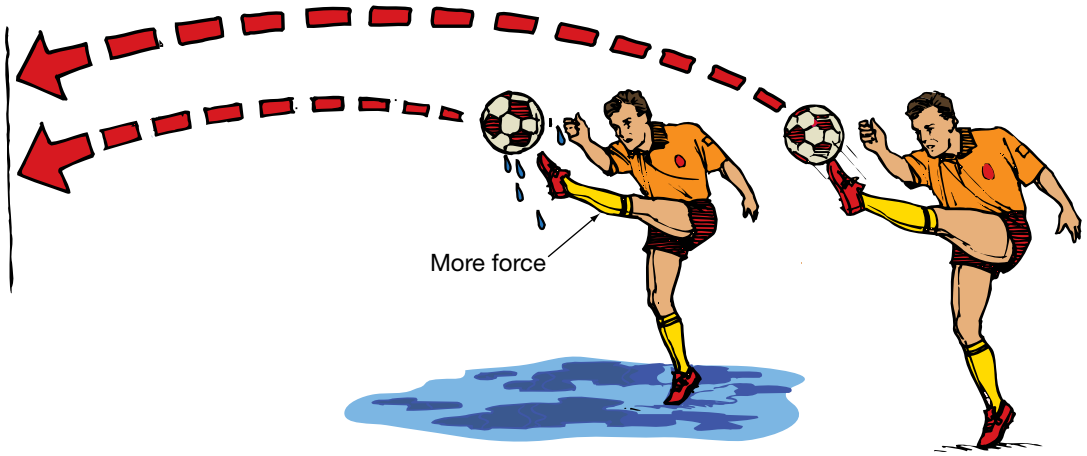


Figure 6.33: If mass increases, for example, a ball becomes wet, more force must be applied to move the object the same distance.

Third, objects of greater mass require more force to move them than objects of smaller mass. The size of the discus, javelin and shot-put used in athletics competitions is smaller for younger students than older students. This assumes that older students have greater mass and are thereby able to deliver more force than younger students because of their increased size (mass) and (possibly) strength.

Centripetal force is a force directed towards the centre of a rotating body.

Centrifugal force is a force directed away from the centre of a rotating body.

In many sports and activities, for example, ice skating or the hammer throw, the body rotates about an axis. When this happens, **centripetal force** and **centrifugal force** are experienced. Centripetal forces are forces directed towards the centre of a rotating body and centrifugal forces are directed

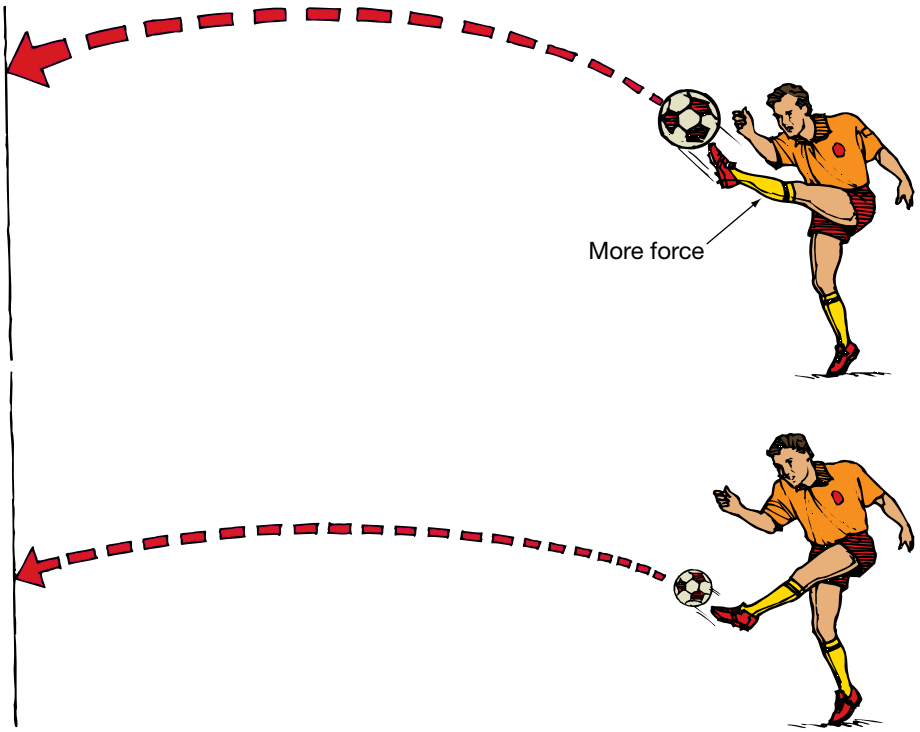


Figure 6.34: As the size of an object increases, more force is required to move it.

outwards. Two examples are the golf swing and hammer throw. Here a body rotates, generating powerful forces on objects (in this case, a golf club/ball and hammer ball), allowing them to be propelled distances far greater than would be possible without body rotation.



Figure 6.35: To remain balanced, a hammer thrower must lean further away from the heavy steel ball as rotation increases.

We experience these forces often in our lives. Passengers in cars experience centripetal and centrifugal forces each time a car goes around a bend. The centrifugal forces cause the passenger to slide towards the outside of the bend. Similar forces operate in the spin-dry cycle of a washing machine, removing water from the clothes. The greater the speed about the axis, the greater the force produced.

Another example is that of ice skaters who link arms to form a 'chain'. When the chain rotates about an 'axis' (the person closest to the centre), considerable speed is experienced by the person at the end of the chain. To counteract the centrifugal force, the skaters need to lean towards the centre and push outwards against the ice to maintain balance.

To manage centripetal and centrifugal forces in sporting situations it is important to:

- begin carefully so that you learn to feel the forces as they develop
- respond gradually, trying to match the force exactly
- work on your balance so that you become comfortable leaning beyond where you would normally be balanced
- ensure you have a firm handgrip if holding an object such as a bat or high bar
- bend your knees and ensure you have good traction if working on a track, field or circuit.



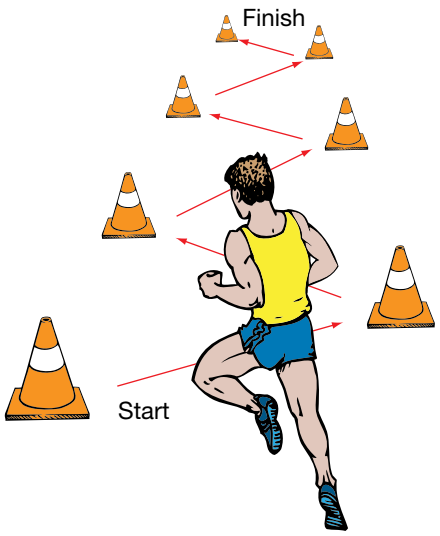
Applying forces

1. Place two objects of varying mass (for example, a shot-put and a tennis ball) on the classroom floor. Move each using a similar force, such as a finger flick.
2. Which implement could you move the furthest?
3. Explain the differences in distance in terms of application of force to the masses of the respective objects.



Applying forces when changing direction

Set up two lines of markers approximately five metres apart as shown in the figure below.



Run to each marker, then change direction by pushing off the foot nearer that marker. Keep your pattern of directional changes to the finish.

1. Explain how forces work in changing direction.
2. In what activities might more effective change of direction improve performance?



INQUIRY

Applying forces during the take off in a long jump

eBookplus

Use the **Forces in long jump** weblink in your eBookPLUS to review the information and drills. Identify ways of maximising force application to improve the distance jumped.



APPLICATION

Applying forces to objects

eBookplus

Use the **Tennis serves** weblinks in your eBookPLUS to view the short videos on developing correct serving technique in tennis. Notice how more force is gradually added to the serve once control is established.

1. Discuss what a player can do to gradually increase the amount of force applied to the ball while maintaining control of the serve.
2. Why is the development of force an advantage in most sporting activities?

SUMMARY

- Biomechanics is a science concerned with forces and the effect of these forces on the human body. A knowledge of biomechanics helps us choose appropriate equipment, improve technique and reduce the risk of injury.
- Motion is the movement of a body from one position to another.
- There are three types of motion — linear, angular and general.
- Velocity is equal to displacement divided by time. It is useful when calculating how quickly people or objects travel when their path is irregular (cross-country runner) or curved (javelin thrower).
- Speed is equal to the distance covered divided by the time taken.
- Acceleration is the rate at which velocity changes in a given amount of time. It is very important in short distance events.
- Momentum is the quantity of motion a body possesses. It is most apparent in collision situations. When this happens, momentum continues in the direction of the body with the greater mass (as long as other factors are equal).
- Momentum can be linear (in a straight line) or angular (moving around a point). Angular momentum can be seen in most activities, particularly when we use equipment such as sticks, bats and clubs.
- The centre of gravity of an object is the point about which all the weight is evenly distributed. The centre of gravity in humans is located approximately at waist height and in the middle between the front and back of the trunk.
- Knowledge of the location of the centre of gravity has important implications for sporting events such as high jump.

- The line of gravity is an imaginary vertical line passing through the centre of gravity and extending to the ground.
- The base of support refers to an imaginary line that surrounds the outside of the body when it is in contact with a surface. We improve balance by using a wide base of support. It becomes increasingly difficult to balance as we narrow the base of support.
- Fluid mechanics is a branch of mechanics concerned with properties of gases and liquids.
- Our body floats when the forces created by its weight are matched equally or better by the buoyant force of the water.
- Body density, or its mass per unit volume, impacts on the ability to float. A body or object floats if its density is less than that of the fluid.
- The weight and distribution of organs and tissues throughout the body influences flotation and the way the body floats (or sinks).
- The centre of buoyancy is the centre of gravity of a volume of water displaced by an object when it is immersed in that water.
- Drag is the force that opposes the forward motion of a body or object, reducing its speed or velocity.
- Lift is the component of a force that acts at right angles to the drag.
- The amount of drag is influenced by fluid density, object shape (bulky or streamlined), surface smoothness and size of the frontal area.
- Surface drag or skin friction refers to a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving.
- Profile drag (also called form or pressure drag) refers to drag created by the shape and size of a body or object.
- The Magnus effect explains why spinning objects such as cricket and tennis balls deviate in the air from a normal flight path.
- Force is the push or pull acting on a body. The body applies force in movements such as running and jumping. These applied forces are met equally by reaction forces. The concept of applied and reaction forces is explained by Newton's third law.
- Power is the application of force applied rapidly. Power is important to most activities, usually of short duration, such as jumping, starting in athletics and throwing.
- In both landing and ball-catching situations, forces can cause pain and sometimes injury. A knowledge of biomechanical principles helps us learn to absorb these forces effectively.
- The mass of commonly used sporting objects, such as soccer balls, can vary within a game if they become wet. The current mass of the object determines the amount of force that needs to be applied to gain the desired result.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

QUESTIONS

Revision

1. **Define** the term 'linear motion'. **Identify** two different sporting activities where players utilise linear motion for some of the time. (P9) (2 marks)
2. Use a sporting example to **explain** the difference between speed and velocity. (P9) (2 marks)
3. Choose one athletic event where speed is an advantage. **Explain** how biomechanical principles

could be applied to improve speed in this event. (P9) (4 marks)

4. What is acceleration? **Explain** how application of biomechanical principles can improve acceleration. (P9) (4 marks)
5. What is the difference between linear and angular momentum? Use an example to **describe** how we would identify each in a sporting situation. (P9) (4 marks)
6. What is centre of gravity? Using examples from a sporting activity, **discuss** how centre of gravity is controlled to improve performance. (P9, P7). (5 marks)
7. **Explain** the importance of the line of gravity in movement. (P7) (3 marks)
8. What is meant by the term 'base of support'? **Describe** two activities that differ in the size required for the base of support. How do athletes in these activities control upper body movements from the base of support? (P9, P7) (5 marks)
9. **Explain** why the ability to float might vary from one person to another. (P7) (4 marks)
10. **Discuss** the relationship between body density and the way we float (or sink). (P7) (5 marks)
11. **Explain** the relationship between the body's centre of gravity and centre of buoyancy in terms of flotation position. (P9) (5 marks)
12. **Discuss** how drag and lift forces impact on the flight of a javelin. (P9) (4 marks)
13. **Discuss** the factors that impact on the amount of drag a body or object experiences in fluid environments. (P9) (5 marks)
14. **Explain** the difference between surface drag and profile drag. (P9) (4 marks)
15. Use examples to **explain** developments that have taken place to reduce the impact of drag. (P9) (4 marks)
16. **Explain** the various types of spin that can be imparted on an object such as a table tennis ball. (P9) (3 marks)
17. **Explain** the Magnus effect in terms of pressure differences and resulting flight path. (P9) (4 marks)
18. **Define** Newton's third law. Use the law to **explain** the difference between applied and reaction force and how these are applied to typical sporting activities. (P9) (5 marks)
19. **Discuss** how forces are absorbed in the body. Using a catch in cricket as an example, **explain** how the absorption of forces can be more effective and less painful. (P9) (4 marks)
20. Using the topspin serve as an example, **discuss** the factors that affect the application of force to objects. (P7, P9) (4 marks)

Extension

21. Copy the following table on to a large piece of paper. Divide the class into four groups and complete one of the concept areas each. Have groups report their findings. Complete the full table based on class feedback and keep the information as a summary of the chapter. (P7, P9) (5 marks)

Concept	Specific principle	Example to explain how this principle influences movement
Motion	Linear motion	
	Velocity	
	Speed	
	Acceleration	
	Momentum	
Balance and stability	Centre of gravity	
	Line of gravity	
	Base of support	
Fluid mechanics	Flotation	
	Centre of buoyancy	
	Drag	
	Lift	
	Magnus effect	
Force	Applying forces	
	Absorbing forces	
	Applying force to objects	

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

Options

PRELIMINARY OPTION 1
CHAPTER 7 FIRST AID

PRELIMINARY OPTION 2
CHAPTER 8 COMPOSITION AND PERFORMANCE



eBookplus
ONLINE ONLY

Chapter 8 'Composition and Performance' for Preliminary Option 2 can be found online in your eBookPLUS in both HTML and PDF formats, along with additional resources.

PRELIMINARY OPTION 3
CHAPTER 9 FITNESS CHOICES

PRELIMINARY OPTION 4
CHAPTER 10 OUTDOOR RECREATION

CHAPTER 7
First aid



OUTCOMES

On completion of this chapter, you will be able to:

- propose actions that can improve and maintain an individual's health (P6)
- demonstrate strategies for the assessment, management and prevention of injuries in first aid settings (P12)
- form opinions about health-promoting actions based on critical examination of relevant information (P15)
- use a range of sources to draw conclusions about health and physical activity concepts. (P16)

OVERVIEW

SETTING PRIORITIES FOR MANAGING A FIRST AID SITUATION AND ASSESSING THE CASUALTY
Situational analysis
Priority assessment procedures
DRSABCD
STOP regime

CRISIS MANAGEMENT
CPR
Bleeding
Shock
Neck and spinal injury
Moving the casualty
Medical referral
Care of the unconscious casualty

MANAGEMENT OF INJURIES
Applying bandages, slings and splints

MANAGEMENT OF MEDICAL CONDITIONS

PHYSICAL ENVIRONMENT
Traffic accidents
Water environment
Electricity

INFECTION CONTROL AND PROTECTION
HIV/AIDS
Blood-borne viruses (hepatitis B and C)

LEGAL AND MORAL DILEMMAS
Legal implications
Moral obligations
Commonsense versus heroics

SUPPORT FOLLOWING FIRST AID SITUATIONS
Debriefing
Counselling

The priority when assessing and managing first aid patients is minimising the harm to:

- yourself
- bystanders
- the casualty.

When managing the first aid situation, it is important that the circumstances and eventual outcomes for the patient are improved as much as possible. Expediency and appropriate care here positively affect the individual's quality of life.



SETTING PRIORITIES FOR MANAGING A FIRST AID SITUATION AND ASSESSING THE CASUALTY

Situational analysis

For most of our lives few, if any, emergencies requiring us to use life-sustaining skills ever happen. However, there is a chance that at some stage we may need to resuscitate a person whose breathing or heart function (or both) have ceased. This could be the result of a range of circumstances, including:

- a car accident
- drowning
- electric shock
- a serious sporting injury
- a heart attack
- a stroke
- drug overdose
- envenomation (bites by snakes, spiders, etc.).

To deal with this quickly, effectively and without risk to yourself or others, you need to:

- *analyse the situation.* Observe what has happened (poisoning, car accident, drowning, etc.) and ask yourself: 'What's the best I can do for this person(s) in terms of the skills that I have?'
- *plan how to deal with the situation.* Prioritise your intended actions, dealing with the most important issues first.
  - Use bystanders (if available) to get medical assistance and help where necessary.
  - Minimise danger to yourself and others.
  - Clear airways and restore breathing.
  - Control bleeding.
  - Tend to other injuries, such as burns and fractures.

You may be alerted to a potentially life-threatening situation by instances such as:

- the noise of a car crash
- a scream if a person is bitten by a venomous spider
- smoke
- an alarm
- being part of a situation where an accident or mishap occurred, such as a sporting injury or electrocution in the home.

In these situations it is essential that your life and safety are not placed at risk. You need to approach the situation and remain alert to possible environmental

hazards that may have contributed to the accident or occurrence. You must not become a victim yourself. For example:

- a house or room may be filled with smoke. Entering the room without proper equipment will cause you to suffocate.
- you may be tempted to save a drowning person when you cannot swim
- a person may be trapped in a burning car and the chance of the fuel tank exploding is imminent.

You cannot administer effective first aid if you are injured in attempting to help someone else. The Royal Life Saving Society Australia suggests that all first aid treatment is based on:

- commonsense and
- knowledge

and that these factors go hand-in-hand in the preservation of life. Keeping this in mind, you should:

- check for danger
- take steps to remove or limit the danger or remove the victim from the danger.

eBookplus

Use the **Australian Resuscitation Council** weblink in your eBookPLUS to view updates on new techniques and procedures for first aid. It also provides guidelines and life support flow charts.

Priority assessment procedures

In emergency situations, it is important to act quickly but calmly. Urgency is critical because if the passage of air to the lungs is blocked or the heart has ceased to beat, brain function progressively shuts down. Each second lost places the patient at further risk of brain damage and death.



Figure 7.1: Settings where first aid may be required are many and varied.

Royal Life Saving Society Australia guidelines (*Everyone Can be a Lifesaver: Resuscitation Teachers Guide*, 2nd edn, RLSSA, Sydney, 2006, p. 15) state that 'the first person at the scene is responsible for the initial support of the casualty', including working through the DRSABCD action plan (see page 264). The second person needs to support the first person by 'contacting emergency services, protecting and interviewing bystanders and gathering first aid equipment before helping with resuscitation'. Should two people arrive at the same time, the most experienced should immediately attend to the casualty.

Procedures to follow during an emergency may include:

- requesting a mobile phone from bystanders
- contacting emergency services
- directing people to go for help
- instructing people on how to give two-operator cardiopulmonary resuscitation
- requesting assistance with bandaging, control of bleeding or attaching slings and splints
- observing people who may be in a state of shock.

When contacting emergency services, the following order of priorities needs to be observed.

- Dial 000 and request help.
- State the type of accident (car, drowning, electrocution, etc.).
- State the number of people injured.
- Clearly identify the location by providing the house number, street and suburb. If an accident has happened on the road, name the road and the nearest cross-street if possible.

INQUIRY

Managing emergency scenarios

From a class discussion, generate a list of situations that people are likely to come across that may require emergency care (for example, plane crashes, emergency landings, being trapped in a snow cave). Have each person in the class briefly write a scenario for one of the incidents. Read each scenario. As a group, suggest the potential dangers that exist and develop an overall management plan for handling each situation.



Figure 7.2: Instructions for CPR can be purchased from the Australian Red Cross and downloaded to your mobile phone by texting CPR to 199 515 15. A free app for smartphones is also available.

DRSABCD

The DRSABCD action plan is easy to remember and, when the procedures are carried out correctly, you have the best chance of sustaining life, preventing further injury and minimising risk to all. Follow this plan when you believe someone is not breathing or their heart has stopped beating. The DRSABCD basic life action plan is summarised in table 7.1.

Table 7.1: DRSABCD basic life action plan

D	Danger	Check for dangers and hazards to the rescuer, bystanders and the casualty.
R	Response	Assess the level of consciousness of the casualty.
S	Send for help	Call triple 000 for an ambulance or ask another person to make the call.
A	Airway	Open, clear and maintain the casualty's airway. Check for signs of life.
B	Breathing	If casualty is not breathing, commence rescue breathing.
C	Compressions	If no signs of life, commence cardiopulmonary resuscitation (CPR), which is a combination of chest compressions and rescue breaths.
D	Defibrillation	Where possible, ensure a defibrillator is utilised as quickly as possible.

Source: http://nsw.royallifesaving.com.au.

Danger

The first step is to check for danger to:

- yourself
- other people
- the patient.

No further steps should be taken until all elements of danger are removed. This may require actions such as:

- turning off the power at a light switch or fuse box
- dragging an injured person away from flames or dangerous fumes
- extinguishing flames or removing flammable liquid.

The danger of cross-infection from communicable diseases, such as tuberculosis and meningitis, is of concern to many. In regard to this, RLSSA provides the following advice.

> *It is important to remember that the risk of cross-infection in the performance of rescue breathing is very low. Therefore, in an emergency, resuscitation should not be withheld because of fear of infection. Using a mask or other barrier device will significantly reduce the potential for cross-infection.*
>
> *Source: Everyone Can be a Lifesaver*, op. cit., p. 18.



Figure 7.3: Check the patient's response.

Response

The next step for the rescuer is to determine the victim's level of consciousness. They may be unconscious and therefore unable to respond in any manner, or partly conscious and able to make some response such as a groan or movement. To assist in making an assessment, the rescuer should gently squeeze the shoulder of the victim and ask questions or give commands in a loud voice, such as 'Can you hear me?', 'Open your eyes' or 'Squeeze my hand'. If there is a response, place the victim in the recovery position and seek medical help.

Management of a conscious patient

Management of a conscious patient requires

- treating shock, bleeding, fractures and other injuries as may be required
- placing the patient in a comfortable position, taking into account the type of injuries sustained.

Priority with an unconscious victim

The unconscious casualty must be handled very gently. Care must be taken to avoid twisting or forward movement of the head or neck to prevent, or minimise, further aggravation of a neck injury, if present. However, establishing and maintaining a clear airway takes priority over a spinal injury.

Source: ibid, p. 26.

How to place the patient in the recovery position

- Kneel beside the unconscious patient, knees slightly apart and centred between the patient's shoulders and waist.
- Lean across the patient and grasp the arm on their far side. Extend this arm out from the body.
- Take the patient's nearest arm and place this across their chest so that their hand rests on the shoulder of the arm that is extended (figure 7.4).

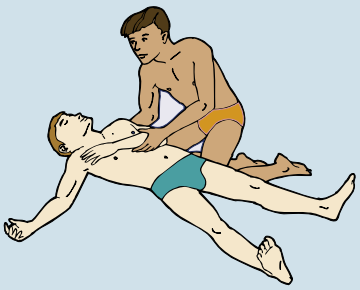


Figure 7.4: Preparing the patient to be moved into the recovery position

- Place your hand that is nearest to the patient's leg behind their knee while supporting the shoulders with the other hand. Lift the leg until the foot is flat on the floor (figure 7.5).

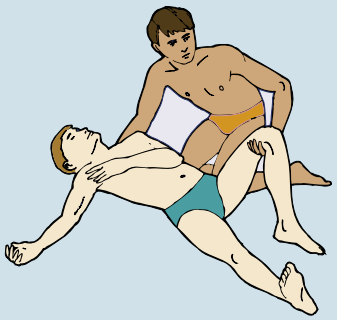


Figure 7.5: Positioning the nearest knee in preparation for the roll

- Using both hands, roll the patient away from you and on to their side. The lower arm should still be outstretched. The upper leg should roll across and on to the floor. The neck may need to be supported. The patient is now in the recovery or lateral position (figure 7.6).

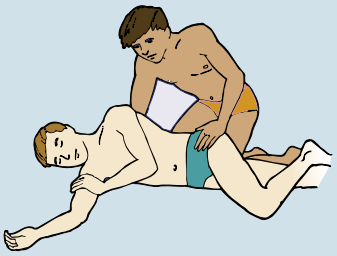


Figure 7.6: Patient in the recovery position



Figure 7.7: The head tilt and jaw support

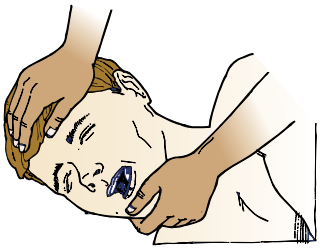


Figure 7.8: Opening the airway by extending the neckline

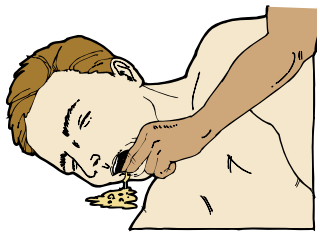


Figure 7.9: The mouth must be cleared of foreign objects as these may stop the passage of air to the lungs.

Send for help

If there is no response, immediately send for help by dialling triple zero (000) and indicate ambulance, fire or police. If other people are present, have them make the call while you check the airway and breathing. The person making the triple zero call should be prepared to answer questions and be aware of the condition of the patient. Questions may relate to the specific location (house number and street), access, type of injury (for example, drowning), number of people injured, estimated age, breathing and level of consciousness. Remember to stay on the phone as there may be more questions and possibly instructions given until emergency personnel arrive.

Airway

If there is no response, it could well be that the airway is blocked, preventing oxygen from reaching the brain. Simply opening the airway could well be sufficient to start a recovery. Ensuring that the airway is open is critical as all further action will be in vain if the blockage remains.

The airway can be checked after tilting the head back. This is performed by placing one hand on the forehead and the index finger and thumb of the other hand on the chin, then gently extending the neckline. This procedure is carried out while the patient is lying on their back, except in drowning cases where the patient is placed in the lateral or recovery position (see figures 7.4, 7.5 and 7.6). The degree of head tilt increases with the age of the casualty. In the case of infants, head tilt is not required but the head must always be supported during the administration of rescue breaths. Some head tilt is required with young children, increasing to full head tilt (keeping safety in mind) with adults.

Any foreign objects may then be cleared by inserting fingers carefully into the mouth. False teeth need not be removed unless they have become dislodged from their original position. It is desirable that the head is tilted backwards and slightly downwards to permit drainage of fluid and mucus from the mouth.

With the airway cleared, the rescuer can now look for any *signs of life*. These signs are if the victim is:

- conscious or unconscious
- responsive or unresponsive
- moving or not moving
- breathing or not breathing.



Figure 7.11: Give the patient two rescue breaths.

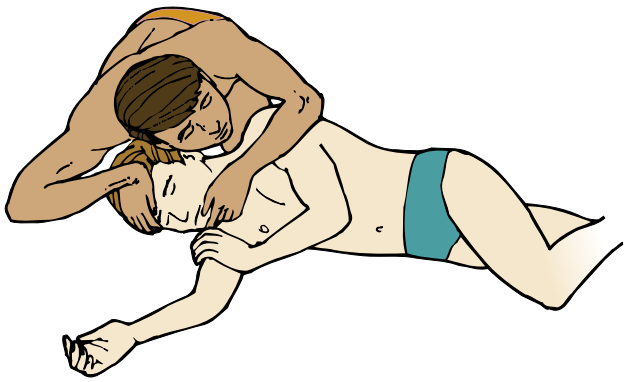


Figure 7.10: Looking for signs of life in a drowning victim

If breathing commences:

- leave the patient in the same position ensuring that the head is tilted and the airway remains open
- reassure the patient
- send for medical assistance.

If the patient is breathing but unconscious, place the patient in the recovery position and support him or her until help arrives.

Breathing

The check for breathing should take five to 10 seconds and certainly no more than 10 seconds. Some patients, particularly adults, may gasp during the first minutes following collapse. Rescuers need to be aware of the difference between gasping and breathing. During a gasp, the patient will draw in breath sharply. This short, convulsive intake of air should not be mistaken for breathing.

Rescuers need to focus on determining whether or not breathing is present. If breathing is not present, **cardiopulmonary resuscitation (CPR)** must begin immediately. Cardiopulmonary resuscitation is a life-sustaining procedure that uses rescue breathing and chest compressions to stimulate blood flow and oxygen delivery when a person has stopped breathing or their heart has stopped beating.

The first step in providing CPR is to give the patient two **rescue breaths**. A rescue breath is a breath given to a victim who is not breathing. The breath takes one second to deliver and makes the victim's chest rise.

In providing a rescue breath, it is important to breathe normally. Do not take a big breath or blow hard into the patient's lungs. A normal breath should be sufficient to make the patient's chest rise. Do not check the pulse, but continue to be aware of any signs of life in the patient.

To perform a rescue breath:

- kneel beside the patient and tilt the head back
- place the thumb across the chin, the index finger underneath and then lift the chin
- pinch the nostrils with the thumb and index finger of the hand providing the head tilt
- place your mouth firmly over the person's mouth making an airtight seal
- take one second to breathe into the patient's mouth
- turn your head towards the patient's stomach and place an ear close to the patient's mouth. Listen for air being exhaled and watch for a fall in the chest.

It is important for the rescuer to observe the chest following the first rescue breath. If it fails to rise, the head-tilt chin-lift needs to be done again to ensure there is no obstruction to the airway. Then provide the second rescue breath. If there is no observable chest rise following the second rescue breath, chest compressions need to begin regardless. If rescue breaths are sufficient to generate signs of life (coughing, moving, breathing), place the patient in the recovery position until professional responders take over.

Cardiopulmonary resuscitation (CPR) is a life-sustaining procedure that uses rescue breathing and chest compressions to stimulate blood flow and oxygen delivery when a person has stopped breathing or their heart has stopped beating.

A **rescue breath** is a breath given to a patient who is not breathing. The breath will take one second to deliver and will make the patient's chest rise.

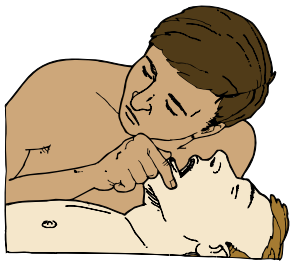


Figure 7.12: Watch for the patient's chest to fall after a rescue breath.



Figure 7.13: Place the heel of the hand on the chest at about the nipple line.

Chest compressions are downward thrusts on the centre of the chest that stimulate blood flow to vital organs in the body.

Compressions

Chest compressions begin immediately the two rescue breaths are complete. These should be given at the rate of about 100 per minute. After each cycle of 30 chest compressions, two rescue breaths should be given. Rescuers should push hard and fast, briefly relaxing after each downward thrust to allow the chest to return to its normal position. Chest compressions keep the blood flowing so it is important to maintain a rhythm that is interrupted only by brief rescue breaths.

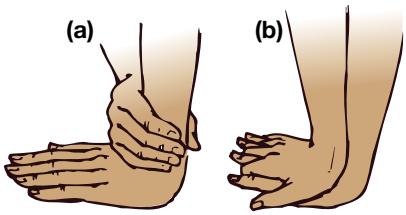


Figure 7.14: **(a)** Keep the palm flat and grip the wrist firmly with a thumb/finger lock or **(b)** fingers interlocked.



Figure 7.15: Use two fingers when giving CPR to infants.

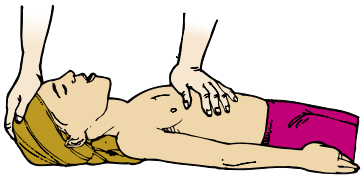


Figure 7.16: Use one or two hands when giving CPR to children.

To perform a chest compression:

- maintain the same kneeling position as required for the rescue breath
- locate the breastbone (centre of the chest) at about the nipple line and on it place the heel of one hand. Fingers should be parallel to the ribs (figure 7.13).
- place the heel of the other hand on top and either interlock the fingers or hold the wrist so that the arms work as one (figure 7.14)
- the rescuer's shoulders should be directly above the patient's chest, allowing body weight to assist the compressions. Providing chest compressions can be exhausting, so it is important for the rescuer to use their weight, not just their arms.
- the depth of compressions should be about one-third of the depth of the chest for all age groups
- focus on making each compression a smooth, rhythmical action, the downstroke (compression) taking the same period of time as the upstroke (relaxation phase)
- for infants, use only two fingers to apply compressions. These should be placed slightly below the nipple line (figure 7.15).
- in the case of children, rescuers decide between one or two hands depending on the size of the patient (figure 7.16).

If two rescuers are present, the roles should be changed approximately every two minutes because of the tiring nature of the procedure. Rescuers should continue the cycle of 30 chest compressions followed by two rescue breaths until:

- signs of life return
- more qualified help arrives
- continuation is impossible due to exhaustion
- an authorised person pronounces life to be extinct.

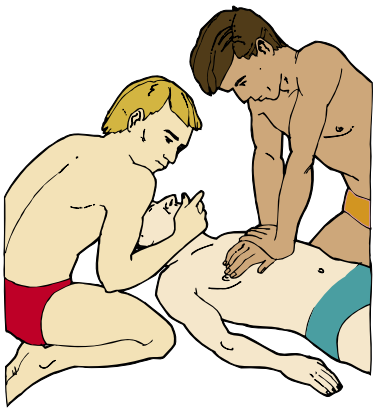


Figure 7.17: Two-operator CPR

Signs of life:

- responsive
- conscious
- breathing
- moving



APPLICATION

Demonstrate CPR procedure using a manikin

Form groups of three and assign a manikin to each group. Allocate the following roles:

- rescuer
- bystander
- observer.

In the demonstration, the rescuer prepares for and then performs CPR on the manikin for two minutes, following which he/she is then assisted by the bystander for a further minute. The role of the observer is to make notes on the demonstration and then provide feedback that addresses the following:

- positioning (on back, head tilt, chin lift)
- checks for signs of life (responsive, conscious, breathing, moving)
- finds no signs of life (begins CPR)
- procedure (two rescue breaths followed by 30 compressions)
- observation (looks, listens, feels)
- timing (breathing rate — one second per inhalation; compression rate 100 per minute)
- cycle (30 compressions followed by two rescue breaths)
- mouth seal — must be effective
- capacity of rescue breath (sufficient to raise chest)
- position of shoulder and arms (directly over chest)
- depth of compressions (one-third depth of chest)
- rhythm of compressions (50:50 compression to relaxation).

Rotate roles at the end of two minutes and then take time to provide feedback. Have the group cycle through the demonstration at least three times, or until the CPR can be demonstrated accurately and effectively.



Figure 7.18: The basic life support flowchart

Defibrillation

A **defibrillator** is a device that provides an electric shock to a patient whose heart has stopped beating.

Use of **defibrillators** greatly improves the chances of survival, particularly following a heart attack. A defibrillator is a device that provides an electric shock to a patient whose heart has stopped beating.

Defibrillators were once used only in hospitals. They are now commonly used by ambulance officers and other qualified rescue personnel.

Some emergency care situations involve multiple injuries and CPR may be needed. In situations like this, you need to prioritise, working progressively from the most to the least serious condition. Priority order can be remembered if you keep in mind the four Bs and work through them in the following order:

1. Breathing
2. Bleeding
3. Burns
4. Bones.



Figure 7.19: A defibrillator

APPLICATION

Scenario test

You are lying on your bed reading a book. You hear a loud noise and your reading light goes out. You race to the kitchen and arrive at the same time as your older sister. You find your younger brother, Ben, lying on the floor, apparently unconscious. There is smoke coming from the toaster which has fallen from the bench.

In groups of three, re-enact this situation. Demonstrate the procedures you would follow in providing emergency care to Ben if:

- you were the only person other than Ben in the house
- you now have help from your older sister who knows little about emergency care.

During the scenario, practise the transition from one-operator to two-operator CPR and coordinate the operations.

INQUIRY

Prioritising emergency procedures

1. Discuss how effectively the emergency procedures required in the application above were put into place.
2. What role did you give to your sister? Why?
3. Discuss how you would allocate priorities in situations where you have a number of helpers, but none of them have emergency care experience.

STOP regime

Using the STOP regime for evaluation of suspected injuries precedes a whole of body assessment. Use of STOP, particularly in sports situations, increases the chances of correct diagnosis of minor injuries, leading to a more accurate whole of body assessment.

The same applies if the injury is incurred outside a sporting situation. The injured person needs to demonstrate that they can perform movements, skills or actions without assistance. If there is any doubt about the risk of further injury to the injured person, consult an appropriate professional.

STOP regime

If you have established that there is no danger to life, use the STOP regime to assess the severity of other injuries such as injury to ligaments, tendons and muscle. STOP is an acronym for

Stop
Talk
Observe
Prevent further injury.

Stop

Stop the athlete from participating or moving. Stop the game if necessary. →

Don't panic — stay cool.

Talk

Talk to the injured athlete. →

- What happened?
- How did it happen?
- What did you feel?
- Where does it hurt?
- Does it hurt anywhere else?
- Have you injured this part before?

Provide a few words of encouragement.

Observe

Observe the following while talking to the athlete. →

General:

- Is the athlete distressed?
- Is the athlete lying in an unusual position/posture?

Injury site:

- Is there any swelling?
- Is there any deformity?
- Is there any difference when compared to the other side/limb?
- Is there tenderness when touched?
- Does it hurt to move the injured part?

If the answer to any of these questions is yes, seek an ASMF accredited sports trainer or qualified first aid support.

Prevent further injury

Three options

Severe injury Suspected head, facial, spinal, chest, abdomen injuries, fractures or major bleeding	→	*Get help* Get professional help; don't move the athlete.	→	• Keep onlookers away. • Comfort the athlete until professional help arrives.
Less severe Soft tissue injuries such as sprains, strains and muscle bruises	→	*RICER regime* The first 48 hours are vital with soft tissue injuries.	→	• Rest • Ice • Compression • Elevation • Referral
Minor injuries Bumps and bruises that do not impair performance	→	*Play on* A few words of encouragement will help.	→	• Monitor any such injuries. • Minor injuries should also be managed using the RICER regime.

Figure 7.20: The STOP regime (*Source:* Matthew Reid, Sportsafe, Australian Sports Medicine Federation and Australian Sports Commission, Canberra, 1990.)

CPR

In cases where the danger has been removed, the patient has been rolled into the recovery position and the airway checked for materials that might cause an obstruction, there is still a chance that breathing will not commence. In these situations, *cardiopulmonary resuscitation (CPR)* must be administered.

eBookplus

Review pages 264–70 where the procedure for rescue breaths and compressions for CPR is described in detail. You might also use the **CPR demonstration** weblink in your eBookPLUS to watch a video of the correct procedure.

Bleeding

Bleeding is the loss of blood from any of the body's blood vessels. By observing a wound, it is possible to determine the type of vessel that is damaged. If the blood comes from an artery it will be bright red and may spurt. If the blood is from a vein it will be darker and the flow is not as forceful. If the blood is from a capillary it will tend to ooze. The first two types of cut are life threatening and require immediate attention.

Bleeding is caused by cuts, contusions, lacerations and abrasions. Most bleeding happens externally, as in the case of a bleeding nose or a laceration to the leg. The steps for management of bleeding from a laceration or similar injury are:

- use the DRSABCD action plan (see pages 264–70)
- apply direct pressure by holding a pad or dressing firmly over the site
- lay the casualty down and elevate the injury
- rest the injured area
- do not give anything to the patient by mouth, particularly aspirin, as this tends to increase the rate of bleeding
- loosen tight clothing
- seek medical advice.

The acronym PER is helpful in remembering what to do in the case of bleeding. It stands for:

- **P**ressure
- **E**levation
- **R**est.

It is important that embedded objects (for example, gravel and broken glass) and bandages that are soaked with blood are not removed as this may increase both the damage to the injury and allow further loss of blood. Where possible, wear gloves to minimise infection through blood-to-blood contact.

Shock

Shock is a condition where the body closes off the blood supply to the extremities (arms, legs and skin) to ensure enough oxygen reaches vital organs (heart, lungs and brain). This can be potentially damaging and even life threatening as it may lead to the collapse of the circulatory system. The causes of shock include:

- loss of blood from a wound
- loss of fluid, as happens with dehydration, burns and bleeding
- heart attack
- being involved in an accident.

The most common symptoms of shock are:

- paleness and cold, clammy skin
- weak, rapid pulse
- rapid, shallow breathing
- nausea and faintness.

In the event of shock, use the following management procedures:

- Use the DRSABCD action plan.
- Reassure the patient.
- Seek medical advice.
- If there is no evidence of fracture to the person's limbs, raise the legs above the level of their heart.
- Dress any wounds or burns.
- Loosen any restrictive clothing, particularly around the neck.
- Keep the casualty comfortable (not too hot or cold), but do not give them any food or drink.

Neck and spinal injury

The signs and symptoms of a neck or spinal injury are:

- pain at or below the site of the injury
- loss of movement
- lack of movement below the site of the injury
- tingling in the hands or feet.

Management of neck and spinal injuries

If the casualty is conscious:

- reassure them
- loosen any tight clothing
- do not move them. Support their head and apply a cervical collar if one is available.
- seek medical attention
- monitor the casualty closely.

If the casualty is unconscious, treat them as if they have a spinal injury and use the DRSABCD procedures. Be careful when turning the patient onto their side. Apply a brace to the neck if possible and try to minimise all neck movement.

Moving the casualty

Unless absolutely essential, a casualty should not be moved. However, there may be some situations where it is necessary to move a casualty quickly, such as

- from a smoke-filled room
- to higher ground level because of rising water
- from a building that is in danger of collapse.

However, if there is no impending danger, the preferred method of transport is by ambulance. This is because medical officers are trained how to move injured people and have the necessary equipment and vehicle to do so. Unnecessary movement may further complicate the injury and make rehabilitation more difficult.

If a casualty needs to be moved, use the following guidelines.

- Work through the DRSABCD regime.
- Work with the patient and tell them what you intend doing. Seek their help when you move them.

- Ensure that fractures have been immobilised and other injuries such as burns or punctures treated.
- If you need to lift the injured person, use your leg muscles and keep your back straight.
- Hold the patient firmly and communicate with them frequently so that you become immediately aware of any problems when you are moving them.
- Stop as often as is necessary.
- Minimise movement of the neck and spinal cord.



First aid scenarios

Prior to the lesson, have one student copy the following scenarios to cards:

1. You are the first to arrive at a traffic accident where the driver is conscious but bleeding from the face and hands.
2. Your brother is cooking vegetables on the stove and accidentally knocks the handle of a saucepan, tipping boiling water on to his thigh.
3. Two cars have collided. The driver of one car remains conscious but trapped, while there is no movement from the driver of the other car. A passenger in that car becomes hysterical.
4. Your best friend asks you to come to her house urgently. When you get there you find her unconscious on the floor with an empty pill bottle beside her.
5. You are relaxing by the river watching people waterski. One of the skiers hits a submerged log, throwing him off balance. He is picked up by the boat driver, but complains of severe pain in the back and that he has no feeling in one of his legs.
6. You are at a party when a fight breaks out. Your friend is hit on the nose and mouth, causing bleeding and dislodging a tooth.
7. You are the first to arrive at a car accident where the driver is unconscious at the wheel, having sustained facial injuries. There is a strong smell of alcohol.

During the lesson, the student should distribute the cards to small groups and allow each group five minutes to conduct an assessment of the situation, then plan an appropriate response.

Pass the cards around the groups until all students have addressed each scenario. At the conclusion, the student leader collects the cards and shuffles them. The leader then chooses a card, reads the scenario and selects a person from each group to briefly report on their response to the situation. Encourage class discussion of issues and evaluate the responses.

Medical referral

The patient needs to be sent to hospital if any of the following happened:

- CPR was required
- the patient was unconscious at some stage
- conditions such as a heart attack or spinal injury were suspected.

Care of the unconscious casualty

Proper care of an unconscious person includes

- rolling them to the recovery position when breathing returns
- supporting their neck to ensure that it remains extended and allows a passageway of air to the lungs
- if outdoors, protecting them from the weather
- keeping them warm

- not giving them food or drink until a medical officer gives approval. This is particularly important where surgery may be required.
- collecting details about the history of the injury.



INQUIRY

Utilising safe procedures when moving a casualty

In groups, discuss procedures that need to be employed to safely move a casualty in each of the following scenarios.

- A person has a suspected heart attack while at work in a city office block
- A glass repair worker has cut his arm while repairing a window in a suburban house
- A person suffers shock following a car accident on a country road
- A player incurs suspected neck and spinal injuries as a result of a tackle during a school football game.

Report your findings to the class.



MANAGEMENT OF INJURIES

Individuals can sustain a wide range of injuries. It is particularly important to be able to identify the symptoms for each type of injury and be familiar with the appropriate management techniques. Paying careful attention to the surrounding environment (such as the presence of electrical wires) and gaining an account of what happened from listening to the injured person or bystanders helps assess the type of injury and determine the management technique. Table 7.2 lists types of injury, their associated symptoms and a suggested management plan.

Table 7.2: Types of injury, associated symptoms and management

Type of injury	Signs and symptoms	Management
Cuts and lacerations		
• abrasions	• scraped skin caused by a fall on a hard surface	• cleanse thoroughly with sterile material • apply nonstick dressing
• open wounds	• incisions or lacerations	• DRSABCD • control bleeding using pressure • cleanse thoroughly • apply clean dressing • seek medical attention
• penetrating wounds	• deep wound from an object, for example, a bullet	• control bleeding using pressure • clean if possible • apply clean dressing • seek medical attention
Fractures. These can be closed (skin unbroken), open (bone protrudes) or complicated (damage to organs).	• sound from the bone breaking • pain at the site • swelling and deformity • tenderness • loss of power • difficult to achieve normal range of movement	• DRSABCD • control bleeding • immobilise with a sling or splints • observe for shock and treat if necessary • seek medical attention

(continued)

Table 7.2: *(continued)*

Type of injury	Signs and symptoms	Management
Dislocations — this refers to the bone being dislodged from the joint	• swelling • discolouration • pain • deformity • tenderness • inability to move	• DRSABCD • support • apply ice • elevate if possible • seek medical attention
Head injuries and concussion	• blurred vision • loss of memory • headache • change in size of one pupil • bleeding from nose or ears • abnormal response to commands	• DRSABCD • support the head or neck • keep airway open • if conscious, lay in the lateral position • do not apply pressure to a bleeding head if a skull fracture is suspected • seek medical attention
Eye injuries	• irritation to the eye • watering • redness • pain to the eye itself • inability to open	• rubbing and removal of embedded objects must be avoided • lay in the lateral position • cover both eyes • seek medical attention
Nasal injuries	• pain • swelling • deformity • bruising	• instruct casualty to breathe through the mouth • blowing the nose should be avoided • assume sitting position with head and shoulders leaning forward • apply pressure with the index finger and thumb to the soft part of the nose just below the bone • apply pressure for 10 minutes or until bleeding stops • seek medical attention
Burns. These can be caused by fire, chemicals, electricity and radiation.	• severe pain • possible swelling • redness • blistering • shock	• remove the casualty from the danger or the danger from the casualty (for example, fire, smoke, electrical wires with a stick or nonconducting implement) • DRSABCD • hold burnt area under cold running water • remove jewellery and clothing only if it is not stuck to the skin • seek urgent medical attention *Note:* Do not break blisters or apply creams, lotions or adhesive dressings.
Teeth injuries	• bleeding from the mouth • dislodged tooth	• if the tooth has been loosened, keep it in place and seek immediate dental advice • if the tooth has been knocked out, re-implant and splint to an adjacent tooth using aluminium foil, if possible. If not, place in milk or clean with the casualty's saliva and seek urgent dental assistance. Most teeth can be saved if the root is not handled, hygiene is observed and attention is immediate.
Electrocution	• unconsciousness • electrical wires may be visible	• DRSABCD • cool burnt area under running water • seek urgent medical attention
Chest injuries. These may range from bruised or fractured ribs to lung injuries.	• pain, usually on breathing and coughing • difficulty in breathing • tenderness when touched	• place in a comfortable position • encourage shallow breathing • pad the injured area • seek urgent medical advice
Abdominal injuries. These are injuries to the stomach and pelvis caused in such instances as car crashes and tackles.	• shock • pain in the region • nausea or possibly vomiting • difficulty in breathing • possible blood in the urine or coming from the anus.	• DRSABCD • loosen clothing in the area; for example, belts • lie patient on their back. Slightly elevate shoulders and bend the knees. • do not allow the casualty to consume food or drink • seek urgent medical attention.

Applying bandages, slings and splints

Folding a triangular bandage

To fold a triangular bandage:

- place an open triangular bandage on a flat surface
- fold the apex to meet the middle of the base
- halve to form a broad fold bandage
- fold the two ends in to meet at the centre
- fold the ends of the bandage to meet in the centre again
- fold the bandage in half to form a compact package.

Triangular bandages are usually stored folded this way.

Arm sling

The arm sling is used to support a fractured forearm and wounds to the arm.

- Reassure the casualty.
- Place the casualty in a comfortable position with the injured part supported.
- Face the casualty.
- Place the open triangular bandage across the chest with the point of the bandage well beneath the injured arm (apex level with the elbow).
- Take the upper point over the shoulder and behind the neck.
- Bring the lower point over the injured arm.
- Tie the two ends together with a reef knot on the injured side so that the knot fits into the hollow of the neck.
- Fold the apex neatly in front of the arm and pin or tape. Make sure the hand is fully supported and the fingernail of the little finger is exposed.
- Check for circulation.



To see a video demonstration of this technique, use the **Arm sling** weblink in your eBookPLUS.

Collar and cuff sling

The collar and cuff sling is used to elevate the arm when the hand or forearm are bleeding. It is also used when the humerus is injured.

- On a flat surface, roll a triangular bandage along its length.
- Pick up one end and form a circle that is about the size of your hand.
- Pick up the other end and form another circle of similar size.
- Place one circle on top of the other and slide on to the patient's arm.
- Pull the ends to secure at the wrist.
- Then pull the ends to the back of the neck and secure by tying.



To see a video demonstration of this technique, use the **Collar and cuff** weblink in your eBookPLUS.

Elevation sling

The elevation sling is used to stabilise the arm and upper body region in case of collarbone and shoulder injuries. It is also used to elevate bleeding hands to help slow the bleeding.

- Reassure the casualty.
- Place the casualty in a comfortable position, with the forearm from the injured side across the chest with fingers touching the opposite shoulder.
- Face the casualty.
- Drape the open bandage over the chest. The apex should be beyond the elbow and the upper point tucked under the fingertips.
- Ease the base of the bandage under the forearm and elevate the injured wrist.

- Cover the arm with the bandage and pinch the material at the elbow.
- Tie the two ends with a reef knot on the uninjured side.
- Fold the apex neatly in front of the arm and pin or tape.
- Check for circulation.

eBookplus

To see a video demonstration of this technique, use the **Elevation sling** weblink in your eBookPLUS.

SNAPSHOT

Pressure immobilisation bandaging

First aid for bites to the lower limb

The principle of pressure immobilisation bandaging as a first aid measure is to prevent the spread of toxins through the body. This is done by applying enough pressure to compress the lymph vessels, and by preventing movement of the affected limb. Correct application of the technique can buy valuable time to get the patient to medical assistance.



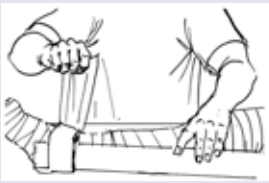
As soon as possible, apply a broad pressure bandage from below the bite site, upward on the affected limb (starting at the toes, bandaging upward as far as possible). Leave the tips of the toes unbandaged to allow the victim's circulation to be checked. Do not remove pants or trousers, simply bandage over the top of the clothing.



Bandage firmly as for a sprained ankle, but not so tight that circulation is prevented. Continue to bandage upward from the lower portion of the bitten limb.



Apply the bandage as far up the limb as possible to compress the lymphatic vessels.



It is vital to now apply a splint. Bind a stick or suitable rigid item over the initial bandage to splint the limb. Secure the splint to the bandaged limb by using another bandage (if another bandage is not available, use clothing strips or similar to bind). It is very important to keep the bitten limb still.



Bind the splint firmly, to as much of the limb as possible, to prevent muscle, limb and joint movement. This helps restrict venom movement. Seek urgent medical assistance now that first aid has been applied.

First aid for bites to the upper limb



Images © CSL Limited

1. As soon as possible, apply a broad pressure bandage from the fingers of the affected arm, bandaging upward as far as possible. Bandage the arm with the elbow in a bent position, to ensure the victim is comfortable with their arm in a sling. Leave the tips of the fingers unbandaged to allow the victim's circulation to be checked.
2. Bind a splint along the forearm.
3. Use a sling to further prevent limb movement.



APPLICATION

Applying bandages

Working in pairs, take turns to apply a splint, an arm sling and a pressure immobilisation bandage to your partner. (Bandages can be made from material or purchased from the Royal Life Saving Society of Australia.)



MANAGEMENT OF MEDICAL CONDITIONS

Certain medical conditions require specialised attention. For example, treating a heart attack victim is different from treating a person suffering an asthma attack or an epileptic seizure. Table 7.3 provides information on how to recognise the most common medical conditions (signs and symptoms) and the management strategies that should be adopted in each situation.

Table 7.3: Signs, symptoms and management of common medical conditions

Medical condition	Signs and symptoms	Management
Heart attack — a life-threatening condition in which the heart ceases to function due to inadequate blood supply	• discomfort in the middle of the chest • possible pain in arm and neck • irregular pulse • shortness of breath • shock	• DRSABCD • seek urgent medical help
Stroke — caused by a sudden blockage of blood to the brain	• slurred speech • blurred vision • pupils may be irregular in size • loss of movement • possible seizures • possible loss of consciousness	• DRSABCD • seek urgent medical help
Diabetes — a condition where the body is unable to either produce or regulate the insulin required to maintain normal blood sugar levels	Prior to treatment • loss of body weight despite increased appetite • increased urination • increased thirst and hunger • irritability • aggressiveness • possible palpitations Hypoglycaemia (low blood sugar) • rapid pulse • profuse sweating • trembling • hunger • aggression • dizziness Hyperglycaemia (high blood sugar) • rapid pulse • drowsiness, possibly progressing to unconsciousness • thirst • smell similar to acetone on breath • need to urinate frequently	• meals at regular intervals • eat complex carbohydrates as opposed to simple carbohydrates • regular exercise • appropriate timing of insulin • avoid large amounts of fat • DRSABCD • seek urgent medical help • do not attempt to give glucose or drink to an unconscious patient • if conscious, administer glucose and drink as required • DRSABCD • seek urgent medical help • if conscious, allow the self-administration of insulin

(continued)

Table 7.3: *(continued)*

Medical condition	Signs and symptoms	Management
Epileptic seizures — seizures triggered by an abnormally high discharge of electrical activity to the brain. They range from the more serious *grand mal* characterised by spasms and loss of consciousness to *petit mals*, commonly referred to as 'absences'.	Some *petit mals* may go almost unnoticed because the person may appear 'vacant' or 'absent' for a short period. More serious seizures can be recognised by the following: • rigid body • tightened jaw • some mouth frothing • possible loss of bladder control • loss of consciousness.	• DRSABCD • place in lateral recovery position • remove dangerous objects • during sleep, ensure that the airway is fully open and that the patient is breathing • check pulse • seek medical help
Asthma — condition whereby breathing difficulties are experienced due to constriction of the airways in the lungs	• tightness in chest • sweating and paleness • fast, shallow breathing • hunched body posture • excessive throat clearing • laboured breathing • difficulty in exhalation • increase in pulse rate • wheezing noises	• reassure the person • assist with medication • monitor breathing • provide water for them to drink • encourage controlled breathing and relaxation • seek medical help if their condition deteriorates
Anaphylaxis is a severe and sudden allergic reaction that occurs when a susceptible person is exposed to an allergen. The reaction appears within about 20 minutes and can rapidly become life threatening. The most common allergens are foods such as nuts and soy, and insect stings such as bee and wasp.	• breathing difficulties • swollen tongue and possibly swollen face, lips and eyes • difficulty talking • swelling or tightness in the throat • loss of consciousness • wheeze or persistent cough • hives, welts or body redness • vomiting, abdominal pain	• DRSABCD • remove the trigger and minimise the effects of co-factors; for example, spit out food, remove the sting • implement the individual's anaphylaxis management plan if known. Students in New South Wales schools who are known to be at risk should have an individual health-care plan providing details of an emergency response. The plan may require use of an EpiPen by trained staff. • seek urgent medical assistance (ambulance)
Poisons — substances that are harmful if taken into the body. They can be taken or absorbed in a number of ways, including swallowing, injection, inhalation or being absorbed through the skin.	• headache • blurred vision • vomiting • breathing difficulty • drowsiness • abdominal pain • tight chest • breath smells of fumes or other odours • possible change in skin colour • nausea	If the person is unconscious: • DRSABCD • seek urgent medical attention. If the person is conscious, determine the type of poison and treat accordingly. If the substance is unknown: • DRSABCD • do not induce vomiting • seek urgent medical attention. If the substance is corrosive (such as acids): • DRSABCD • do not induce vomiting • give milk or water • seek urgent medical advice. If the substance is medicinal or general: • DRSABCD • induce vomiting • seek urgent medical help.
Bites and stings **Snakebite**	• puncture marks • headache • double vision • rapid pulse • tightness in chest/breathing difficulties • faintness • sweating	• DRSABCD • rest • reassure the patient • apply a pressure immobilisation bandage over the site of the bite and beyond • immobilise the affected area • do not elevate • call for medical help

Medical condition	Signs and symptoms	Management
Bee and wasp	• sharp pain at the site of the bite • possible swelling	• remove sting by scraping or flicking sideways (do not squeeze) • apply ice • monitor for allergic reactions • seek medical advice
Redback spider	• stinging pain at the site • faintness • sweating • swelling • rapid pulse	• DRSABCD • reassure the person • apply ice • seek medical advice
Funnel-web spider	• intense pain at site of bite • profuse sweating • cold skin • shivering • sense of numbness • breathing difficulty • abdominal pain • nausea	• DRSABCD • reassure the person • apply pressure bandage over the bitten area and extend down the limb (see snapshot p. 278) • seek urgent medical attention
Bluebottles	• localised sting marks • pain • headache • vomiting • breathing difficulties	• DRSABCD • immerse the area in hot water to help alleviate pain • seek medical attention
Exposure to heat and cold **Heat exhaustion** — condition caused by dehydration. It is usually experienced by athletes working in hot, humid conditions.	• rapid, weak pulse • clammy, pale skin • headache • dizziness • profuse sweating • fatigue • extreme thirst • dilated pupils • loss of coordination	• DRSABCD • rest in cool, shaded area • provide cool water • apply ice to head, neck and other areas to cool the body • seek medical assistance
Heatstroke — a serious condition of extreme dehydration. It is characterised by a breakdown of the temperature regulatory mechanism and subsequent rapid rise in internal body temperature.	• disorientation leading to possible unconsciousness • marked increase in core body temperature • rapid pulse • hot, dry skin • fatigue • lack of sweat despite exertion • rapid breathing • constricted pupils • possible respiratory and cardiac arrest	• DRSABCD • seek urgent medical help • rest in shade • cool the body with wet towels and ice • provide plenty of water • do not wrap in blankets
Hypothermia — medical condition caused by exposure to very low temperatures, as might be experienced if trapped in a snowstorm	• shivering • weak pulse • slurred speech • slow response to instructions • shallow breathing	• DRSABCD • protect from the elements — wet ground, wind and rain • remove any wet clothing and replace with warm blankets. If possible, place casualty in a sleeping bag. • provide warm fluids to drink • do not use artificial measures such as electric blankets and hot water to provide extra heat • seek medical attention

The nature of the physical environment may, in part, have been responsible for the occurrence of the accident in the first place. For example, a drowning may have occurred because of rapidly rising water. A traffic accident may be due to oil on the road. Whatever the circumstances, it is important that protective measures be observed and strategies put into place so that a further injury does not occur.



Figure 7.21: The forces of nature can cause changes to the physical environment that are potentially dangerous.

Traffic accidents

In the case of traffic accidents, the rescuer must be aware of the potential danger from:

- oncoming traffic
- fallen electricity wires
- flammable liquids such as LPG, gas and petrol
- glass and debris
- fire.

Protective strategies that the rescuer needs to observe include

- providing a protective barrier by parking a vehicle between the oncoming traffic and the accident
- turning hazard lights on
- placing a warning signal or sending a person back up the road to warn traffic
- turning the ignition off if the engine is still running
- lighting the area with low beam if the accident has occurred at night to raise awareness and increase safety.

When the rescuer has followed the protective strategies, they can:

- call for or send for help
- assess the number of casualties and potential dangers. If fallen electricity wires are in contact with the vehicle, the vehicle must not be touched as electrocution may occur.
- implement the DRSABCD procedures (see pages 264–70).

Do not remove the casualty unless one or a number of the following conditions is present:

1. there is evidence of increasing shock and the casualty is upright in the car
2. the casualty is unconscious and an adequate airway cannot be maintained
3. the casualty's position prevents access to control bleeding
4. there is danger of fire. (*Source: Australian First Aid*, vols 1 and 2, St John Ambulance Australia, Canberra, p. 218.)

eBookplus

Use the **Road traffic accidents** weblink in your eBookPLUS for more guidance on procedures.

Water environment

The water environment can disguise particular problems. The rescuer must be aware of:

- their own physical limitations, such as their ability to swim
- the desperation of a drowning person and their potential to cause difficulty to the rescuer
- hazardous objects under the water and not visible to the observer
- dangerous rips and currents
- changes in weather conditions
- water temperature.

Protective strategies that need to be used include

- sending for help immediately
- not placing yourself at risk if you are not sure that you can perform the rescue safely
- using ropes, branches and flotation devices where possible
- entering unknown waters carefully.

Electricity

Electricity has an immense potential for danger because it is not visible. We know it is in electrical wires. When the wires are exposed through circumstances such as frayed or cut electrical insulation or fallen power lines, electricity is conducted through any metallic material that is in contact with the wires. By touching the conducting material, such as a car body, electrocution occurs. The voltage in most wires is sufficient to cause severe burns and instant death. The rescuer needs to:

- be aware of the deadly nature of electricity and how it is conducted
- examine the situation and assess the potential for harm.

Protective strategies include

- not touching cars or objects that are in contact with fallen power lines
- turning the power off at the source (light switch or main switch) in the case of a domestic accident
- removing live power cords with nonconducting material such as a stick if the power cannot be turned off immediately.



INQUIRY

Safety issues and protective strategies

Divide the class into small groups. Allocate one of the following physical environments to each group:

- traffic accidents
- water environments
- electricity.

Choose three students to act as recorders and to be responsible for summarising the information reported from groups. Then have each group:

- analyse the safety issues with their specific environment
- formulate strategies that need to be observed to ensure safety.

Groups report and recorders collate the information relevant to their physical environment. When all groups have reported, recorders summarise the information and distribute to the class.



INFECTION CONTROL AND PROTECTION

There is a risk of cross-infection (passing infection from one person to another) when administering first aid. This is particularly so when giving CPR or managing wounds. Illnesses that can be transferred include:

- colds and influenza
- HIV/AIDS
- glandular fever
- measles
- chickenpox
- mumps
- herpes
- hepatitis.

Administration of first aid requires that measures be taken to avoid transmission of infection under any circumstances. The first aider must use hygienic practices and create a barrier so that the infection cannot pass from one person to another. The situations that cause most concern are in relation to HIV/AIDS infection and blood-borne viruses such as hepatitis B and C.

HIV/AIDS

The HIV virus (human immunodeficiency virus) that causes AIDS can be transmitted only through the exchange of blood and, in some cases, body fluids, from an infected to a noninfected person. Although this is unlikely in the administration of first aid, it is best that appropriate precautions be taken.

Highest concentrations of the HIV virus are in blood. To pass the virus from one person to another during first aid, both the casualty and the rescuer need to have cuts or wounds that are open and the blood of the infected person needs to mix with the blood of the noninfected person. This situation, although possible, is highly unlikely.

It is important to realise that this type of infection must pass from the bloodstream of one person and into the bloodstream of another for transmission to take place. Although HIV exists in saliva, the quantity exchanged during CPR would not be sufficient for effective transmission and, in any case, the virus would be destroyed by the stomach juices.

To prevent transmission, the first aider needs to implement appropriate management strategies that prevent any possibility of viral transfer. The simplest way is to assume that every casualty is infected and take the following precautions:

- use disposable plastic gloves
- cover sores, grazes, cuts, abrasions or incisions of any nature that exposes anyone's blood

- cover the face of an unconscious person with a face mask before administering CPR
- wash hands and any surfaces of the body that have made contact with the casualty with soap and warm water as soon as possible following treatment.

Blood-borne viruses (hepatitis B and C)

Hepatitis refers to a disease that causes varying degrees of inflammation and subsequent damage to the liver.

Hepatitis comprises three viruses — hepatitis A, hepatitis B and hepatitis C. While it is difficult to contract HIV, it is not as difficult to contract some of the hepatitis strands. We do not catch the virus like a cold or influenza. It must be transmitted from an infected person to a noninfected person.

Hepatitis B is present in blood, semen, vaginal secretions and, to a lesser extent, in saliva. Usual modes of transmission include sharing needles, unprotected sex, ear piercing and tattooing. The virus can be transmitted during first aid, particularly if there is an exchange of blood. Contracting hepatitis B carries the risk of serious illness, such as cirrhosis of the liver and cancer due to damage to the liver cells. Hepatitis C is transmitted through blood-to-blood contact as may happen with sharing needles, or by sharing contaminated equipment such as ear-piercing implements. Like hepatitis B, it too has the potential to cause extensive liver damage.



INQUIRY

Reducing the risk of contact with body fluids in first aid settings

eBookplus

Use the **Infectious disease prevention** weblink in your eBookPLUS to answer the following questions.

1. What are the three usual methods of communication for infectious diseases?
2. Provide five examples of common infectious diseases that could be transmitted in first aid settings.
3. Read the section on first aid hygiene and needle-stick injuries. Use the information to describe ways of preventing contact with body fluids and managing contact with body fluids in the event of an occurrence.



LEGAL AND MORAL DILEMMAS

Legal implications

The legal implications of providing emergency care are often a cause of concern for many people. According to the Royal Life Saving Society Australia (RLSSA) (op. cit., p. 11), a first aider could be expected to:

- use reasonable care in assessing the priorities of the situation based on their level of training
- take steps to call for further medical assistance
- keep the casualty stabilised until medical assistance arrives
- follow established treatment and management protocols
- not misrepresent themselves or take unnecessary risks.

The RLSSA further suggests that each individual needs to use commonsense and act in accordance with their level of training should situations requiring first aid arise.

Everyone has a duty not to injure other people during day to day activities. There may not be any duty to rescue a person from danger, which the rescuer has not created. Whether a greater or more specific duty of care is owed is determined by the relationship between the people injured and the person allegedly responsible for the injury. The relationship between the people involved creates obligations, duties and rights. Examples of established duties of care include those between teachers and their students, first aid officers and their staff.

When you follow the protocols of treatment and management and do so with ordinary skill, you will have met the duty of care required. At law, there is no obligation to act as a 'good Samaritan'. An individual is under no duty to rescue or provide first aid to an injured or ill stranger unless a duty of care is owed to that person.

Source: *Everyone Can be a Lifesaver*, op. cit., p. 11.

However, the RLSSA makes the point that this information does not constitute legal advice and draws reference to the fact that the interpretation of duty of care varies from state to state. For example, in the Northern Territory, the mandatory provision of assistance to a person in need is embedded in law.

If we choose to be involved, how far do we need to go to satisfy 'duty of care'? The RLSSA suggests that, where duty of care exists, the legal requirement is to provide a standard of care that would be considered to be reasonable.

This standard means a person is obliged to take such care as a reasonable person, having due regard to the consequences of his or her actions, would take in the circumstances. The following could be used to establish an appropriate standard of care: the amount of training a person has and what he or she is trained to do, the evidence of experts, policies, procedures, rules or standards set by an authorising group (for example, the employer).

Source: ibid., p. 11.

Of concern also to many first aiders are the legal implications of touching another person during the provision of first aid.

A person who is touched without consenting to it can initiate legal action for assault. A first aider must seek permission from the victim prior to providing first aid. If the victim is unresponsive or unable to communicate, the law assumes that consent would have been given by the victim. If the victim is a child, the consent of a parent or guardian should be sought where possible. However, if this is not possible, and there is a threat to life, consent can normally be assumed.

Source: ibid., p. 11.

First aiders should document written records of exactly what happened should they be involved in providing emergency first aid. The account should provide

- the date
- time of incident
- factual explanation
- advice given
- details of witnesses if any were present.

This information should remain confidential to protect the privacy of the victim, but may be required in a court of law.

We do not need to attempt rescues if our own life will be placed in danger in the process. However, it is important that we act in the spirit of the law; that is, that we provide whatever aid we can within the level of our ability.



INQUIRY

Legal issues in first aid

eBookplus

Access the **Legal issues in first aid** weblink in your eBookPLUS. Read the information regarding the 'main legal considerations relating to first aid', then summarise the legal issues under each heading in a table like the one below.

Duty of care	Negligence	Consent	Recording

Moral obligations

In emergency situations there exists a certain moral responsibility to act in accordance with your training and provide assistance to the injured or distressed. It would be considered a responsible action to help people involved in an accident. It would be irresponsible not to help people unable to help themselves. Fortunately we are not frequently tested with these situations to see just how we would respond. In many cases, the emergency first aid required is for a family member and we react instinctively. But what would we do if we came across a road accident where none of the victims were known to us?

Responsible citizenship suggests that we should help and provide assistance to the best of our ability. Imagine how you would feel if you were in an accident and the only people able to provide support walked away.

The ability to empathise with others or try to feel as they feel in that particular situation is important when confronted with moral dilemmas. As we grow, we learn to develop a sense of compassion and are often saddened by circumstances where injury or perhaps tragedy occurs to others. We realise that victims in accidents, people drowning or perhaps people suffering a heart attack or stroke need immediate help because they are unable to do anything about their situation at that time. For some, the circumstance may be related to a state of physical health that needs immediate medical assistance; for others, they may just have been in 'the wrong place at the wrong time'.

Put yourself in the situation of having been critically injured while on a street or at a railway station. Imagine yourself lying on the ground, in pain, trapped and unable to talk. How would you feel if people walked past, not wishing to get involved, your life slowly slipping away? While imagining a situation like this is very confronting, it provides you with an opportunity to make a decision that might be as defining as deciding life or death for the person involved.



APPLICATION

What would you do?

Read the following scenario.

> The conversation in the car was lively, but was about to be shortlived. It was not difficult to see the car ahead in the night as the red tail-lights shone through the mist. Suddenly the lights were gone. A cloud of dust appeared, followed by the sound of the car smashing into something solid off the roadside.

Dave slammed his foot on the brake as our vision of the road ahead vanished in the dust cloud. We could just make out the blinking lights of the upturned vehicle well off the road. We stopped, got out and moved closer to the accident. The muffled sounds of people inside could be heard. I felt a sudden chill penetrate my spine. What do we do? My first instinct was to get out fast.



INQUIRY

Responding to an accident

1. In the application above, are the two people in the car behind required to provide emergency first aid?
2. How would you act in this situation?
3. Why did you make this decision?
4. If you were in a similar accident and somebody came to your aid, how would you feel?
5. What assistance would you provide if one of the victims was unconscious, but as you checked their pulse, you found a number of syringe marks in their forearm?
6. Discuss your actions with the class.

Commonsense versus heroics

Basic first aid training reinforces the principles of commonsense and the prevention of further injury. The first principle of the DRSABCD action plan is to remove the danger from the patient or the patient from the danger so that there is no further injury and possible loss of life. There may be some risk involved, but a rescue action does not call for heroics. How often do we hear of people who are unable to swim jumping into water to save a drowning person? Had the rescuer thrown a flotation device or rope instead, certainly one life and possibly two would have been saved. Using commonsense is absolutely essential in rescues and requires that the rescuer is able to think clearly, plan thoughtfully and act wisely.



APPLICATION

Legal and moral dilemmas

Hold a class debate on this statement: 'People should be legally bound to provide first aid to the injured rather than it be a matter of choice.'



SUPPORT FOLLOWING FIRST AID SITUATIONS

Debriefing

Debriefing involves obtaining information about the circumstances of the incident that resulted in first aid being administered. The rescuer or rescuers may be required to give an account of what happened and describe as precisely as possible the nature of the incident. Police officers, ambulance officers or accident investigation personnel may make these inquiries.

During debriefing, it is important to:

- take the time to ensure that the full picture is gathered
- make all descriptions as accurate as possible
- remain impartial and describe the incident exactly as it occurred.

Counselling

Rescuers involved in emergency procedures where there were fatalities and serious injuries (for example, spinal injuries or amputations) may need counselling. Providing emergency care, organising help and possibly watching life slip away can be very upsetting for individuals and result in personal pain. This can lead to anxiety, depression and possibly an inability to cope. Where this is evident, individuals should seek or be advised to seek help. Help is available from various counselling organisations including hospitals, medical support centres and State government organisations such as NSW Health.

In the event of major crises, it is not uncommon for large groups of counsellors to be sent to disaster areas to support people in direct contact with casualties. Counselling is beneficial as it provides the opportunity to 'work through' situations and dispel feelings of blame and inadequacy.

Emergency first aid may provide an opportunity for a life or lives to be saved. However, if life is lost, rescuers should not feel that the blame rests with them if they acted in accordance with their training and ability level.



INQUIRY

Sources of support in delivery of emergency first aid

eBookplus

Access each of the **Emergency first aid training** weblinks in your eBookPLUS. Critically evaluate each website in terms of information available and provision of training.

SUMMARY

- There are many situations, including drowning, traffic accidents, electrocution and heart failure, where first aid may be required.
- Sound first aid is based on commonsense practices and adequate knowledge of what to do.
- Correct administration of first aid requires that the DRSABCD procedures be followed. The acronym DRSABCD stands for danger, response, send for help, airways, breathing, compressions, defibrillation.
- The DRSABCD procedures help the first aider to remember what to do and in what sequence to do it to deliver life support.
- Cardiopulmonary resuscitation (CPR) is required if the patient is not breathing and has no signs of life. This procedure combines rescue breaths with chest compressions.
- Cardiopulmonary resuscitation can be given using one or two operators. Two-operator CPR is more efficient than one-operator CPR.
- Crisis management can also involve treating other injuries and conditions such as shock, bleeding and neck and spinal injuries.
- The first aider also needs to know about the management of injuries such as cuts, lacerations, fractures, dislocations, electrocution and concussion, as well as head, eye, nasal, teeth, burn, chest and abdominal injuries.
- Certain medical conditions, such as heart attack, stroke, diabetes, epilepsy, asthma, anaphylaxis, poisoning, bites and stings, and exposure to heat and cold require specialised knowledge. The first aider needs to be able to analyse signs and symptoms and implement appropriate action.

- The environment where the first aider is attempting to administer first aid may be hazardous. Traffic, water and electricity present particular problems. It is important that all precautions are taken and that the rescuer is not injured as a result of the surrounding conditions.
- There is potential for infection to be transmitted during the administration of first aid. In particular, HIV/AIDS and blood-borne viruses such as hepatitis B and hepatitis C can be transmitted through the exchange of blood and (to a lesser degree) the exchange of other body fluids. During the administration of first aid, the rescuer needs to implement safety precautions such as wearing gloves and protective face masks and washing their hands following treatment if possible.
- Some people hesitate to provide first aid because of legal implications and the possibility of litigation. While people are not required to give first aid to strangers, most find themselves providing assistance out of concern, duty of care and responsible citizenship. Some people, such as teachers and nurses, are entrusted to care for other people and need to provide assistance that reflects their level of training.
- A first aider need not fear litigation in any circumstances providing they work within the limits of their abilities and to the best of their knowledge.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

QUESTIONS

Revision

1. **Discuss** the planning procedures you need to make if you and a friend came across a traffic accident where the occupants were injured. (P6) (5 marks)
2. **Explain** how you would assess if a person was conscious or unconscious. (P15) (2 marks)
3. **Outline** the technique for clearing the airway. (P12) (3 marks)
4. **Outline** the steps that need to be taken by one operator administering CPR to an unconscious adult. (P12) (4 marks)
5. **Explain** the measures you would take to control shock in a person who has just survived a car accident. (P12) (4 marks)
6. **Describe** the difference between a fracture and a dislocation. **Outline** the management techniques used to stabilise a shoulder dislocation in preparation for medical attention. (P12) (4 marks)
7. What are the differences in the signs and symptoms of hypoglycaemia and hyperglycaemia? **Explain** how each case of diabetes is managed. (P12) (5 marks)
8. **Outline** the measures you would take to manage a person suffering from heatstroke. (P12) (3 marks)
9. **Describe** how you would apply an elevation sling to a person with a fractured collarbone. (P12) (4 marks)
10. **Discuss** the personal safety issues you need to address if you come across a traffic accident while you are driving at night. (P15) (5 marks)
11. **Discuss** the types of infection that can be transmitted during the administration of first aid. What measures can be taken to prevent cross-infection? (P6) (5 marks)
12. **Discuss** the legal implications of providing first aid to a casualty and causing injury in the process. **Outline** the measures that need to be taken to avoid litigation in these circumstances. (P16) (6 marks)
13. What is the difference between debriefing and counselling? **Outline** the situations in which each may be necessary. (P16) (4 marks)

Extension

You and a friend are the first to arrive at the scene of a car accident. The driver and three passengers are injured. A quick assessment reveals the following:

(a) casualty one is bleeding from the lower leg
(b) casualty two is unconscious but does not appear to be bleeding
(c) casualty three is conscious and has a leg trapped, but otherwise appears to be in a satisfactory condition
(d) casualty four is conscious, has burns on their arms and is hysterical.

Outline your action plan and, specifically, your priority for treatment. **Determine** how you would manage each of the casualties until medical assistance arrives. (P6, P12) (10 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

CHAPTER 8
Composition and performance



OUTCOMES

On completion of this chapter, you will be able to:

- develop, refine and perform movement compositions in order to achieve a specific purpose (P13)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

OVERVIEW

COMPOSITION AND MOVEMENT MEDIUMS

SPACE
Direction; Level; Dimension; Patterns and formations

DYNAMICS
Force; Flow

TIME AND RHYTHM
Musical applications; Duration; Momentum; Self-paced versus externally paced; Timing

RELATIONSHIPS
Other people
Apparatus and equipment
Team formations, positional play and partner work

THE PROCESS OF CREATING MOVEMENT
Defining the purpose or motivating factors
Generating movement relevant to the purpose
Exploring variations
Improvisation

COMBINING AND ARRANGING MOVEMENTS
Rules and conventions of the medium; Sequencing; Transitions; Repetition; Variation

APPRAISAL
Ways of appraising
Aspects of appraisal
Establishing and applying criteria

COMPOSITION AND MOVEMENT MEDIUMS

A **composition** refers to a movement pattern consisting of a number of movement sequences, with a beginning, middle and end.

Performance is the end result of learning a movement composition. It is the game, dance, gymnastics or aerobics routine.

Movement mediums refer to physical activities that use gross motor movements as their medium. They include dance, gymnastics, aerobics and games.

Elements of composition are identified aspects of movement that can be changed or manipulated to produce movement patterns. They include space, dynamics, relationships, time and rhythm.

Many physical activities involve the use of different movements linked together to achieve a purpose or communicate an idea. Linking movements for a purpose is referred to as the art of composing. A **composition** is a movement pattern consisting of a number of movement sequences. The end result of learning a movement composition is the **performance**. There are several **movement mediums** through which individual skills are linked together to create a movement or a performance. These media include gymnastics, aerobics, dance and games.

Often there are similar skills within these media. However, depending on the purpose of the movement, these skills can look very different when they are performed. For example, compare jumping for height and jumping for distance. Both types of jump include the simple movement sequence of run, jump and land. By varying the speed of run-up, the force of take-off and landing, the coordination of body parts in the air, and the height and length of the jump, we can change this movement sequence. By varying the different movement elements, we can create a movement that fulfils what we are trying to achieve; that is, the purpose of the movement.

Developing a movement pattern or movement sequence that reflects the intention or purpose of a performance requires the choreographer, composer or coach to use and manipulate the **elements of composition**. These elements are integral to movement composition and performance. If we examined a gymnastics floor routine that required the same movements to be performed by different gymnasts, we would find that each performance was different, depending on

- how the performer used the space
- the pace at which the movements were performed
- the relationships the performer developed with other people
- the coordination and timing of movements.

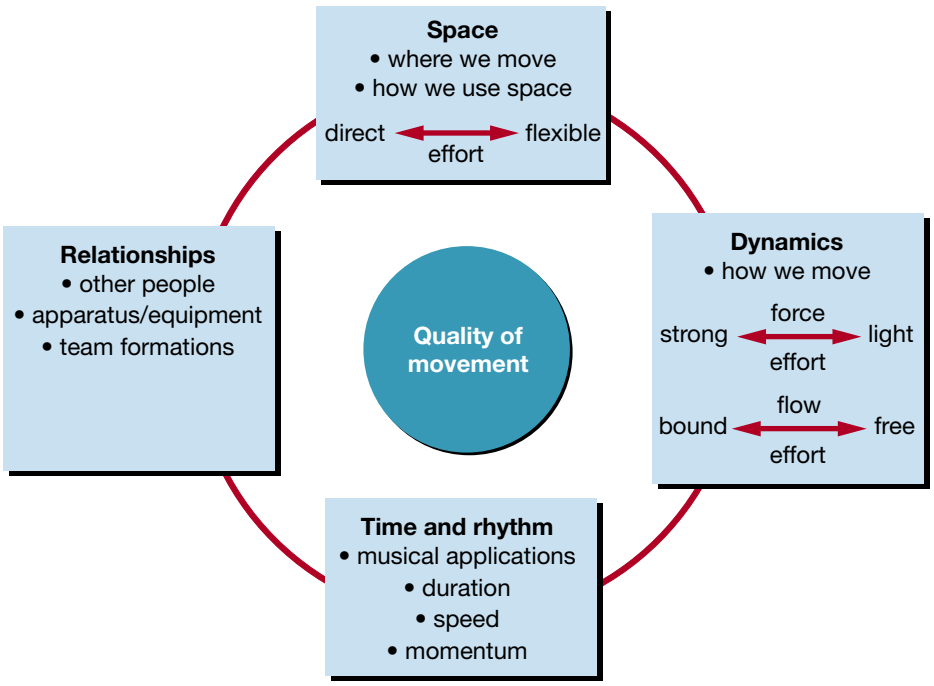


Figure 8.1: Overview of the elements of composition

By changing different aspects of movement, each gymnast can produce a unique performance while still including the same skills. By manipulating the elements of composition we give quality to the movement pattern.

The major elements of composition include

- space — where we move and the shape of our movement
- dynamics — the degree of energy applied to a movement and the continuity and control of our movement
- time and rhythm — the speed and duration of our movement; the underlying beat
- relationships — movement in relation to people and the environment.



SPACE

Space is the medium in which movement takes place. It is defined by shape and size.

Personal space is the space immediately around you.

General space is the space shared with other people or objects.

Space is the medium in which movement takes place. The immediate space around you is called **personal space**. **General space** is the space shared with others or things such as equipment or props. A person's success in moving partly depends on their ability to use space successfully, whether it be in outmanoeuvring an opponent in a game or in creating an aerobics routine.

There are many spatial aspects that you should consider when looking at where movement takes place and the shape that your body or movement makes in space. These spatial elements are summarised in figure 8.2.

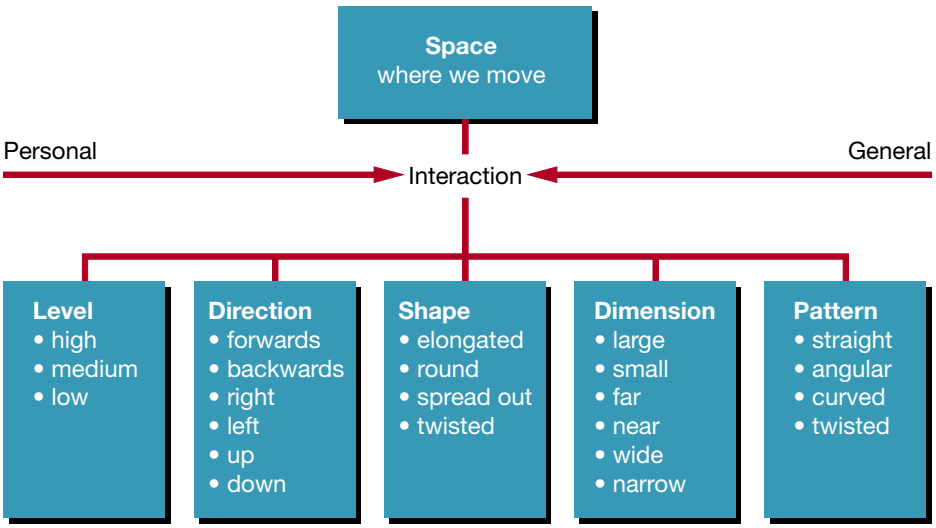


Figure 8.2: Spatial elements of movement

Direction

Direction is the course our moving body follows or the direction in which we move.

There are many **directions** in which a person can travel within their performance space. These directions include forwards, backwards, right, left, up, down, diagonal, zigzag, circular or turning. Moving in any of these directions results in specific actions, such as rising, falling, advancing or retreating. The direction in which we move gives importance or expressiveness to our movement. For example, a dancer may move in a zigzag fashion to portray the idea of evasion, or a player in touch football may run a diagonal line in an offensive play to draw an opposition player.

When moving in any direction, there is usually a body part that naturally leads the movement. For example, when moving backwards the back leads. Changing direction as we move through space adds complexity to a movement task. Compare the basketball player who travels in a straight line forward

dribbling a ball to a basketball player who weaves around opposition players while dribbling a ball.

In games, direction is used to achieve a specific goal. Generally, a forward direction is when the player or team is travelling towards their opponents' goal or try line. In dance, gymnastics and aerobics, direction is used to enhance the visual appeal of a performance.

Level

Level is the height of the movement in personal space.

Level is the height of the movement in personal space:

- high level is generally above the shoulders
- low level is below the hips
- medium level is between the shoulders and hips.

Some activities require the performer to move at different levels during a movement. When performing a leap in dance, the performer moves from a medium level during the running phase to a high level during the leap and returns to a medium level on landing. In an aerobics class, an instructor leads the class through moves that will be performed at all three levels. A pitcher in softball can use the air space, direction and different levels to achieve a range of pitches, such as a slow lob pitch (high), a straight fast pitch (medium) or a drop pitch (low).

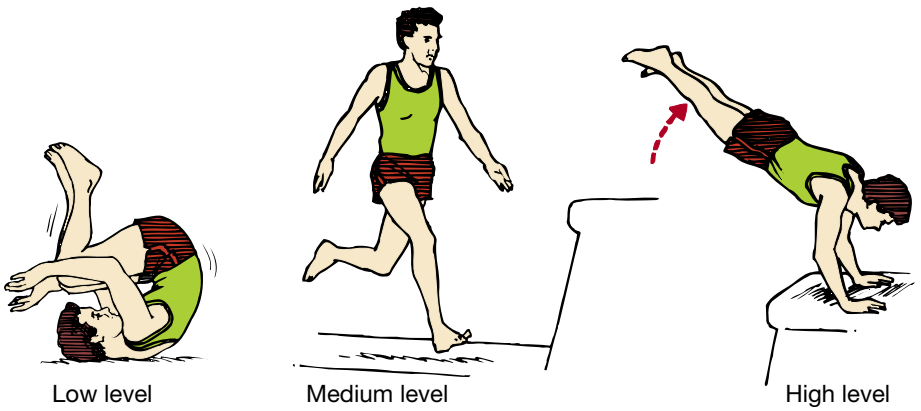


Figure 8.3: The use of high, medium and low levels in gymnastics



Space: direction and levels

Perform the following activities, which relate to direction and levels.

1. Standing in one spot, perform a simple movement, such as twisting, bending, stretching or reaching. Observe yourself in a mirror while you perform. Now try performing the same movement while you face your body in different directions.
2. Use a variety of directions, such as backward, forward, sideways, or any four of the diagonal directions, to walk across a space.
3. Move around a space using a basic walk. As you walk, begin to change direction on specific counts. Practise changing directions on every eighth, fourth and second count.
4. While walking around a space, change the level of your walking. Change from middle, to high, to low.
5. Alter the level of other locomotor movements while moving around the space.

Source: Sandra Cerny Minton, Choreography – *A Basic Approach Using Improvisation*, 2nd edn, Human Kinetics, Champaign, Illinois, 1997.

Dimension

Dimension describes the size or extent of the movement or performance space.

Dimension is the size or extent of the movement or performance space. It considers our personal and general space. The dimensions or size of a field, court or performance space have an effect on the movement patterns that occur within the space. Imagine doing an individual gymnastics routine on a floor the size of a rugby league field, or playing a game of touch on a netball court. A composer needs to know the size and shape of the performance space in order to know how many skills or movements to include so the composition fits into the space. If a set aerobics routine was to be performed in a smaller space, the range of movements may need to be reduced and the direction of movement altered.



Dimension and composition

Compose a simple dance routine and gymnastics floor routine. Perform the routines in a space large enough to fit the routine. Reduce the performance space and perform the routines again.

1. Compare how the reduced space affects the dance and gymnastics routine.
2. What elements of composition need to change to accommodate the reduced space? Why?

Dimension includes the relationship of our body parts to one another and to objects in space. As a movement extends away from the body into space, the movement becomes large. As the movement comes near to the body, it becomes small. Movements can pass through many stages in between in the process of becoming smaller and larger. This process of shrinking and expanding movements has a functional role in games and adds to the aesthetic nature of dance and gymnastics. The body can shrink by bending in and expand by stretching out.

In games, players often need to change their body dimension in space to give an advantage in either attack or defence. For example, when performing a zone defence in basketball, players expand their body by stretching their arms out and taking a wider stance in an effort to reduce the space through which a defender may try to attack.



Figure 8.4(a): Dimension relates to the playing or performance space and the relative positions of players or performers within it.

The perception of the body's dimension in space is a significant aspect in our performance of movement tasks. Dancers or gymnasts may concentrate on the extension aspect, known as amplitude, in order to achieve long lines in the body and limbs. In performing rolls and somersaults, a gymnast aims to make the movement small by keeping the body curled to assist the speed of turning. However, if the gymnast does not have a perception of the body's position at any time during the turn, the somersault may not be completed before the landing, or if the tuck is held too long, over-rotation may occur.



Figure 8.4(b): We use different dimensions to achieve specific tasks.

Patterns and formations

Patterns and **formations** are the imaginary lines that the body or its parts make when moving in general space, whether it be in the air, on the ground or floor, on your own or in combination with other performers. Movements can make either straight, angular, curved or twisted patterns, or combinations of these four basic patterns; for example, circular, spiral, square or zigzag.

Patterns refer to the floor patterns made by a performer as they move from one point to another.

Formations refer to the design groups of players or performers make while performing offensive or defensive moves or movement phrases.

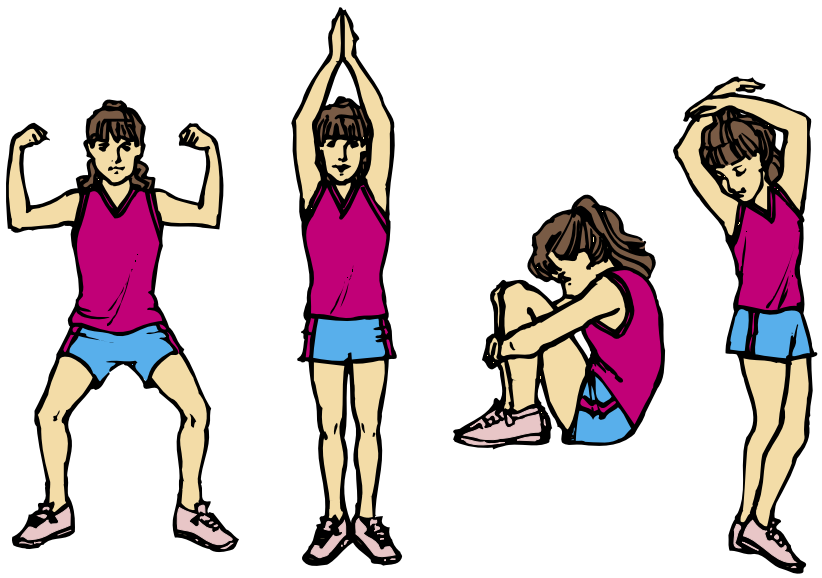


Figure 8.5: Some angular, straight, curved and twisted movement patterns

In games we may need to change our movement pathway due to another person. This occurs frequently in games as teams set up offensive and defensive moves in response to the positioning of opposition players. Individual players use straight runs, dodges, weaves and changes of direction in an attempt to outmanoeuvre an opposing player.



APPLICATION

Patterns and formations

Choose a team game you have a good knowledge of. Design an offensive tactical move that could be used in this game. Draw this move, including lines of player movement and equipment, such as the ball.

1. How have the patterns formed in the move created space for attack?
2. Draw a defensive formation to counter the offensive pattern. Discuss why this pattern would be effective.

In aerobics, many instructors use a variety of organisational patterns for their class to promote group activities; for example, line work formations, circles, relay formations and circuits. Dancers and gymnasts use this spatial aspect by varying independent air and floor patterns, or accompanying air and floor patterns to communicate certain feelings or images, and to add emphasis, interest or variety to their performance.



APPLICATION

Patterns

Observe the following movement sequences and draw the pattern formed during the movement:

1. gymnastics floor routine
2. back line throw in netball (both ball and players)
3. hits by a batter in cricket in one over
4. a short sequence of a dance routine (principal dancer only).

Explain the meaning or tactic behind each pattern formed.



INQUIRY

Space

1. Why is the use of space critical to games strategies?
2. Suggest ways that space is created and reduced in team game situations.
3. Analyse a performance in games and debate how effectively space was used.



DYNAMICS

Dynamics refers to the flow and force produced by the body as it moves.

The element of **dynamics** incorporates both the force exerted during movement and the flow of the movement. Varying the force and flow of a movement results in dynamics. The dynamics of movement allows performers to better express the purpose of their performance. By changing the degree of energy applied to a movement and the control of the movement through space, a performer can achieve or portray the purpose of the performance. For example, a dancer can perform a movement using a high degree of energy to generate

a strong force that may communicate the idea of assertiveness. Alternatively, they could use light force in their movements to convey the idea of softness or passiveness.

Force

Force (composition and performance) is the degree of energy applied to a movement.

Force (composition and performance) refers to the magnitude or intensity of the energy exerted, expended, or released. Force is active and is realised in movement. The amount of force used affects the quality of any given movement.

The effective use of movement skills in various situations partially depends on our ability to control the force created and to absorb the force appropriately. For example, to perform a handspring vault in gymnastics, force is created in the take-off on the vault and absorbed on landing.

You may have heard a spectator comment on the 'weak' attempt made by a player to tackle an opposing player. This simply refers to the degree of energy applied in attempting the tackle. The degree of force applied to movement can be either strong or light.

Strong movements are those performed with a large degree of energy. Movements such as jumping, striking, kicking and take-off in gymnastics are strong movements as they require a high degree of energy or force to do them. Weak or light movements are those done with a small degree of energy. Catching a cricket ball where the hands 'give' in the action of catching requires a small degree of energy resulting in a light force. A rhythmic gymnast will catch a ball by using the entire body to follow the fall and to absorb the weight of the ball. This enables the catch to be soft and silent and does not interrupt the trajectory of the ball.

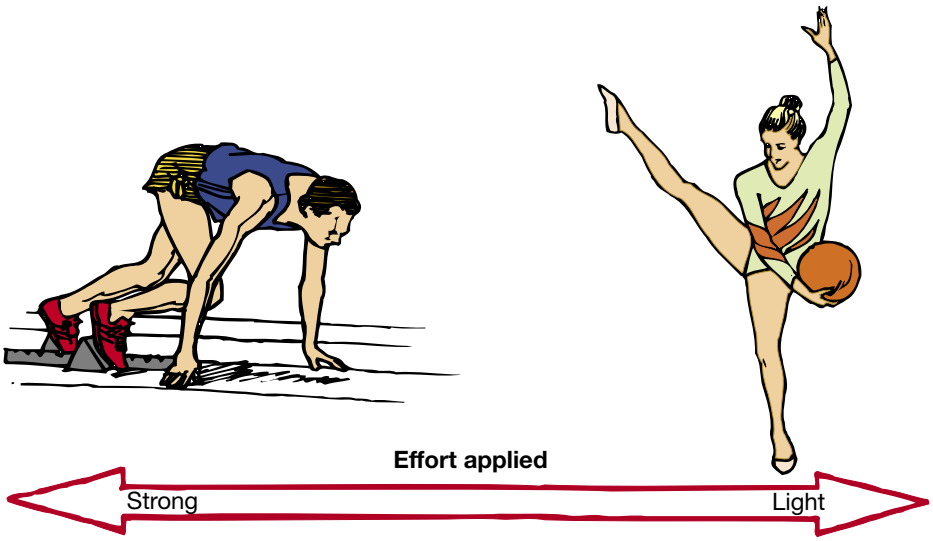


Figure 8.6: Force can vary from strong to light.

The dynamics of movement can be described in other ways. When a movement is performed with consistent, even release of energy, it can be described as smooth or sustained. An ice-skater skating at the same speed produces a sustained release of energy. A movement can be described as explosive when energy is suddenly released. The start in a sprint race or the take-off in a leap in dance are explosive movements. When energy is released in short bursts it produces a jerky movement.



APPLICATION

Force, flow and speed

Perform movements using variations in force, flow and speed of movement.
For example:

- walking on the moon compared to walking across a busy road dodging traffic
- drifting aimlessly through outer space compared to hang-gliding to a predetermined landing area
- the movement of a bee compared to a butterfly
- a slow jog in the park compared to fleeing from danger.



INQUIRY

Impact of varying force, flow and speed

1. How are the dynamics of force and flow used in each movement performed in the application above?
2. How does the use of dynamics create realism for the audience?
3. What changes in the use of space when you increase the force?
4. How does the use of dynamics improve the quality of movement?

Flow

Flow is the control of movement through space.

Flow is concerned with the movement of the body or an object through space and time. Within this element there are three aspects that can describe the movement: continuity, body flow and control.

Continuity refers to the way movements follow from one to another when combining movements in a serial skill. These movements can be performed in either an uninterrupted way, where the movement is flowing without stops or starts, or in an interrupted way, where there are stops and starts. When dance and gymnastics movements are sequenced together in an uninterrupted way they are visually appealing to the spectator.

Body flow relates to the way the movement flows through the body while moving. For example, an undulating body wave involves successive flow through the body as one body part starts a movement that is passed onto another adjacent part in a sequential way.

The successive movement of body parts is also a desirable technical requirement in the execution of many game skills. Whether it be striking, kicking, hitting or throwing, the coordination and flow of body parts is critical in the success of execution of the skill.

Control deals with the way movement is controlled or not controlled and suggests an effort reflecting flow. It can be seen as a continuum from bound to free.

If at any moment during a movement the body can be stopped, controlled or restrained without difficulty, the flow of the movement is said to be bound. The movement may not necessarily stop altogether, but it may be altered or restrained momentarily. Bound flow may also be described as controlled, restrained, cautious, limited or withheld. A performer who is learning a skill or movement sequence will often stop and start in practice as they try to master the skill or movement. Think of a person learning to juggle.

Free flow occurs when the movement flows in an unhindered manner and it is difficult to stop the movement suddenly. The person moving is generally not attending to any cues and moves automatically through the various parts of the movement action. Free flow may also be described as uncontrolled, abandoned, fluent or outpouring. A performer who is extremely skilled may move with free flow as the skills can be executed automatically.

INQUIRY

Dynamics

Observe a dance performance (or recording of a performance).

1. Identify the dynamics of the performance.
2. What was the purpose or message of the performance?
3. How did the changing dynamics communicate the ideas or purpose of the performance?

TIME AND RHYTHM

Rhythm is the mathematical organisation of time in music, dance, aerobics and movement skills.

Timing and **rhythm** are essential elements in all movement mediums. The successful execution of skills in games depends on the timing and coordination of body parts. For example, striking a fast pitch ball in baseball requires the athlete to time their swing so that they can generate a large degree of force when the bat strikes the ball. The point of time at which the ball is struck while swinging the bat forward will also influence direction. For example, a late swing by a right-handed batter is more likely to travel close to first base. The visual appeal of dance and aerobics relies on the performers being in time with the music and each other.



Figure 8.7: The execution of skills depends on correct timing.

Musical applications

Performances or compositions within the movement mediums of dance, aerobics and gymnastics are created to sounds and music. The music or sounds organise the timing of movements.

In movement, rhythm has two aspects:

- the metric organisation of time (beat, tempo, accent)
- the organisation of a single movement or a series of movements into patterns or forms.

Rhythm is determined by:

- beat — the steady, underlying beat or pulse that is organised in repeatable patterns
- measure — a number of beats grouped into a unit. Most commonly there are two, three or four beats or counts per measure. (In music, a measure is called a bar.)
- metre — the number of beats in one measure, such as 2/4, 3/4, 4/4 or 6/8. The first number represents the number of beats per measure, while the second number represents the time value of the beat.
- accent — the emphasis or stress put on a beat within a measure. It is usually put on the first beat of a measure, but it may occur on any beat.
- tempo — the speed of the beat. It can be fast, moderate or slow. Tempo is frequently indicated at the beginning of a piece of music. A movement in 3/4 time may move slowly, but if the tempo is increased, the same movement could be performed quite quickly with the impact or feeling of the movement changing. By changing the tempo of the beat, the performer can explore and create movements that portray an intended purpose.
- rhythmic patterns and phrases — result from combining beats into a pattern within a measure or a phrase. Rhythmic patterns are usually subsets of rhythmic phrases. In some dances, it is obvious when a phrase ends and a new one starts. This is evident in folk and social dance. Some locomotor patterns have natural rhythmic patterns. Some are even, such as running, walking and hopping, and some are uneven, such as skipping and galloping.

In dance, rhythmic patterns are generated when a dancer moves at a varying tempo within a movement sequence or within a specific number of pulse beats. Adding silences or places where you hold a pose or body shape also contributes to rhythmic patterning.

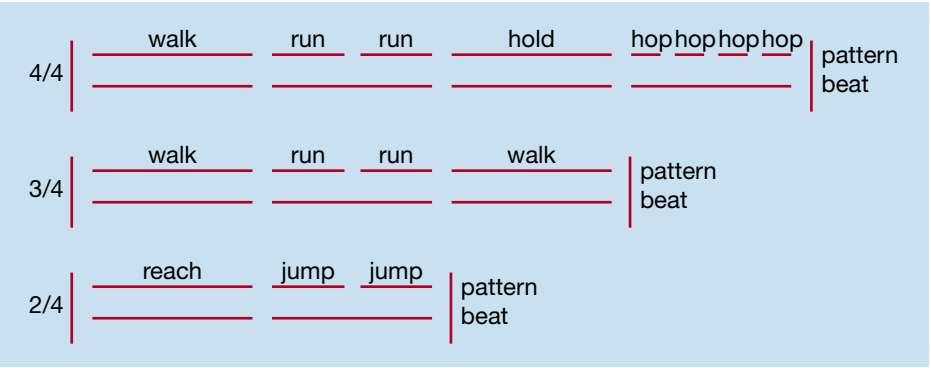


Figure 8.8: The pattern and underlying beat of three types of metre (*Source*: Sandra Cerny Minton, *Choreography: A Basic Approach Using Improvisation*, 2nd edn, Human Kinetics, Champaign, Illinois, 1997, p. 29. Reproduced with permission.)



INQUIRY

Rhythm

Discuss how the element of rhythm is applied to:

(a) individual games, for example, golf
(b) team games, for example, touch football
(c) running
(d) gymnastics.

Duration

Duration refers to how long it takes to perform a movement or the time in which a movement must be performed.

The time taken to perform a movement is a continuum from short to long. Within all media of movement, the **duration** of a performance or movement can have a great impact on what the performer is trying to achieve. In aerobics, a performer may take a long period of time to perform one push-up in a routine compared to a series of push-ups performed quickly. In games, rules influence the movement being performed and the positioning of players. For example, in basketball offensive players have a three second limit in the keyhole and in netball the goal shooters have three seconds in which to shoot a goal. In rugby league, slowness in playing the ball allows the opposition to advance and reduce the chances of the offensive team gaining ground.

In dance, a change in the duration of a movement being performed can impact on the quality of the performance. For example, a performer would need to take a long period of time to perform a movement such as pushing against an imaginary barrier, or a short period of time to perform a punch-like action.

Duration also refers to the length of time in which the activity is performed. The length of a music track may determine the duration of a dance or floor gymnastics routine.

Governing sports bodies determine the duration of games; for example, touch football is played in two halves of 25 minutes each. Performers must be physically prepared for the duration of the performance. If their physical abilities and fitness levels are poor, the performance will suffer.



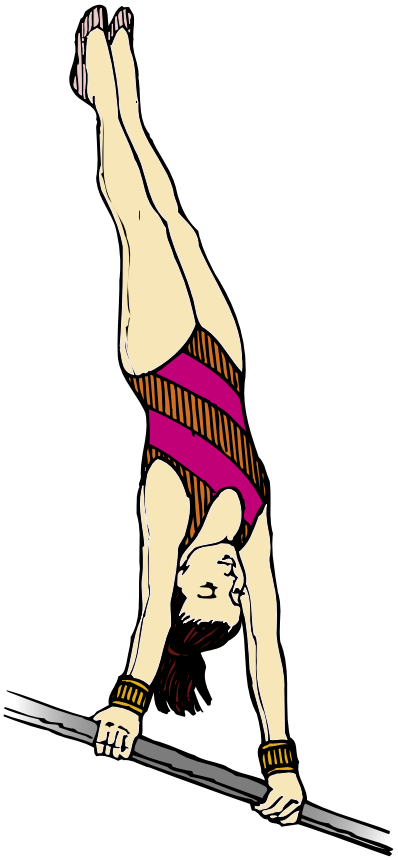
Figure 8.9: The duration of the movement skill of shooting in basketball is influenced by the speed of the player and the pressure of the defence.

Momentum

Momentum (composition and performance) is the speed at which we perform a movement.

Momentum (composition and performance) is determined by the speed at which we perform a movement or movement phrase. Speed can be seen on a continuum from fast to slow. Some movements require us to control the pace at which we perform in order to achieve a specific purpose. For example, a baseball fielder needs to field and throw a fielded ball at a fast speed in order to beat the runner to the base. On the other hand, an aerobics instructor may need to slow down a series of movements in the learning phase or to maintain a high level of safety.

The speed in any movement is not usually constant. An increase or decrease from one speed to another is common. These changes in speed give moments of acceleration and deceleration during the movement. Acceleration and deceleration have many uses in dance, such as representing someone fleeing from danger, the building intensity of a fight, or the wind down showing fatigue and exhaustion. In gymnastics, a performance on the uneven bars may require the gymnast to increase the momentum of movement as she circles the bars, and decrease the momentum as she holds a handstand on the high bar. In games, a tactical ploy by teams is to increase or slow down the tempo and momentum of the game to 'put off' the opposition.



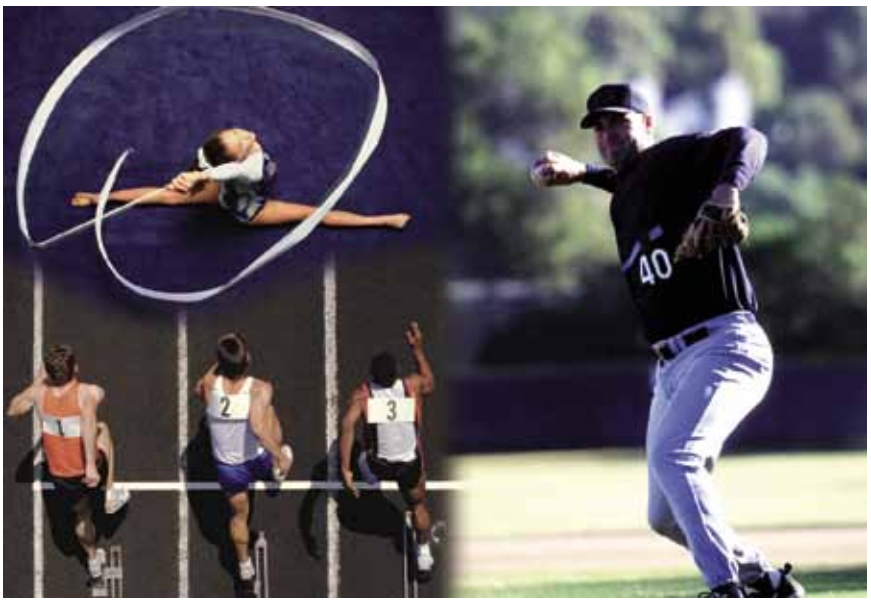


Figure 8.10: The speed at which movements are performed varies according to the purpose of the movement or the performance.

APPLICATION

Time and rhythm: momentum

View short excerpts from a dance, a gymnastics floor routine and a game. Alternatively, compose your own short movement sequence in each of the movement mediums.

INQUIRY

Changing momentum

1. In each medium used in the application above, identify where there were changes in the momentum of the performance.
2. What was the purpose of the changes in momentum?
3. How was momentum used in the dance to add to the quality of the performance? Give examples.

Self-paced versus externally paced

The use of the element of time in the execution of any movement skill is important. To perform any movement skill successfully, we need to put together the subroutines or phrases (related component parts) in sequence. The smoothness and continuity of a movement (rhythm and flow) is influenced by pacing (how we time our movement) and anticipation (how we predict what is going to happen).

When we can determine when to start and finish a movement and how fast to perform it, the skills are said to be a **self-paced movement**. Performing a serve in tennis is a self-paced skill, as the performer is able to completely control the pace of the movement.

Self-paced movements are skills where the performer has control over the timing of the skill, including when it begins and when it ends.

We are not always able to control the pace or timing of our movement, however. In some activities we have to constantly time and adjust our moves in relation to the movements of an opponent or a ball, such as returning a serve in tennis or in dribbling around an opponent in basketball. These movements are said to be **externally paced movements**, as are dances and aerobic routines, which are restricted by external musical rhythms. Environmental factors such as the weather and the playing surface also impact on the performance of a skill.

Externally paced movements are skills where the pace and timing of the skill is controlled by outside influences such as music or an opponent.

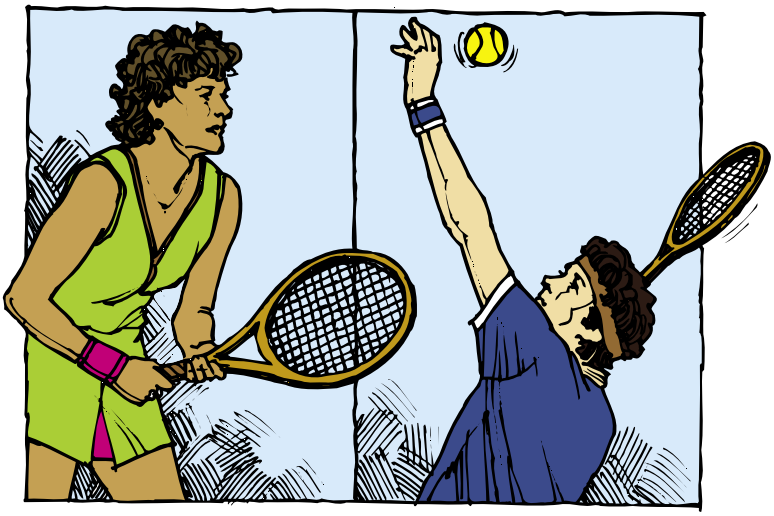


Figure 8.11: A tennis serve is a self-paced movement, but receiving the serve is an externally paced movement.



APPLICATION

Externally paced versus self-paced skills

From the skills listed below, choose one that you can perform competently. Perform each skill as a self-paced skill and then as an externally paced skill.

- A layup in basketball
- Hitting a softball off a tee-ball stand
- Kicking a soccer ball at a target



INQUIRY

Skills

1. Which is the easiest type of skill to perform, self-paced or externally paced? Explain your answer.
   (a) How did you make the skill an externally paced skill?
   (b) How did this affect your performance of the skill?

2. What would happen if you had no previous experience at performing this skill and you had to perform it as an externally paced skill?
3. What impact would using self-paced compared to externally paced skill practices have on a beginner learning a new skill?

Timing

In all movement timing is crucial. This is especially evident in dance, aerobics, floor gymnastics, rhythmic gymnastics and ice-skating, where skills and movements are choreographed to music. It is very obvious to the audience when a performer is out of time either with the music or with the other performers. It detracts from the aesthetic appeal of the performance. In games, timing is vital to the successful performance of skills. For example, when hitting a ball in softball, the batter must time the swing of the bat to hit the ball.



Figure 8.12: The rhythm of a dance is determined by the sounds or music to which it has been choreographed.

The timing of movements is often controlled by external factors such as positioning of opponents, environmental factors, music and the pace required. Timing can be discrete in nature. It is discrete when it has a distinct beginning and end, such as a leap or throw. Timing is continuous when the activity continues without a break, such as cycling or running.



INQUIRY

Timing and rhythm

1. Select a sport that you are familiar with. Identify three or four skills performed in this sport. For example, soccer has the skills of kick, trap and dribble. Explain how timing and rhythm relate to the skills of this sport.
2. View a group dance. Explain how the elements of time and rhythm are used in the dance.
3. Compare the application of timing and rhythm between games and dance.
4. Use the **Choreographer's toolbox** weblink in your eBookPLUS to view performances of the elements of composition — shape, space, timing and dynamics — as they apply to dance.

eBook*plus*

When we move in space we have a relationship with our surroundings. These relationships reflect the way we move, respond or react to people and the environment in which we are moving. The more aware we are of this relationship, the more effective we are in achieving our purpose or communicating our movement message. The relationship that the performer has with others and with their own surroundings can change in response to the purpose of the movement.

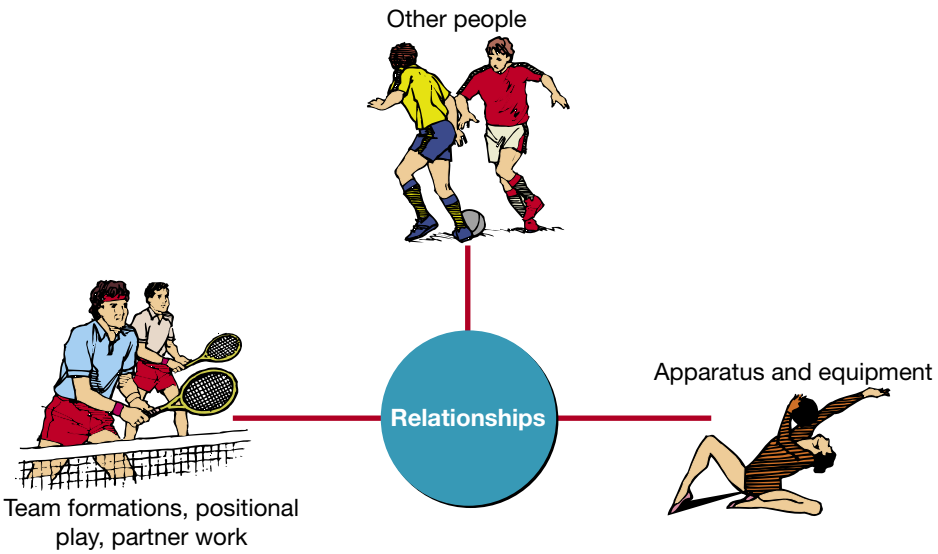


Figure 8.13: Movement relationships

Other people

Within all movement mediums, the relationships or bonds that develop between performers are critical to the overall performance. A successful result in games often depends on the cohesiveness of the team and teamwork on the field or court. Team players must have a good understanding of the role of their team members as well as their own role in the game. They need to be aware of the positioning of others and be confident that their team members will be in the correct position during team plays. When watching elite athletes play, the relationship between the players is obvious. For example, during offensive moves in the keyhole in basketball, it is not uncommon for players to pass the ball without looking at where they are passing, as they know that a team member will be there to receive the pass. Within games, movement sequences or plays can be practised and put into play on the field or court in which players know the spatial position they and their team members should be in order to gain advantage. Often circumstances can change in games that break down set plays. The team that has superior skills and fitness in conjunction with positive communication and good game sense can capitalise on these situations and take the advantage in a game.

Figure 8.14: A movement in unison



In contrast, dance, gymnastics and aerobics have set movement sequences choreographed to an underlying beat, sound or music. Performers move in space in time to the cues of the sound or music, so the relationships between the performers are clearly defined. Relationships between performers are developed through the use of a variety of techniques. For example, two people can move together in different ways:

- in unison (same movements at the same time)
- in contrast (different movements at the same time)
- in sequence (one after another)
- mirrored (moving at the same time with a mirror image of the movement)
- echoing (same movement but at a different time)
- shadowing (guarding)
- in opposition (movements have opposite qualities or move against one another).

Larger groups can make similar sorts of movements but the combinations are more complex. Large group unison movement in dance can be very effective and powerful, yet is difficult for the dancers to perform well.

Communication is important in the development of relationships between performers. Communication can be verbal or nonverbal, such as gestures, eye contact, facial expressions and movements. Verbal communication is most often used in games where team players call out team plays, advice or encouragement. Nonverbal cues, such as those between the catcher and pitcher in baseball, are important in communicating plays. In dance and floor gymnastics, the use of nonverbal communication is a powerful tool in relaying the message of the performance.



Moving with others

Apply the following techniques when moving with others in a game or aerobics routine: unison, sequencing, mirroring, opposition.

Apparatus and equipment

Through movement we can also relate to the apparatus we use and to the equipment we manipulate to effect movement. The body can be used in unique ways to manipulate and control objects. It is important to consider the special properties of these objects when using them. For example, even though squash and tennis are both racquet sports, they vary not only in the structure of the game, but also in the properties of the equipment and court. Therefore, we need to vary our movements and actions when playing either sport.

The way we use our body and the elements of movement can influence the effectiveness and the efficiency of movement when using equipment. Racquets, bats and clubs can act as an extension of the body's levers. They therefore can be used to increase the degree of an imparted force and to control the direction of the force and the speed of a movement. Using apparatus incorrectly can also negatively affect a performance. When using apparatus in rhythmic gymnastics, the gymnast must keep the apparatus moving and manipulate the object with flowing movements to score maximum points. In hockey, the relationship between the player and their hockey stick is obvious. A skilled player can manipulate their hockey stick to perform a range of skills to outmanoeuvre the opposition. The stick becomes an extension of the player's body.

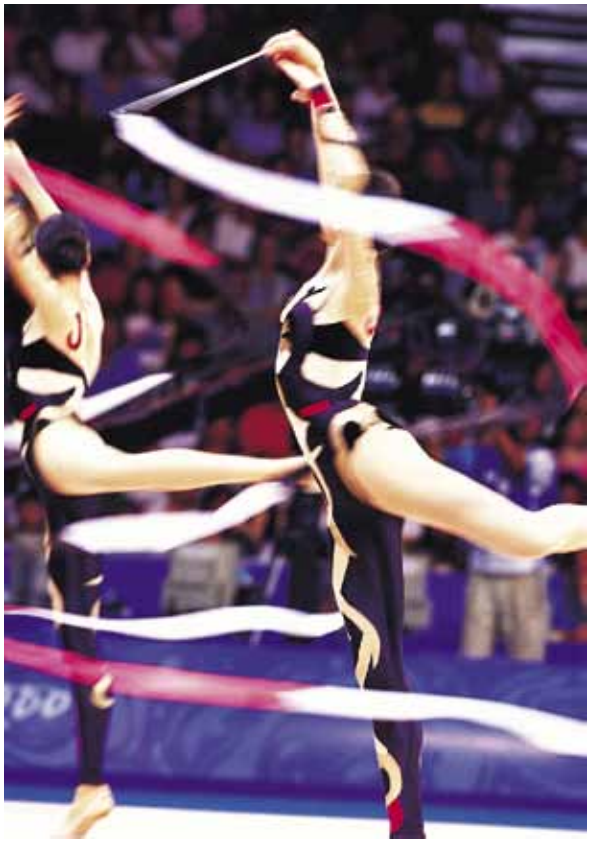


Figure 8.15: The use of various apparatus in flowing movements in rhythmic gymnastics is crucial to its aesthetic appeal.



Figure 8.16: The correct manipulation of equipment is crucial to the execution of skills.

Team formations, positional play and partner work

In games, successful team play is based on the ability of the team to execute plays in which each player understands and executes a specific role. Players have a responsibility to be in the correct position. Players also rely on other

team members to be in or move into a specific position within the playing space when executing plays. Team formations are used in both offence and defence in games.

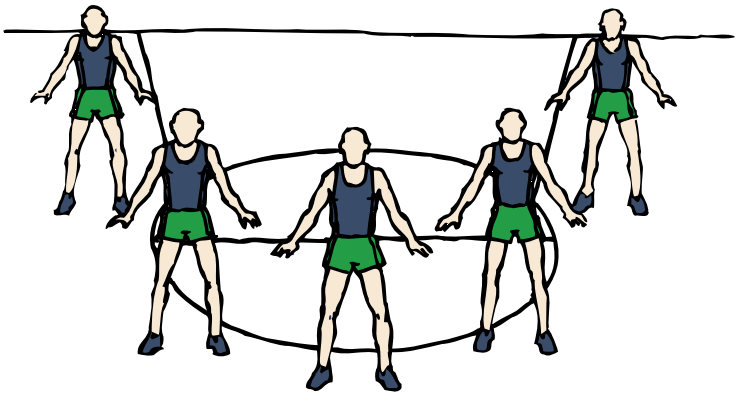


Figure 8.17: Use of a defensive formation in basketball

In an aerobics team composition, which consists of three performers, the performers incorporate a variety of team formations in their display of strength and flexibility. This emphasises the group's relationships and adds to the visual presentation. In dance, pairs aerobics and pairs ice-skating, partner work is integral to the performance. In partner work, each performer is essential to the whole. There is a shared objective. Performers move in different ways such as in unison, contrast and opposition to achieve the desired outcome.

Creating or composing movement requires practice as well as a good knowledge of the elements of composition and how to use or manipulate them in the creative process. Movement composition within each medium utilises a variety of elements, although some are more relevant than others.



Figure 8.18: In partner work, performers work together to create a unique performance.



INQUIRY

Exploring a movement medium

Choose a movement medium you have a good knowledge of, then answer the following questions.

1. What is the purpose of the performance?
2. What are the motivating factors to create movement for the performance?
3. What skills are common to this movement medium?
4. What role does skill development play in the achievement of the purpose?
5. What elements are relevant to this medium?
6. Access the **Elements of composition** weblink in your eBookPLUS. Read the information then carry out the jigsaw activity. Use the tables on the second page as a summary of the elements of composition.

eBookplus



THE PROCESS OF CREATING MOVEMENT

In the beginning of the creative process, the coach or choreographer needs to explore and improvise with the movement skills specific to their medium to discover possible movement solutions. They need to practise with variations in spatial elements, dynamics, time, rhythm and relationships in order to achieve a movement that leads to the desired outcome. For example, in determining an effective offensive play for a rugby league team attacking their try line, a coach may use a variety of combinations of players, direction, positional play, and patterns and formations to break the defensive line to score a try. In dance, the use of stage space and the relationship between dancers are elements that the choreographer should explore.

The process of creating movement also depends on the performer's skill level. Within dance, creating movement depends on dance technique and the ability of the choreographer and performer to explore movement. Through this movement exploration and improvisation, it is important to allow the individual to express movements that feel 'right' and act on impulses and intuition. When composing movement, we need to take into account the kinaesthetic abilities that gifted performers possess and allow **improvisation** to take place.

Improvisation refers to the spontaneous discovery of movement.

Defining the purpose or motivating factors

The purpose or intention of movement composition and the motivating factors behind the development of composition are the basis of performance. The purpose of the movement refers to the reason why we are doing it. For example, in games the purpose is to score. In some games, such as basketball, the purpose is to score more goals. In other games, such as golf, the purpose is to score less. Motivating factors refer to the stimuli or sources of inspiration that are shaped to communicate the coach's or choreographer's intent. For example, the motivating factor to vary a movement in a gymnastics routine may be to increase the degree of difficulty, which leads to a higher score. In aerobics, the music used is the stimulus that influences the sequencing of skills, the arm movements used and the tempo of the routine. In dance, the inspiration may be the use of a prop that inspires the choreographer to compose a movement sequence. It is these factors that guide the creative process of composing movement.

The initiating factors of movement composition vary across the movement mediums. In order to understand the purpose or motivating factors it is necessary to look at each movement medium separately.

Table 8.1: The purpose and motivating factors of each movement medium

Movement medium	Purpose	Motivating factors
Games	• Score • Win • Outplay the opposition to gain the advantage	• Put the opposition on the defensive • Use specific talents of team members • Use individual characteristics, such as strength and height
Competition aerobics	• Achieve personal best results • Win • Aesthetic appeal • Entertainment • Display of strength and flexibility	• Achievement of flexibility and strength • Design a unique performance that incorporates the compulsory components • Higher degree of difficulty • Greater aesthetic appeal • Music
Gymnastics	• Score • Win • Achieve high degree of difficulty in skills • Aesthetic appeal • Achieve personal best	• Music • Design a unique performance that incorporates the compulsory components • Greater aesthetic appeal • Higher degree of difficulty
Dance	• Entertain • Communicate an idea • Inspire • Aesthetic appeal	• Music, sounds, rhythmic patterns • Visual stimuli such as pictures or interesting objects • Props • Tactile stimuli • Kinaesthetic such as gestures and everyday movements • Imagery; for example, feelings such as having your feet on a hot road or being in a chase



INQUIRY

Purpose or motivating factors of activity

1. What is the purpose of aerobic fitness classes?
2. Identify and discuss the factors that would influence the selection of movements incorporated into an aerobics fitness class.
3. Is the purpose of competitive games the same as social games? Explain.



Figure 8.19: The purpose of dance is to communicate an idea, to entertain and to inspire.



APPLICATION

Purpose and motivating factors

Explore the motivating factor of imagery, which is used to motivate movement in dance.

1. Imagine the feeling of swimming in very cold water on a hot day.
2. Move like a piece of paper being blown in the wind.
3. Visualise your body performing a leap.
4. Imagine you are walking with very tired and heavy legs.

Generating movement relevant to the purpose

Locomotor skills are those that involve moving or travelling.

Nonlocomotor skills are performed while the body is in a stationary position.

In the process of composing movement, the coach or choreographer must be familiar with the skills of that specific movement medium. They need to select skills relevant to the purpose. Each movement medium has specific skills that are basic to it. They can be **locomotor**, **nonlocomotor** or manipulative in nature. Locomotor skills are those that involve moving from place to place. The basic locomotor skills include walking, running and jumping. Variations to these basic skills are hopping, leaping, galloping, skipping and sliding. Nonlocomotor skills relate to those movements performed on the spot (above a stationary base). Basic nonlocomotor movement skills include bending, stretching, swinging, swaying, pushing, pulling, rising, falling, twisting and turning.

Table 8.2: Examples of skills basic to each movement medium

Movement medium	Locomotor	Nonlocomotor
Games	• Running • Dodging • Jumping • Walking	• Bending • Twisting • Swinging • Stretching
Aerobics	• Star jumps • Step touch • Step hop • Jogging • Grapevine • Easy walk	• Crunches • Push-ups • Kicks • Squats
Gymnastics	• Running • Tumbling • Leaping	• Balances • Swinging
Dance	• Walking • Sliding • Leaping	• Stretching • Bending • Turning • Twisting • Rising • Falling

Recognising the basic skills specific to each movement medium is one of the first steps in the process of generating movement. The level of skill of the performers is also an important consideration at this stage of movement composition. It impacts on the choreographic process. For example, a basketball

coach may plan an offensive play that requires a player to perform a jump shot. However, if that player is only in the early stage of learning this skill, the play will not be successful.

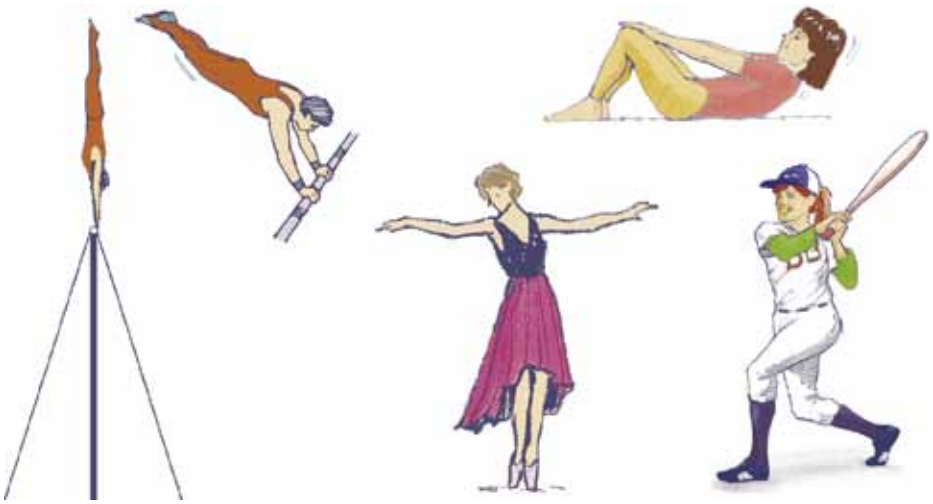


Figure 8.20: Recognising the basic skills specific to each movement medium is one of the first steps in the process of generating movement.

Not only does the coach or choreographer need to identify the purpose of the performance and then choose the relevant movement skills, they must then vary the elements of composition to produce the desired performance. For example, in rhythmic gymnastics the coach needs to consider the use of spatial elements, rhythm, timing and dynamics when choreographing a ribbon routine. They may vary the direction of movement of the performer, the levels of both the performer and the ribbon, or the relationship the performer has with the ribbon to generate a unique routine.

The choreographer or coach must allow improvisation during the production, rehearsals or practice sessions. It is important in group performances to encourage all members to work together to form a united and coordinated performance or team play.

Exploring variations

Movement exploration refers to guided discovery or exploration of movement.

Movement exploration allows spontaneous movements to occur. The exploration process is guided by the coach or choreographer or suggestions for movement. This process encourages performers to extend and vary movements they have already learned and movement combinations.

Table 8.3: Examples of ways to explore variations to known movements and combinations

Movement medium	Variations
Games	• Vary the momentum of play. • Change the direction of flight of the ball and the angles run. • Vary offensive and defensive patterns. • Vary team formations. • Vary the pace of movement execution.
Aerobics	• Add equipment, such as steps, weights or rubber bands. • Vary arm lines; for example, front raise, lateral raise, back raise.

(continued)

Table 8.3: *(continued)*

Movement medium	Variations
Aerobics *(continued)*	• Vary the basic sidestep; for example, use a step touch, double step touch, step hop, or step curl. • Vary the tempo of the music. • Vary the momentum of the movements. • Vary the degree of difficulty by adding difficult arm lines and complex step sequences, and using changes in directions. • Vary the intensity: high versus low impact.
Gymnastics	• Select music with varying tempo that can be used for changes in momentum. • Vary the direction of travel: use diagonals, up and down. • Use different arm movements in floor routines. • Vary dimensions: use rolls, leaps and tumbling sequences as opposed to vertical positions.
Dance	• Allow the performer to improvise with movement. • Vary the spatial elements of direction and dimensions. • Vary the dynamics of movement: strong versus weak. • Vary relationships; for example, introduce props and other performers, or emphasise different body parts.



Figure 8.21: Exploring arm movements to set aerobics sequences adds variety and difficulty to the movement.



APPLICATION

Exploring variations

Choose a movement medium, then compose a simple movement sequence. Teach this movement sequence to other class members. As a group, explore ways of varying the movement sequence learned.

1. Identify the elements that apply to this medium.
2. Change and manipulate these elements to explore a variety of movements with this sequence.

Example: Offensive play in touch football
Original movement sequence: two settles (one pass hit ups), followed by a dump and scoop, followed by a pass.
Variations:

- run wider angles in the settles (change in direction and dimension)
- add a wrap on the settles (change in patterns)
- add a dummy pass in the dump (change in dynamics)
- add a switch move between the person who scooped and another player (change in patterns; direction; relationships).

Improvisation

Improvisation is the unplanned and spontaneous discovery of movement. It is initiated by a motivation or stimulus. Improvisation allows the performer to follow a more personal stimulus where internal cues become important. During the process of improvisation in dance, the performer should be conscious of how the movements flow and connect. The movement should have a beginning, middle and end, allowing the movement to come to a natural conclusion.



APPLICATION

Improvisation in dance

These improvisation exercises allow you to explore movement in an uninhibited way. Allow movement to flow; do not force it.

1. Lie on the floor. Take several deep breaths. Focus on your body. Let your body follow some of the small movements that develop.
2. Let some of these movements become larger. Alternatively, allow them to lead you into new and extended actions.
3. Now try exercises one and two while listening to soft, soothing music.
4. Imagine that you are in a cool, quiet forest. Feel and sense this situation. Think about the spongy pine needles beneath your feet, the sunlight filtering through the trees, small animals scampering out of your path, and the closeness of foliage and vegetation. Begin to move while you focus on how you feel about this imagined situation.

Source: Sandra Cerny Minton, *Choreography: A Basic Approach Using Improvisation*, 2nd edn, Human Kinetics, Champaign, Illinois, 1997.

Improvisation within games occurs frequently, particularly during offence. A coach may compose a set play in a given part of the playing area involving specific team members. Unfortunately the defence's movements are an unpredictable factor, often resulting in the offensive team having to improvise during a set play to counteract the movements of the defensive team.

When an aerobics instructor is choreographing movements to music tracks, they often improvise with arm and leg movements and direction of travel. They do this to compose a challenging movement sequence.



Figure 8.22: The process of creating movement can include improvisation, so long as the performance still flows and connects.



COMBINING AND ARRANGING MOVEMENTS

A **phrase** is a number of related movement skills or actions.

A **sequence** is a group of related phrases.

Whether we are performing a dance, a gymnastics or aerobics routine, or playing a game, our movement skills and elements will be combined and arranged into some pattern or structure. The process of composing involves arranging skills into movement **phrases**. These phrases are combined into a number of **sequences** which, when linked, form the final composition. To fully understand the process of choreography it is important to understand the rules and conventions of the movement medium and the variety of ways in which movements can be arranged.

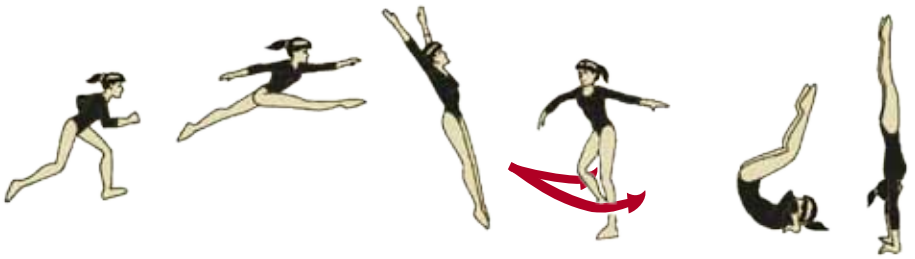


Figure 8.23: A gymnastics phrase — run, leap, land, turn and roll to balance

Rules and conventions of the medium

When examining each movement medium it is obvious that each has its own rules and conventions that direct the choreographic process. The very nature of each movement medium influences the selection of skills and the use of elements.

Games

Games are mostly characterised by the movement of the body in order to propel or retrieve an object, which is most commonly a ball. They have a predetermined objective, such as to score goals. Games tend to rely mainly on the use of a range of locomotor skills together with the use of manipulative skills such as kicking, throwing and striking. Each game has specific rules that govern the play of the game. These rules impact on how the compositional elements are used. For example, the use of dimension in space is a particular consideration in games such as:

- netball, where player movement is governed by the thirds of the court
- touch football, where the five metre rule applies in defence
- basketball, where the three second rule applies to offensive players in their keyhole.

It can often be challenging for athletes to adjust to the rules and conventions of other games. For example, a netball player playing touch football may have difficulty adjusting to throwing the ball backwards in order to advance forward.





Figure 8.24: We use both locomotor and manipulative skills to play most games.

Dance

The medium of dance incorporates many styles including ballroom, classical (ballet), jazz, Afro or primitive, Latin American, folk and modern dance. A particular style of dance often has certain techniques or 'rules' that separates it

from other styles. A particular style is often identified by where the body moves, what parts of the body move and how the movements are arranged. However, the two things common to all styles is the use of the body and the expressive quality of the movement. The type of dance that is performed is therefore determined by the way the body is used to express a feeling or action. The movement skills and elements give us the dance materials to determine what we can do, where we can move and the various qualities we can express with our body.





Figure 8.25: Different dance styles involve variations in the application and use of movement skills and elements.

Gymnastics

Gymnastics can take a variety of forms: Olympic (formal or artistic), rhythmic (using small hand apparatus), educational (creative or movement exploration) and general (team events).

The movements involved in gymnastics are characterised by the skilful manoeuvring of the body to perform predetermined, specific tasks. These movements often involve the use of a piece of apparatus or equipment.

The type of locomotor movement skills performed require precise execution. Nonlocomotor skills, such as turns, balances and pivots, are used extensively. Most often in gymnastics there is a standard sequence of motor actions to conform to. The compositional elements are then applied to the movement skills to achieve these predetermined movement objectives and a particular quality.

Aerobics

The medium of aerobics encompasses competitive aerobics (including singles, pairs and team aerobics) and aerobics fitness classes. Competitive aerobics requires four compulsory movement skills to be performed: crunches, push-ups, star jumps and kicks. Each skill must be done at least four times consecutively and be identical in execution. Moves can be added to the routine, but must not be contraindicated or gymnastic in nature. A time limit also applies in competition. Compulsory moves are the basis of a competitive aerobics routine; other skills are added and the compositional elements are applied to achieve a unique performance.

In aerobic fitness classes, the instructor uses movement skills and elements to achieve the purpose of improving the health-related components of fitness through a sociable form of exercise. The exercises can be structured in many different ways to suit the participants in a class and to achieve specific goals such as toning, strengthening, stretching or aerobic fitness.



Figure 8.26: Aerobic fitness classes involve the use of aerobic movements with the aim of improving health and fitness.

Sequencing

A movement sequence is the combination of a group of related phrases that come to a natural conclusion. The choreographer or coach arranges a number of sequences into a movement pattern. This becomes the final outcome or composition.

Sequencing is the organisation of single movements into short and long phrases, then into sequences and sections and finally into a completed performance.

Sequencing is the process of putting movements and phrases together into larger sections in an ordered, sensible way. Sequences may flow from one to the other or be joined by transitional or connecting phrases.

A sequence of play in a game of hockey might be a series of individual and team offensive manoeuvres or plays (phrases) to bring the ball from one end of the field to the other past the opposition to score a goal.

An aerobics sequence could be a number of movement tracks following on from one another.

The structure or arrangement of a movement composition is referred to as its form. The form shapes the way in which the movement sequences and phrases are put together to make the whole. Form is more evident in and applicable to dance, gymnastics and aerobics than it is to games. The order and arrangement of the sequences within a composition is often determined by the accompanying music.

When music is used as the stimulus for the movement, the movement composition will often follow the accompanying musical form. For example, a musical composition that has three contrasting sections will often have a chorus or original theme that will be returned to. A dance composition can reflect the same arrangement with repetition of the original movement theme.

Transitions

Transitions are a natural evolution from individual movements to phrases and major sections of a dance, game or routine.

Transitions are the joining sections of movement phrases and sequences. The transition should be a natural progression from one phrase or sequence to another. Transitions are an integral part of choreography because they contribute to the continuity and unity of a composition. The audience should not be distracted by transitions as they should be fluid and automatic.

Transitions can vary in size and complexity. A transition in dance may be as simple as a change in direction or focus, or it may be a movement phrase itself. In aerobics it may be a change in the music track or the tempo of the music.

Repetition

Repetition in movement is repeating a movement or movement phrase.

Repetition involves repeating certain movement phrases so that the audience can see these movements again and identify with them. Repetition also supports the learning of movement skills and phrases. For example, an aerobics instructor will choreograph a movement sequence to a music track, repeating the basic skills so that the class has a chance to learn the sequence. The instructor provides variety to these movements by manipulating elements such as direction travelled and arm lines.

There should be a balance of repetition and variety. If movements are repeated too much they become predictable. If there is too much variety it is difficult for the audience to identify with a string of unrelated movements.

Variation

Adding variation to set movements and sequences is important in all movement mediums. It creates interest and visual appeal in gymnastics, dance and aerobics. Adding variation to movements in games gives more options in offence and defence and reduces the predictability of team plays.



Figure 8.27: In sports such as netball, adding variations to set plays can make it more difficult for the opposing team to predict players' moves.



APPLICATION

Variation to a movement sequence

Compose and perform a movement sequence in your chosen movement medium. Experiment with the elements of composition and the movements to devise at least four variations to this movement sequence. For example, in an aerobics routine variation can be accomplished by changing

- the arm lines
- the direction of travel
- leg movements in side touches (such as a knee lift or step tap)
- the music and tempo.



INQUIRY

Variation and performance

1. What effect does each variation in the application above have on the performance?
2. How can variations be used to increase the difficulty or intensity of a performance?



APPRAISAL

Appraisal is the process of determining the quality, quantity and status of a movement performance or skill.

Appraisal gives the coach, choreographer and performer feedback on performance. Appraisal is an integral part of composition and performance as it gives information about the following factors:

- the degree of success of the performance
- self-evaluation
- the ability and success of others
- self-improvement
- areas that need correction
- recognition of skill level
- motivation.

Ways of appraising

There are several ways that we can appraise a performance.

Observation

Objective observation is judgement based on a predetermined set of criteria used to measure a performance. Examples of criteria could be:

- the use of the elements of composition
- presentation
- music selection
- height jumped
- distance thrown.

Subjective observation is based on feelings, impressions or opinions rather than a predetermined scoring system.

A rating scale is an observation technique used to measure a specific aspect of the performance. It allows us to focus on specific qualities or desirable aspects of a performance. A category (excellent, good, fair and poor) and a rating scale (5, 4, 3, 2, 1) can be determined and applied to the observation.

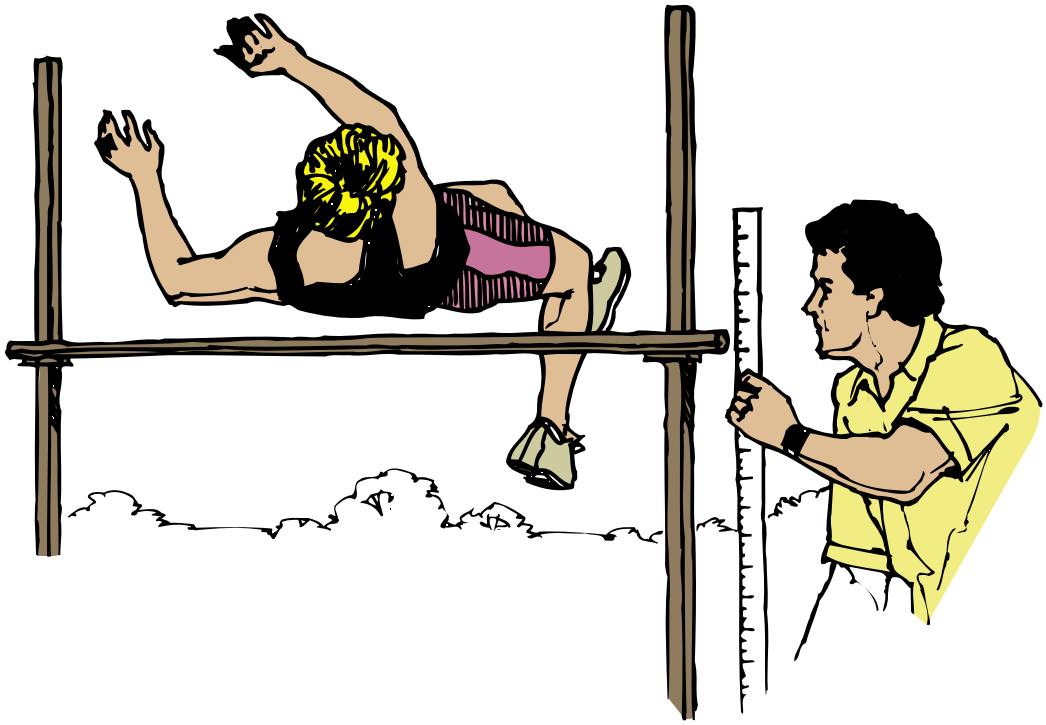


Figure 8.28: Height jumped is an example of objective observation of performance.

Criteria		Level of achievement				
		Inadequate 1	Limited 2	Sound 3	High 4	Outstanding 5
Use of the element of composition	• Space (floor pattern, shape, focus, etc.) • Rhythm elements (beat, accent, tempo, phrasing) • Relationships (variation, groups, etc.) • Flow (uninterrupted) • Force (change in the dynamics) • Time					
Composition	• Musicality • Structure • Choreography					
Performance	• Technical ability • Presentation					

Figure 8.29: A dance evaluation form showing a sample of components that can be assessed with a rating scale

A check list is a list of things to look for when observing a movement performance. Figure 8.31 shows how a rating scale and a check list can be used to measure skills.

Basketball skills	Subskills	Rating	Faults
Shooting	Grip Stance Take-off Ball release Follow-through	Good Fair Poor	For example: Unbalanced Feet too close together Feet not parallel
Dribbling			
Passing			
Footwork			

Figure 8.30: An example of how a rating scale can be used in association with a check list to measure basketball skills



Developing a rating scale

In your chosen movement medium, develop a rating scale that could be used when appraising a performance.

Analysis

Norms are useful standards that allow individual performance scores to be compared to the performances of others who have taken the same test. A norm is a scale that enables a raw score to be converted to a score that can be compared to and interpreted in relation to a large, representative group. For example, physical fitness tests such as the beep test use norms.

A percentile rank is a common normative scoring scale used in motor performance tests. It is based on the actual performance score. For example, an eightieth percentile score indicates that the individual has scored better than 80 per cent of those taking the test.

Statistics are often used to appraise the performance of an individual or team. For example, statistics may be collated about the goal average of a shooter in netball, the number of rebounds in basketball, or tackles in rugby league.



Appraisal and statistics

Observe a game that you are familiar with. Identify the areas of performance you wish to appraise. Record statistics for the game and make an analysis of each player's or the team's performance based on the statistics.

Experiencing

When a performer has mastered a skill or movement, they develop the ability to judge if they have performed that skill or movement correctly. This internal appraisal mechanism or kinaesthetic sense is characteristic of a skilled performer.

To become an objective observer such as a judge, it is essential that the individual spends a lot of time judging performances.



Ways of appraising

1. Identify and list objective methods of observation.
2. How can an appraisal of a performance be made more objective?
3. Why is it important to receive feedback about performance?

4. How could the coach or performer use this feedback?
5. Why is it important that judges of performance are experienced?
6. How does an experienced performer have an advantage over an inexperienced performer when appraising their own or others' performance?
7. Would an audience appraisal of a performance be a good indication of the quality of a performance? Explain.



INQUIRY

Appreciating mediums

1. Choose a dance or gymnastics performance. Describe how an observer may appreciate that performance if viewing from an aesthetic perspective.
2. Choose a different medium such as a game. Describe what to look for to appreciate the game from an artistic perspective.

Aspects of appraisal

Appraisal is the process of determining the
- quality (worth or value)
- quantity (for example, measurements)
- status (level)

of a movement performance or skill. Appraisal may involve procedures such as judging, measuring or interpreting a performance to estimate its value or worth. It is based on specific and/or established criteria or on personal opinion. Appraisal determines the extent to which movement goals are achieved. When appraising a performance, the following can be considered:
- how the elements of composition are used
- how creative or innovative the skills and movements are
- the arrangement of movement
- whether the performance achieves its intended purpose.

Elements of composition

When appraising a performance, this question needs to be addressed: 'How are the movement elements being used to enhance the quality of movement and performance?' For example, the following questions about the use of elements can help determine whether a dance is good or not:
- Is the whole stage area being used to its best advantage?
- Are there positive relationships between performers?
- Are the relationships between performers and props effective?
- Are the movements used appropriate to the music selected?
- How do the elements combine to produce aesthetic appeal?
- Have the elements been manipulated to add variety to the dance?

A good performance would use the elements of movement to show variation and creativity to produce quality movement.

Creativity and innovation

Adding creative and innovative movements to a performance adds to the aesthetic appeal for the audience. In competition aerobics, performers are judged on their creativity in the presentation component of the judging. Performers should demonstrate the creative use of movements and transitions. Demonstrating unique movements that add difficulty to the performance is an important aspect of judging gymnastics. Innovations and variations to gymnastics skills make a performer more competitive. Creativity in movements

within games is often used to reduce the predictability of team plays to gain the advantage.

Arrangement of movement

A performance must show flow and continuity in the arrangement of the movement. Selected skills must suit the purpose of the performance and must be sequenced in a logical pattern. Transitions from one movement phrase to another must demonstrate coordination, flow and creativity.

Achievement of purpose

When judging a performance it is critical that the purpose of the performance is evident. In dance it would mean the clear communication of intent or an idea. Ambiguity detracts from the performance. The audience does not like to be left wondering what a performance was about, so it is important choreographers select movements, music and props that reflect their intention.

In games, it is quite simple to judge the achievement of the purpose. The final tally of goals is one method of determining this. The final score is an indication of the success of a performance in gymnastics.



Appraisal

1. View a recording of a movement performance, such as an aerobics routine or dance. Make a personal appraisal of the performance. Share this with the class, explaining the reasons for your judgements.
2. As a class, design a set of criteria that reflect each aspect of appraisal; that is, the elements of composition, creativity and innovation, arrangement of movement and achievement of purpose. Now view the recording again and make an appraisal based on the aspects identified by the class.
3. As a class, discuss
   (a) the differences in appraisal
   (b) the impact of set criteria on judging
   (c) objective versus subjective appraisal.

Establishing and applying criteria

In order to give a fair evaluation of a performance it is important to:

- consider the nature of the activity
- analyse the components of each activity
- identify what is required to produce a quality movement or series of movements in each activity.

Each movement medium has similar characteristics, but each also has some that are unique to that activity; for example:

- gymnastics requires balance, coordination, power, flexibility, agility, body control and precision of movement
- games require skills specific to the game, flexibility in adapting to changing conditions and many of the fitness components
- dance requires coordination, balance, agility, rhythm, a good kinaesthetic sense and an expressive quality in movement
- aerobics requires flexibility, strength, cardiovascular fitness, creativity and rhythm.

It is therefore appropriate that we consider the nature and components of each activity to develop a set of criteria for measuring performance in each of these areas.

Criteria for judging gymnastics

Gymnastics consists of a number of disciplines: women's and men's artistic (Olympic) gymnastics and rhythmic gymnastics. Gymnastic routines are evaluated using a scoring system where the maximum score is 10 points. Judges deduct points or fractions of points for errors or faults.

A gymnastics judge needs to know and be able to identify:

- the skills the gymnast is performing (what it should look like and what is wrong if it is executed incorrectly)
- the qualities required for an ideal execution of the routine.

In artistic gymnastics, a performance is evaluated by considering:

- what the gymnast demonstrates; for example, difficulty, set requirements, original and risky moves, the composition of the routine and the connecting movements between skills
- how well the gymnast demonstrates the skills and the connections. This is termed execution and includes artistry, technique and style.

Criteria for execution include:

- exactness of the phrases of the skill — phrases need to be performed with precision and a defined body shape and show quick, crisp transitions
- fullness of amplitude — the range through which the body moves; that is, height, length, stretch and flexibility
- stretched arms and legs — the routine should demonstrate optimum posture and extension of body parts
- precision of timing — the performance must demonstrate absolute sureness, lightness of movements and style.

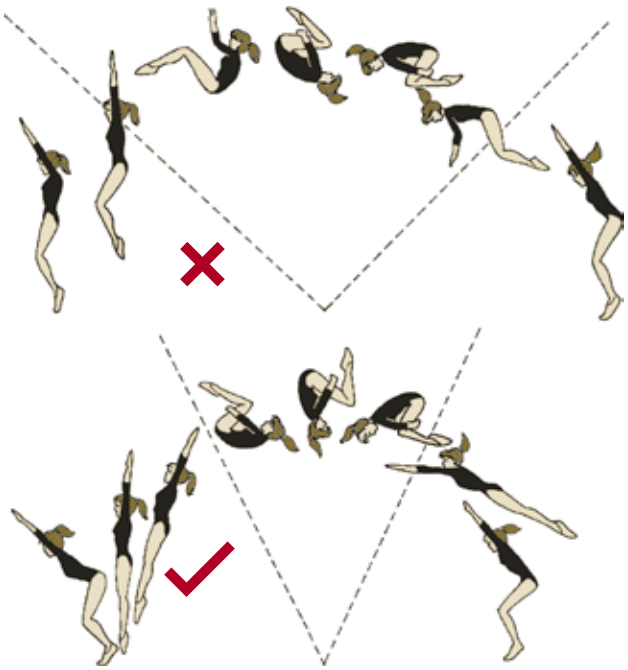


Figure 8.31: Good timing and sure execution give a stylish performance in artistic gymnastics.

The execution of the skills in an artistic performance is judged by recording the mistakes made during the routine. Typical faults include:

- posture — poor positioning of the arms, legs, feet, body and head
- balance — wobbles, unsure landings, off direction and touching the floor or apparatus
- amplitude — lack of height or length, poor stretch or lack of flexibility

- rhythm — pauses, loss of rhythm, lack of continuity, monotonous tempo, extra swings, turning too early or too late, having a routine that is too long or too short.

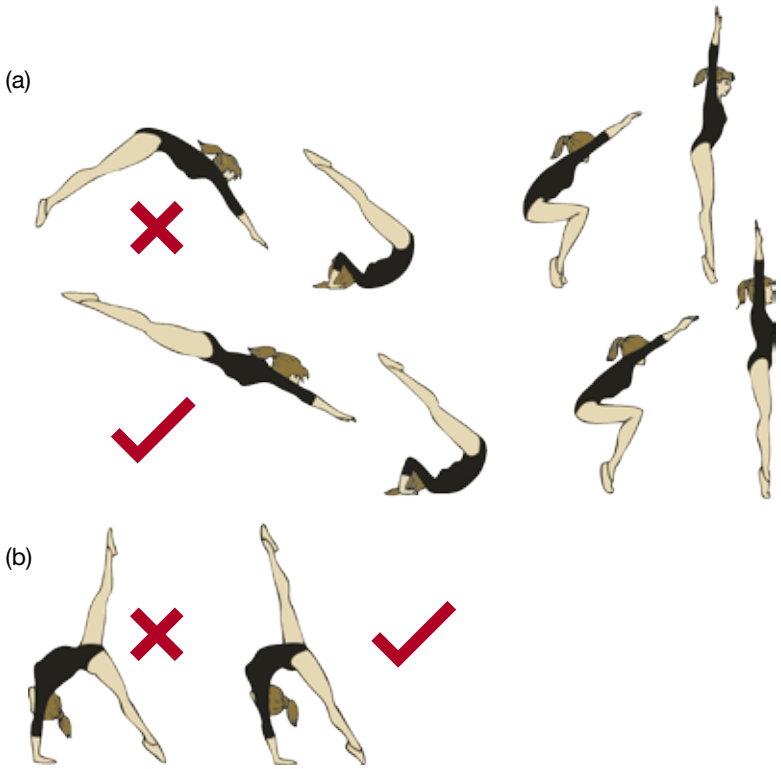


Figure 8.32: **(a)** Changes in body shape need to be well defined in artistic gymnastics. **(b)** Incorrect and correct amplitude

Criteria for judging games

Performance in a game can be judged on:

- the execution of basic skills; for example, running, jumping, stopping, starting, twisting, passing and striking
- the use of game techniques — these are skills specific to each game; for example, manipulating a hockey stick to control a ball in hockey
- physical fitness
- perceptual motor ability — the ability to relate to the position and movements of other players and changing game situations
- team play.

Objective appraisal in games is made by using statistical information obtained from the game.

Criteria for judging aerobics

In competition aerobics a routine must be between one minute 40 seconds and one minute 50 seconds long. It is judged on a skill component, representing 60 per cent of the performer's score, and a presentation component that comprises 40 per cent of the performer's score. These components are based on the following criteria.

1. Skill:
    - strength — balanced upper and lower body strength and the clear demonstration of leverage and applied strength principles
    - flexibility — full range of motion in the major joints

- form — overall execution should show coordination and technical control
- exercise selection — this should be varied, safe and appropriate and show a balanced use of all the major muscle groups
- transitions — these must demonstrate coordination, flow and creativity
- synchronisation of pairs and teams — performers should 'move as one' and match in style and the execution of movement.

2. Presentation:
   - showmanship
   - creativity
   - musical selection
   - music interpretation
   - appearance
   - physique.



Figure 8.33: A dance judge looks for key criteria when appraising a performance.

Criteria for judging dance

While the criteria for judging a dance performance may vary depending on the dance style or genre, certain general criteria can be applied to all.

A good dance performance is distinguished by:

- technical competence — the performer demonstrates technical skill in the execution of movement skills appropriate to the style of dance and shows coordinated and logical movements
- use of elements — the elements of composition show development, variation and creativity to give quality
- music
- performance and presentation — achievement of the purpose of the performance
- communication — the performer demonstrates stage presence and entertains and communicates with the audience
- stagecraft — costuming, lighting, props, scenery and sets used to heighten the story or mood of the dance.

Different percentage weightings may be allotted for each criterion and in a dance competition, a panel of judges may be required to allow for the most objective appraisal.

APPLICATION

Establishing and applying criteria

1. As a class, devise a set of criteria that could be used to appraise a performance.
2. Individually, make a judgement about the performance based on the established criteria.
3. Compare and discuss your judgements.

INQUIRY

Using criteria to make a judgement

1. Was this method of appraisal fair and objective?
2. How could this process be made more objective?
3. Suggest reasons for differences in final judgements.
4. How could the performer use the feedback from the appraisal?
5. Use the **Performance videos** weblink in your eBookPLUS to view two dance performances. As individuals, apply the criteria for judging dance to rate each performance. As a class, discuss your appraisals.

eBookplus

SUMMARY

- The elements of composition are identified aspects of movement that can be changed or manipulated to produce movement patterns.
- The elements of composition include space, dynamics, time, rhythm and relationships.
- The element space includes direction (moving forwards, backwards, right, left, up, down or diagonal), level (high, medium, low), dimension (the size or extent of the movement or space), patterns and formations (imaginary lines that the body or its parts make when moving in general space).
- Dynamics refers to the force with which a skill is performed and the flow of movement.
- Time and rhythm refer to the synchronisation of a movement to music, sound or a beat; the coordination of body parts to perform a skill; how long it takes to perform the movement; and the pace at which it is performed.
- When a performer controls the timing of a movement, it is defined as self-paced.
- An externally paced skill is controlled by outside factors such as game rules, music or opponents.
- The element relationships reflect the way we respond or react to people and the environment in which we are moving.
- Within all movement media our relationship with others and the environment is constantly changing.
- The process of creating movement is influenced by many factors. These include the purpose of the performance, the stimulus or motivating factors that initiate the movement, the elements of composition and the skill level of the performer(s).
- The purpose of movement refers to the reason why we are doing it, or the intent of the performance.
- Motivating factors refer to the stimulus or sources of inspiration that initiate the process of composing movement.
- One of the first steps in generating movement is to identify the purpose and recognise the skills (locomotor, nonlocomotor or manipulative) that are specific to the movement medium.
- Manipulation of the elements of composition gives quality to a performance.
- Movement exploration is guided discovery of movement. Improvisation is spontaneous discovery of movement. Both are useful tools in the process of creating movement.
- When combining and arranging movement, the coach or choreographer arranges skills into movement phrases, combines phrases into sequences and then combines sequences into the end performance.
- Each movement medium has specific rules and conventions that govern the choreographic process.
- Transitions are the joining sections of movement phrases and sequences. They need to be a natural progression from one phrase or sequence to another.

- Repetition of movements supports the learning of skills. Variation of movements in a performance creates interest and visual appeal. There must be a balance of each in any performance.
- Performance appraisal provides information about a performance. Appraisal is the process of determining the quality, quantity or status of a performance.
- In the process of appraisal the following aspects of performance should be observed: use of elements, creativity and innovation, clear purpose and accurate arrangement of movements.
- There are several ways to judge or appraise a performance. They include: objective and subjective observation, use of rating scales, percentile ranks, statistics and norms.
- To provide an objective appraisal of a performance it is important to establish set criteria on which to judge the performance. Each movement medium has specific skills and qualities that require specific criteria for judging.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

QUESTIONS

Revision

1. **Identify** the elements of composition. (P17) (2 marks)
2. How do the elements of composition apply to different movement mediums? **Describe**, using examples. (P17) (5 marks)
3. **Outline** how space is used in floor gymnastics. (P17) (3 marks)
4. How could dynamics add quality to a dance performance? (P17) (2 marks)
5. **Identify** and state the relationships that exist in the game of basketball. (P16) (3 marks)
6. **Describe** the role of rhythm in dance and aerobics. (P16) (2 marks)
7. Why is timing important in games? **Explain**, using examples. (P16) (3 marks)
8. Select a sport. **Discuss** the use of team formations in offence and defence. (P13) (5 marks)
9. What is the difference between self-paced and externally paced movement? **Discuss** the impact each would have on the process of composing movement in games. (P17) (5 marks)
10. Select a movement medium. **Describe** how each element is used to compose movement in this medium. (P17) (5 marks)
11. **Identify** the skills that are specific to aerobics. How could variation be used to add quality to an aerobics routine? Give examples. (P13) (5 marks)
12. What is the difference between movement exploration and improvisation? **Discuss** the purpose of each in the process of movement composition. (P17) (6 marks)
13. How can the specific rules and conventions of each movement medium influence the process of creating movement? **Describe**, giving examples. (P17) (4 marks)
14. **Explain** the role of transitions in movement composition. What are the characteristics of effective transitions? **Identify** ways of linking movement phrases in aerobics or gymnastics. (P16) (7 marks)
15. **Explain** the difference between objective and subjective appraisal. (P17) (2 marks)
16. **Explain** the importance of experience in the process of appraising performance. (P16) (3 marks)
17. **Create** a set of criteria that could be used to appraise a performance in your selected movement medium. Base the criteria on the aspects for appraisal. (P16) (5 marks)
18. **Explain** the role of appraisal in movement composition and performance. (P16) (3 marks)

Extension

1. **Describe** how the elements of composition can be observed in a floor gymnastics routine. (P17) (5 marks)
2. **Discuss** how the elements of composition can be manipulated to plan an attacking move in a chosen sport. (P17) (7 marks)
3. **Describe** the process of establishing and applying criteria when judging a performance in a chosen movement medium. (P16) (6 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

CHAPTER 9
Fitness choices



OUTCOMES

On completion of this chapter, you will be able to:

- describe factors that contribute to effective health promotion (P5)
- propose actions that can improve and maintain an individual's health (P6)
- plan for participation in physical activity to satisfy a range of individual needs (P10)
- form opinions about health-promoting actions based on critical examination of relevant information (P15)
- use a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

OVERVIEW

MEANINGS OF EXERCISE
Exercise as a form of physical activity
Exercise and its relationship to fitness

THE VALUE THAT PEOPLE PLACE ON EXERCISE AND FITNESS
Changing attitudes to fitness
Fitness as a commodity

INDIVIDUAL FITNESS ACTIVITIES
Power walking; Running; Swimming; Cycling; Weight training programs; Tai chi; Pilates; Yoga
Emerging individual fitness activities

GROUP FITNESS ACTIVITIES
Aerobics; Aquarobics; Pump classes; Step classes; Spin classes; Circuit training; Team games; Exercise for specific groups
Emerging group fitness activities

SETTINGS FOR EXERCISE
Exercise at home; Community facilities; Fitness centres and personal trainers; Exercise clubs; Cultural groups

ADVERTISING AND PROMOTION
How do you know who to believe?
Promotional techniques
Accuracy of information
Ethics of advertising

MOTIVATORS AND BARRIERS TO PARTICIPATION
Access to facilities
Convenience of use
Cost
Feelings about fitness and exercise
Exercise as a priority
Influence of other responsibilities

In our everyday lives we engage in a variety of physical activity, from washing the car and doing the housework to getting dressed for school or work. Completing these types of task requires a small amount of effort and often we use only our upper body to do them.

Although these activities require the expenditure of a certain amount of energy through the movement they involve, their contribution to overall health and fitness is minimal. In order to gain health and fitness benefits, it is necessary to engage in moderate to vigorous activity. Individuals who choose to lead an inactive lifestyle are at risk of developing many lifestyle diseases. Inactivity is a major risk factor of coronary heart disease and contributes to other risk factors, including obesity, high blood pressure, stroke and diabetes.



Figure 9.1: People engage in a variety of physical activities. The impact these activities have on their health varies according to the intensity of the activity.



MEANINGS OF EXERCISE

The reasons why people participate in exercise and what exercise means to them is varied. It may mean an enjoyable experience that aids in stress release and relaxation, or it may be an activity that is planned to achieve benefits such as weight loss and improved cardiovascular efficiency. Exercise may simply mean hard work. Regardless of what exercise means to different individuals, people generally take on exercise for the health and fitness benefits that result.



APPLICATION

Meanings of exercise — survey

Conduct a survey of 10 or more people. Select people from a variety of age groups, both genders, different cultural backgrounds and a range of exercise experience. Ask them the question 'What does exercise mean to you?'



INQUIRY

Meanings of exercise — survey results

Answer the following questions using the results from the survey in the application above.

1. Suggest reasons for the wide range of opinions about exercise among people.
2. How does the meaning of exercise change with age? Suggest reasons for this change.
3. What does exercise mean to you?
4. What things have influenced your opinion about exercise?
5. Do you regard exercise as an important component of lifestyle? Explain.

Exercise as a form of physical activity

Physical activity is any movement that results in some expenditure of energy.

Exercise is planned, structured and repetitive bodily movement. It is performed to improve or maintain one or more components of physical fitness. Exercise is a subset of physical activity.

Light exercise is activity that requires approximately three to four times as much energy as rest.

Moderate exercise is activity that requires approximately five to six times as much energy as rest.

Vigorous exercise is activity that requires seven times or more energy as rest.

Physical activity in the form of **exercise** has always been considered positive lifestyle behaviour. Exercise itself is a special form of physical activity because it is planned, structured and consists of repetitive bodily movements. Performing a series of push-ups and sit-ups is considered exercise because movements are repeated with the intention of improving selected components of fitness, in this case, muscular strength and/or muscular endurance.

Exercise varies in intensity or the amount of effort we put into performing the movements. Intensity can be categorised as light, moderate or vigorous and is measured in a number of ways. **Light exercise** is activity that requires approximately three to four times as much energy as rest. It is equivalent to brisk walking. Needing more effort is **moderate exercise**, which is activity that requires approximately five to six times as much energy as rest. It is equivalent to jogging at a comfortable pace. The highest level of intensity is called **vigorous exercise**. It is activity that requires seven times or more energy as rest. It is equivalent to a fast jog or activity that makes the person 'huff and puff'.

The easiest method of assessing the intensity of effort is to use the talk test, which measures intensity in terms of the subject's ability to maintain conversation while exercising.

- *Low intensity* — at this level the person is able to sing while doing the activity.
- *Moderate* — normal conversation can be held while performing the activity.
- *Vigorous* — there is insufficient breath to carry on conversation while exercising.

However, athletes in training and those who are genuinely trying to monitor cardiorespiratory fitness improvement use the heart rate's response to exercise as the basis of measurement. Exercise causes your heart rate to increase in proportion to your exercise intensity. In other words, the harder you work, the higher is your heart rate. This relationship continues until you approach exhaustion where maximal values are attained. At this point, your heart rate begins to level off.

Training at a level of intensity that is too close to your resting heart rate provides little, if any, benefit to fitness. Alternatively, training at near maximal

values quickly leads to exhaustion and subsequently is of little value. In between resting and maximal values is a zone called the **target heart rate (THR)**, which can be used to help you train at a level of intensity where performance benefits are maximised.

Target heart rate (THR) is a predetermined pulse rate to be obtained during exercise and is expressed as a percentage of maximum heart rate.

To find your target heart rate, calculate your maximal heart rate, which is approximated by subtracting your age from 220. For example, a 20-year-old person would have a maximal heart rate of 200 beats per minute (220 minus age).

For exercise of moderate intensity, the target heart rate is 50 to 70 per cent of the maximal heart rate. For exercise of vigorous intensity, the target heart rate is 70 to 85 per cent of the maximal heart rate.

The target heart rate zones are illustrated in figure 9.2. People beginning exercise programs should aim to hold their heart rate in the moderate intensity zone. As fitness improves, the target heart rate is increased to 70 to 85 per cent of maximal values (vigorous zone). Only well-trained athletes are able to work at the anaerobic threshold zone and then for only limited periods of time.

Examples of activity that are considered light, moderate or vigorous are illustrated in table 9.1.

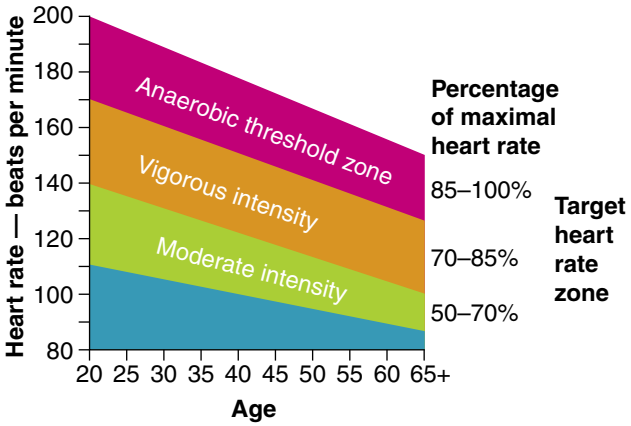


Figure 9.2: Target heart rate zone

Table 9.1: Examples of intensity-related activities

Physical activity intensity	Examples*
Light activity	• Swimming for recreation • Strolling around the shops • Flying a kite • Gardening (e.g. light weeding)
Moderate activity	• Walking for pleasure • Cycling on level ground • Putting away groceries • Handwashing a car • Operating heavy power tools • Horse riding
Vigorous activity	• Jogging or running • Step aerobics • Playing an energetic sport (e.g. basketball, football or tennis) • Carrying heavy loads (over 25 kg) • Pushing a non-motorised lawnmower • Loading a truck

**Dependent upon age, ability and fitness.*

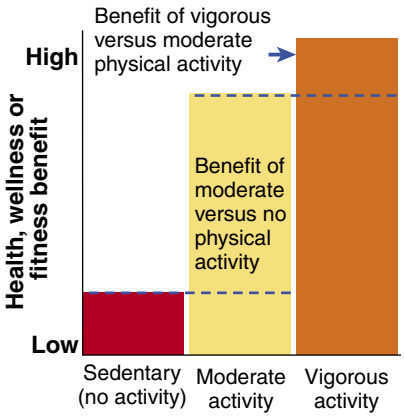


Figure 9.3: Health benefits of physical activity

Physical activity of moderate intensity benefits people of all ages, with greater benefits going to people who are able to partake in vigorous activity. This is illustrated in figure 9.3.

There is increasing evidence that these benefits occur soon after adopting an active lifestyle. Physical activity should start as a lifelong habit in childhood. Its benefits are greatest if activity is maintained throughout life.

The National Physical Activity Guidelines (NPAG) suggests the following in terms of physical activity.

Child and youth recommendations (up to 15 years)

- *Frequency:* every day
- *Intensity:* moderate
- *Duration:* 60 minutes and up to several hours. This can be accumulated across the day.
- *Type:* a range of activities including some weight-bearing activities.

Adult recommendations

- *Frequency:* most if not all days per week
- *Intensity:* moderate
- *Duration:* 30 minutes. This can be accumulated; for example, three bouts of 10 minutes each.
- *Type:* a range of activities.

Figure 9.4 shows how the National Physical Activity Guidelines relate to frequency, intensity, duration and type of activity. Proportionally, we need more of level one type activity, progressively decreasing to lesser amounts of levels two and three and little of level four.

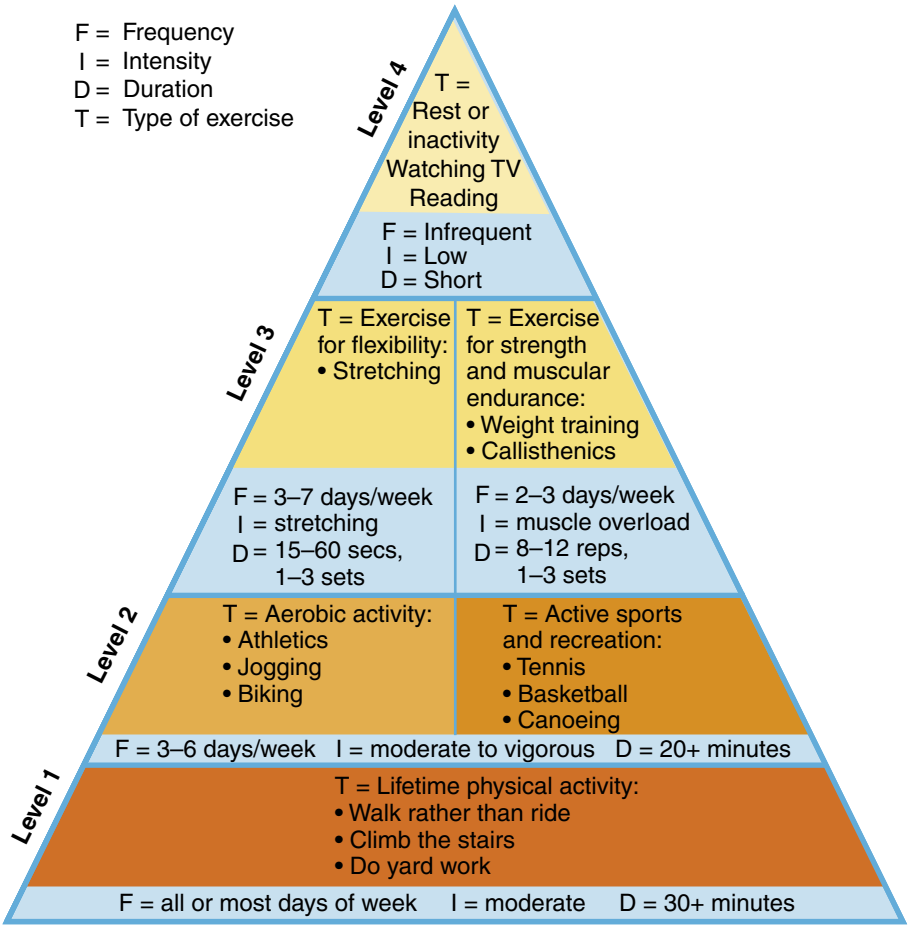


Figure 9.4: The physical activity pyramid



INQUIRY

Exercise as a part of lifestyle

1. Examine your own lifestyle and determine your level of activity. Do you engage in sufficient moderate activity each day? Keep a record of the physical activity (type and frequency) you engage in over a two week period.

2. Are you meeting the recommended level of physical activity for your age group?
3. Identify ways in which you could increase the amount of activity you engage in each day. Include both planned exercise and opportunities for incidental activity.
4. To what extent should exercise be a part of lifestyle?

Exercise and its relationship to fitness

What does it mean to be fit? Fitness is a difficult concept to define as it means different things to different people. If we consulted the authorities we would discover a variety of definitions, including:

> *the ability to carry out daily tasks with vigour and alertness, without undue fatigue and with enough reserve energy to enjoy leisure time pursuits and to meet unforeseen emergencies* (World Health Organization)

> *the capability of the heart, blood vessels, lungs and muscles to function at optimal efficiency* (Getchell, 1979).



APPLICATION

Meanings of fitness — survey

Design a survey to investigate the meanings of fitness. Survey a range of people from different age groups. An example of a fitness survey is shown below.

Name	What does it mean to be fit?	What do you need to do to improve your fitness?	Do you consider yourself to be fit? Why?
Me			
Friend			
Teacher			
Coach			
Team-mate			
Mum			
Dad			
Uncle			
Neighbour			



INQUIRY

Fitness survey

Use the results from the survey in the application above to help you answer the following questions.

1. Is fitness important to people?
2. Do people know how to maintain or improve their fitness? How could they get this information?
3. What does it mean to be fit?
4. Identify your own fitness goals. What do you need to do to achieve these goals?

Consider the fitness levels of an Australian basketball player and an Australian marathon runner. Do they both satisfy the definitions in regard to individual fitness? Do these definitions give us an accurate determination of



Figure 9.5: The components of fitness required to play basketball include strength, speed, agility and coordination.

each individual's fitness level? Can we gain an accurate comparison of fitness levels between these athletes? As basketball and distance running are very different in their physical demands and skills, we need to look at fitness in regard to the components needed to perform physical activity.

Physical fitness refers to a set of attributes that people have or achieve and that relates to the ability to perform physical activity. These attributes can be divided into two sets of components.

1. Health-related components include
   - cardiorespiratory fitness
   - flexibility
   - muscular endurance
   - strength
   - body composition.
2. Skill-related components include
   - speed
   - power
   - coordination
   - balance
   - agility
   - reaction time.

For those people who wish to improve their general health and fitness, it is necessary to undertake a regular, moderate intensity exercise program that incorporates the health-related components. For those people who wish to improve their fitness levels in order to improve sports performance, exercising at a moderate intensity is not sufficient. A planned training program is needed. It should incorporate specific exercises to improve the fitness components required of the sport or performance. The intensity of exercise needs to be vigorous and can be measured by heart rate. Both the intensity and frequency of exercise increase as fitness gains are achieved.

Regardless of your fitness requirements, including exercise as a regular lifestyle behaviour is essential to improve and maintain health and fitness. The specific exercise program adopted must meet your specific needs.



Figure 9.6: Rugby league requires strength and power. Players incorporate weight training into their training programs to improve these fitness components.



THE VALUE THAT PEOPLE PLACE ON EXERCISE AND FITNESS

In the past, people did not need to plan for physical activity. Work was much more labour intensive, so fitness was achieved through work. As technology was introduced in the workplace and home, and physical labour was replaced by mechanisation, the need for planned exercise to improve health and maintain fitness became apparent. As people's lifestyles became more sedentary, the incidence of lifestyle diseases increased. The fitness boom in the 1970s and 1980s resulted from an increase in community concern about the morbidity and mortality rates associated with lifestyle diseases, particularly coronary heart disease. Activities such as aerobics and fun-runs became popular as they led to improved cardiovascular functioning. Although the fitness boom and health promotion programs have led to an increased awareness about the importance of physical activity and fitness, statistics reveal that almost half of the adult population in New South Wales are still insufficiently active. Females are less active than males.

Changing attitudes to fitness

In January 2007, a report by the NSW Centre for Physical Activity and Health showed some recent improvements in people's levels of participation in physical activity, although participation levels are still of concern. Some of the findings are outlined below.

- Between 1998 and 2005, there has been a significant increase in the proportion of people aged 16 years and over in NSW undertaking sufficient physical activity (at least 150 minutes of walking, moderate and/or vigorous activity per week over at least five occasions) (see figure 9.7).
- The prevalence of sufficient physical activity was stable from 1998 (47.6%) to 2002 (46.5%), decreased in 2003 (44.7%), increased markedly in 2004 (50.5%) and remained steady in 2005 (51.3%).
- Walking was a major contributor to the change in prevalence of sufficient physical activity, with increased participation in walking since 2004. There were also some increases in moderate and vigorous activity.
- It is possible that increased media coverage of physical activity and obesity between 2001 and 2004 has helped to increase the salience of these issues and motivated people in NSW to participate in physical activity.
- Changes in active commuting behaviours, specifically growth in prevalence of walking to work, and rising petrol prices may have contributed to the increase in physical activity levels.
- It is possible that recent increases in physical activity participation are a result of intensive physical activity promotion work that occurred in the late 1990s in NSW, that led to greater awareness and understanding of the Active Australia moderate physical activity message in NSW compared with other states.
- Nonetheless, close to half the NSW population is still insufficiently active, indicating that physical activity promotion efforts need to continue in NSW for further and sustainable improvements.

Source: NSW Centre for Physical Activity and Health, 'Trends in population levels of sufficient physical activity in NSW, 1998 to 2005', executive summary pp. 1–2 and full report p. 22, published January 2007.

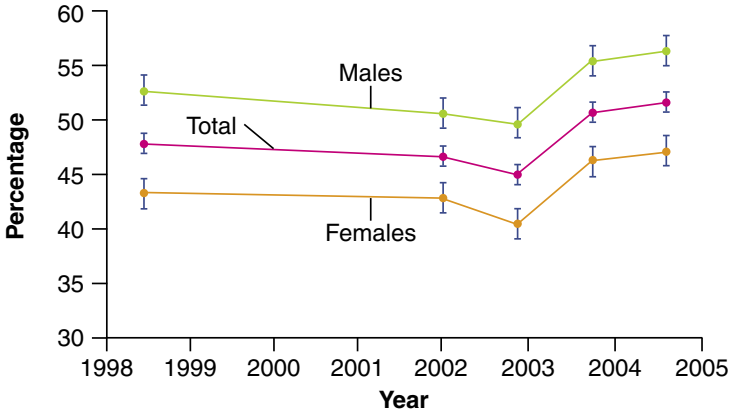


Figure 9.7: Participation in sufficient physical activity (per cent), New South Wales, 1998–2005 (*Source:* Report from the NSW Centre for Physical Activity and Health, 'Trends in population levels of sufficient physical activity in NSW, 1998 to 2005', published January 2007.)

People's attitudes to fitness determine whether they participate in regular physical activity. Attitudes to fitness are influenced by a number of factors.

- Age — statistics show that people who are aged between 18–29 years are the most physically active of all age groups. Older age groups have lower levels of adequate activity and are more sedentary.
- Gender — males are more active than females. In New South Wales, statistics reveal that in 2005, 56 per cent of males reported achieving sufficient physical activity, compared with 47 per cent of females.
- Family — adolescents who have parents who are active or support them in their activity generally value fitness.
- Peers — the attitudes of a person's peer group can put pressure on that person. If the peer group does not value exercise and is not active, others in the group can feel pressured into adopting the same values and behaviours.

Figure 9.8: Parents can have a positive influence on their children's attitudes to exercise and fitness.



- Media — the media are a powerful channel through which the fitness message is given. Awareness raising of the benefits of fitness and the types of activities and sports available can positively impact on the attitudes of individuals.
- Past experience — the physical activity that adolescents experience within the school setting or local community can directly affect the decisions of adolescents to continue to be active as they get older. Research shows that if children's experiences with activity are fun and foster skill development, they are more likely to adopt physical activity as a lifelong behaviour.
- Cultural — women from non–English-speaking backgrounds (NESB) are more likely to be sedentary. They often do not receive the social support they need to be active. People from a NESB are significantly less likely to be adequately active (NSW Health).

- Socioeconomic status — people with a lower level of education are more likely to be sedentary. This could be attributed to a lack of knowledge about the benefits of fitness.

The degree to which an individual values fitness is determined by a combination of many factors. As a person grows older, the value they place on fitness may change many times. For example, a person who suffers from heart disease later in life and who has never engaged in exercise may now recognise the importance of regular exercise to improve their cardiovascular efficiency.



APPLICATION

Changing attitudes to fitness — survey

Use the following survey to gain a range of opinions about the value people place on fitness. Survey at least 12 people from a variety of age groups.

Survey: attitudes to fitness

1. Name: .....
2. Age: .....
3. How often do you exercise? .....
   .....
4. What intensity do you exercise at? .....
   .....
5. Why do/don't you exercise? .....
   .....
6. Do you value fitness? .....
   .....
7. What factors have influenced your attitude to fitness? .....
   .....
   .....
8. Has your attitude to fitness changed over time? Why? .....
   .....
   .....



INQUIRY

Fitness and values

1. From the people you surveyed in the application above, what value do people place on fitness?
2. Are there any similarities in attitudes and values?
3. What reasons are given that support the value of fitness?
4. What are the predominant factors that influence people's attitudes to fitness?

Fitness as a commodity

Commodification is the process of turning something into a commodity that can be bought and sold.

A **commodity** is a product that exists to generate profit.

The **commodification** of exercise and fitness became increasingly apparent during the fitness boom of the 1970s. The individual, community, government and business sectors became aware of the need for everyone to participate in activities that improved their health. Companies recognised that fitness could be a profit-making **commodity**. The establishment of fitness centres, along with a renewed interest in many physical activities, became commonplace.

Fitness centres provide a range of activities designed to meet every exercise and fitness need. They promote a range of services, have fully trained

personnel and provide a wide range of exercise equipment based on the latest technology. Through advertising, the fitness industry aims to convince the consumer that the easiest and best way to get fit is by using their services. Advertising within the fitness industry can be presented in many forms. Advertisements often depict male and female bodies that mirror society's perception of the perfect body. The use of special deals, a range of fitness activities, extended hours and child minding facilities further appeal to the consumers.



INQUIRY

Commodification of fitness

Read the following snapshot from 'The Future of Australian Sport'.

1. Suggest why fitness is becoming a growth industry.
2. Why are many people turning to gyms and personal trainers as their preferred form of exercise?
3. Should participation in gym programs be at the expense of participation in team sports?
4. To what extent are fashion and convenience driving the growth of the fitness industry?

SNAPSHOT

A perfect fit

Growth of the fitness industry

The Australian fitness industry provides products and services to improve people's fitness. Examples include gyms, personal trainers, pools, exercise equipment, sports clothing, running shoes and nutritional supplements. According to IBISWorld (MacGowan, 2011) in 2011–12, the fitness industry had revenue of $A2.9 billion and its 7281 individual businesses generated profits of $A229.6 million and wages of $A1.2 billion. The industry is forecast to grow revenue at the rate of 3.6 per cent per annum over the period 2012 to 2017. Future growth in the industry will be boosted by the government and societal focus on health and wellbeing.

Personalised gyms

Gyms have started to diversify to capitalise on the growing demand for fitness experiences. One such trend is the rise of 24-hour access gyms, such as 'Anytime Fitness', 'Jetts' and 'Snap Fitness'. Another trend is to offer the customer a personalised experience. An example comes from 'Virgin Active'. The company has over 170 clubs in the UK, Italy, Spain and South Africa, with over 900,000 members (Virgin Active, 2012). The company's first Australian club opened in December 2008, followed by another four shortly after. The company differentiates itself from other fitness clubs by offering a tailored customer experience through its 'Who are you?' campaign.

Personal training

People are seeking personal trainers to meet their unique health and fitness needs. In 2011 personal training held 19.8 per cent of the market share in the fitness industry and is forecast to grow (MacGowan, 2011). This reveals consumer demand for personalised fitness solutions.

Rising sales of fitness equipment

The appetite for fitness training is also reflected in the sale of fitness equipment. The sale of fitness equipment outperformed all other commodities in the sports equipment market in 2004–09 in Australia, with total revenues of $A318.4 million, equivalent to 24 per cent of the market's overall value (Datamonitor, 2010).

Rising sales of lycra

The fitness trend has spurred growth in sports fashion sales. An example of the rise in sports fashion comes from the Lorna Jane stores. Lorna Jane opened her first store in Brisbane CBD in 1990. By May 2011 she had opened 104 stores across Australia, generating $A90 million in 2010 (Mills, 2011). While providing new business opportunities, sportswear fashion may exclude those from lower socioeconomic areas or particular age demographics such as youth who cannot afford sports fashion merchandise.

Source: The future of Australian sport, Dr Stefan Hajkowicz, CSIRO, April 2013, p. 9.

APPLICATION

Fitness centres

Research your local fitness centre to find out the following information:

- services offered
- cost for each service
- payment plans
- special offers or package deals
- equipment available
- expertise of staff
- availability of staff for individual support
- facilities for the disabled
- child-care facilities.

INQUIRY

Fitness commodity — local fitness centre

1. Would the fitness centre you examined in the application above meet your fitness needs? Explain.
2. Do you think this fitness centre is value for money? Explain.
3. Before paying to join this fitness centre, what could people do to determine if it is worthwhile?
4. Why has the fitness industry continued to be a viable, profitable industry?



Figure 9.9: Fitness centres can provide a range of services and facilities including aerobics, yoga, power boxing, weight training, step class, personal trainers, nutritional advice, saunas, spas and solariums.

People should recognise that gyms are not a quick fix to their health and fitness needs. To improve your fitness level takes effort and commitment to planned exercise. However, the fitness industry does provide a range of beneficial services and expertise. Fitness centres meet the fitness needs of a large number of people. For many people, they provide the expertise and environment they need to improve their fitness. It is important for people to determine their fitness needs and investigate the services, cost and expertise offered by fitness centres before they make a financial commitment and join a gym.

If you decide that the local fitness centre is not what you want, the fitness industry offers many other services and products to aid you in your goal of improved fitness and health. If you require motivation and expertise, employing a personal trainer may suit your needs. If you are not comfortable 'sweating it out' in the company of others, a wide range of exercise videos and DVDs is available. Fitness clothing, nutritional supplements, home gyms and exercise machines are other products on offer.

The fitness industry has incorporated the latest technology into many products, providing convenience and up-to-date information. For example, there are numerous CD-ROMs available that people who are interested in fitness can use at home for convenience. Topics cover areas such as fitness, Swiss ball, Pilates, Gymstick, fitball exercises and all-round workout. The availability of exercise heart rate monitors, computerised exercise equipment and body fat monitors/scales further supports the individual in their quest for improved fitness.

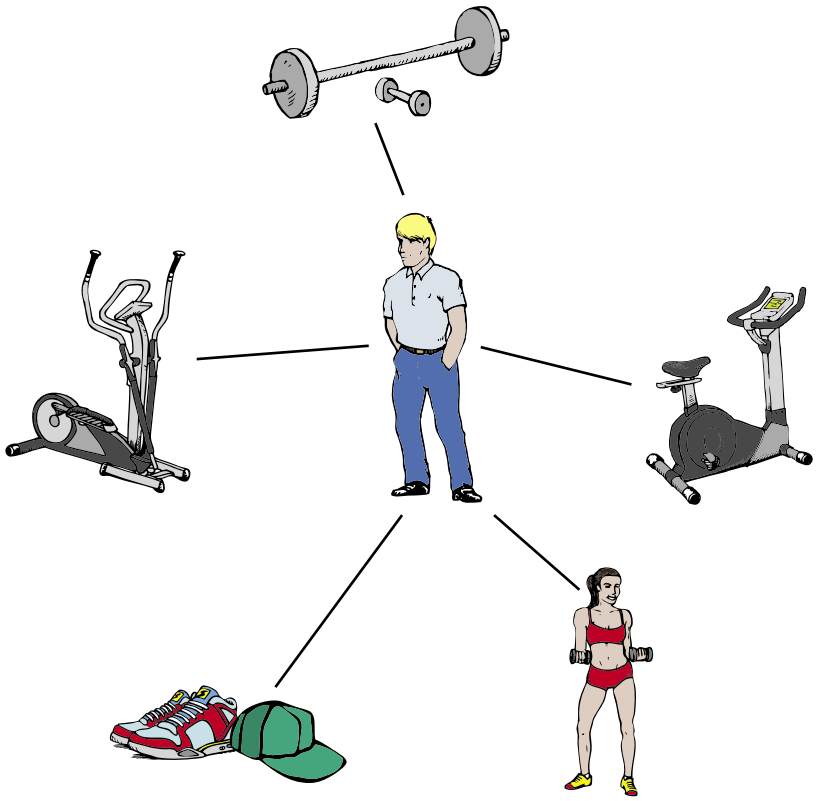


Figure 9.10: Fitness is a commodity. A wide variety of services and products are aimed at improving your fitness.



INQUIRY

Commodification

Choose one of the following physical activities and investigate its commodification:

- aquarobics
- running
- swimming
- aerobics.

Consider the following questions in your investigation.

1. What equipment has been specifically designed and produced to aid performance in this activity?
2. How has the commodification of this activity influenced participation (consider cost, image, motivation and accessibility)?
3. Has the commodification of exercise and fitness had a positive or negative effect on the individual's level of health and fitness?



INDIVIDUAL FITNESS ACTIVITIES

There is an incredible range of physical activities on offer, from the commercially driven activities that offer fun and challenge, such as indoor rock climbing, to the more traditional exercise types. The challenge for the individual is to find an exercise type that meets their fitness needs and that is enjoyable.

What type of exercise should you choose to improve your fitness? Do you prefer exercising by yourself or in a group? Have you got the time or the money to join a gym? Does working out at home best meet your needs? It is not always an easy choice to make. Having a good knowledge of the range and variety of fitness activities available definitely helps you make the correct choice.

In the past, jogging or swimming were the practical options to improve fitness for people who preferred to exercise by themselves. Today many individual fitness activities are available, some of which require specific knowledge and skills. Raised awareness of health has led to the revival of many fitness and recreational activities and the emergence of new ones. Activities such as indoor rock climbing, in-line skating, snowboarding and power boxing are examples of fun and challenging fitness activities that are now available.

Power walking

Figure 9.11: Power walking is a popular form of exercise. It appeals to people of all ages as it is low impact and convenient.



One of the easiest low impact activities is power walking. Brisk walking for 30 minutes each day at a pace of around four to six kph improves fitness and overall health. It is just a matter of putting on a comfortable pair of shoes and heading out the door. One of the benefits of power walking is that you can do it anytime, such as in your lunch hour or before or after work. Power walking is safe, cheap and convenient.

Walking is an excellent exercise for heart health and for health in general. If you walk regularly you tend to:

- feel more confident, happy and relaxed
- control your weight better
- have lower blood pressure and lower cholesterol levels
- have stronger bones
- be less likely to have a heart attack and recover better in the event of one
- be less likely to have a stroke
- be less likely to develop diabetes in middle age (*Facts on Walking for Pleasure and Health*, Active Australia).

To have a greater impact on fitness, walking at a greater intensity, uphill or carrying a load is required. To maintain motivation when power walking, change your route, include regular bushwalks and walk in parks.

The benefits of walking are recognised by many people. It is a recommended form of exercise for people recovering from heart disease because it is low impact. It is one of the most popular forms of exercise for people across all age groups.

Running

Running is an activity that can be done only at moderate or vigorous intensity. It is an effective aerobic activity because it involves movement of the whole body. Running is a convenient and time-efficient form of exercise. For those people who don't have a lot of spare time, a 20 minute run could be a good fitness option. It is advisable to run on grassed surfaces rather than the road to reduce stress on the joints. Cross-country running is a great way to maintain motivation.

It is important to start slowly and increase intensity as your fitness level improves. This can be done by increasing the distance run, incorporating speed play, or running in more challenging environments such as hilly areas.

Swimming



Figure 9.12: Swimming is a good way to improve cardiovascular fitness.

Leisurely swimming is sufficient to gain health benefits. Swimming laps using various strokes improves cardiovascular efficiency. Swimming is an activity that can be enjoyed all year round for most people. Heated indoor pools cater for the need to have swimming facilities available all year. Swimming is relatively inexpensive and requires little equipment, making it a cheap and convenient form of exercise.

Swimming is not restricted to the local community pool. Pools can be found in leisure centres and resorts. The popularity of swimming as a fitness activity has led to the emergence of aquarobics. As one of Australia's favourite physical activities, swimming is an effective conditioning activity that is low impact, but uses both the upper and lower body, giving a total body workout. It is often recommended as a form of exercise for asthmatics as it helps to build up lung capacity, and for people rehabilitating from injury, due to its buoyancy effect.

INQUIRY

Swimming fitness

eBookplus

Use the **Swimming — health benefits** weblink in your eBookPLUS.

1. Read the information about the benefits of swimming.
2. Use the information to evaluate swimming as an individual fitness activity.

Cycling

Cycling is an activity that most people enjoy in their youth but stop doing as they get older. Like running, cycling provides a good cardiovascular workout. Cycling at a vigorous intensity (more than 16 kph) has beneficial effects on fitness.

Your decision to start cycling may be influenced by the cost of a bike or the area you live in. Busy city roads are not the ideal place to exercise. Some communities have recognised this and built cycle paths through their suburbs in an effort to encourage people to cycle and to improve the safety of cyclists.

The introduction of the mountain bike has broadened the choice of terrains people can ride over. People can now ride on rugged surfaces through the bush. For those people who don't like road riding, this is a great option.

The benefits of cycling to health and fitness are well recognised. The fitness industry has endeavoured to make cycling accessible to everyone by producing stationary bicycles. These are available in most gyms or can be bought for home use. The introduction of indoor cycling classes, known as 'spinning', at fitness centres has become a popular fitness option. It is particularly appealing to those people who are not confident road riding or cannot afford their own bike. It is also a great option in bad weather.

Get on your bike and go indoors

As the winter months set in, taking advantage of the outdoors for exercise is no longer a viable option. This has prompted inventive individuals to come up with alternatives — such as bringing outdoor activities indoors!

By Chris Rabba BAppSc(PI)

Traditional outdoor activities such as rock climbing, abseiling, tennis and running can now be pursued away from the elements by way of indoor rock climbing centres, indoor tennis stadiums and indoor running tracks. The newest addition to this list is indoor cycling.

Take some specifically designed stationary bikes, set them up in a room, add an instructor and music for inspiration and there you have it — the latest outdoor activity to be brought indoors — indoor cycling! Indoor cycling has quickly secured its place in the health club industry both here and overseas.

The concept is a little deeper than just riding a stationary bike indoors. The bikes have been especially designed to mimic an outdoor ride. Imagery and visualisation play an intricate role in the execution of a class. Imaginary hills are climbed, head winds confronted as the terrain changes by a simple turn of the resistance knob on the bike. The music in the class sets the scene acting as a road map for the journey ahead. The instructor acts as a leader, coach and motivator as he/she urges you on your journey.

The original indoor cycling program was SPINNING® established in the USA in 1995. Developed by ultra marathon cyclist Johnny G, the SPINNING® program and bikes have been welcomed with open arms by the fitness industry worldwide. Since then, various versions of the original indoor cycling program SPINNING® have emerged, highlighting the demand for this new concept. You may have come across Cycle Reebok, Revolution, RPM and Studio Cycle in your travels to various health clubs. Be aware that there is a distinct difference in quality of bike, instructor and program, so do your homework before committing to a class.

The original intention of indoor cycling was to incorporate mind/body facets in the class, thus taking a holistic approach to exercise. As you lose yourself in the cyclical rhythm of each pedal stroke and the accompanying music, you find yourself in a state of flow, experiencing a natural high.

From a physical perspective, indoor cycling has proven to be an excellent cardiovascular workout. The exercise is aerobic in nature with anaerobic components, depending on the class structure. It has been suggested that you can burn up to 800 calories [3300 kilojoules] in a single class.

Indoor cycling has attracted people from all walks of life. It allows the individual to work at their own level, with no obligation to keep to a certain pace. It requires no real coordination — it's as simple as riding a bike! Indoor cycling has proven to be beneficial for those who cannot endure impact of the knees, as there is no direct impact involved in cycling.

All in all, indoor cycling has become accepted as an alternative to exercise to music type classes such as Aerobic, Circuit and PUMP. Indoor cycling is extremely accessible with most established health clubs providing a version of it as part of their overall program.

Things to consider before taking part in a class

1. Let the instructor know that it's your first time in an indoor cycling class.
2. Make sure the instructor sets the bike up to suit your particular height.
3. Bring with you a waterbottle and workout towel.
4. Indoor cycling can be addictive, so make sure you pace yourself during the class.
5. A good stretch after the class can assist in avoiding muscle soreness the following day.

Source: Women's Fitness Australia, vol. 5, no. 3, pp. 60, 62.



Spin class

INQUIRY

Individual fitness activities

Read the snapshot 'Get on your bike and go indoors', then answer the following questions.

1. What is indoor cycling?
2. How are people motivated to cycle indoors?
3. Why has indoor cycling become a popular fitness option?
4. Evaluate cycling as a fitness option.

Weight training programs

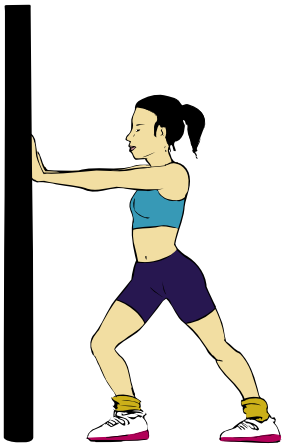
Weight training programs can be undertaken at home or in a gym that has the appropriate equipment. Programs can be isometric, isotonic or isokinetic. Weight training is a good option for people who want to improve the specific fitness components of strength and muscle endurance.

In isometric training, muscles develop tension but do not change in length. A typical isometric exercise would be pushing or pulling against an immovable object. By devising a series of exercises that are isometric in nature the individual can do their training program in a variety of places. They do not need a specific environment in which to exercise. The best gains in fitness are made in isometric training programs using six to eight repetitions of exercises, each lasting six seconds.

Isotonic weight training programs involve lifting weights through a full range of movement. This type of training requires the use of free weights and can incorporate weight machines. It is usually done at a fitness centre or gym, but can be done at home if the equipment is available. This is the traditional type of weight training and is the most popular.

Isokinetic weight training involves the use of elaborate machines that allow maximum muscle tension through the full range of movement. Isokinetic machines are designed so that the muscular force exerted by the body is equalled by the resistance of the machine. This type of training equipment is available in some fitness centres. The major advantage of this type of training is that strength gains will be constant throughout the full range of movement because the level of resistance is constant.

Figure 9.13: By pushing or pulling against an immovable object, tension is developed in muscles. This is referred to as isometric muscular contraction.



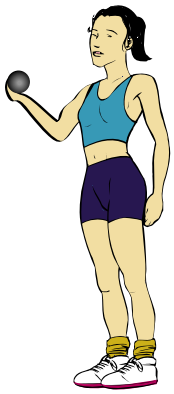


Figure 9.14: Isotonic weight training involves lifting a weight through a full range of movement using free weights.



Figure 9.15: Many types of equipment are available for use in weight training programs.

Repetitions are the number of times an exercise is repeated without rest.

A **set** is the number of repetitions done in succession; for example, one set may equal 12 repetitions.

Weight training can be used to add muscle bulk, increase strength, improve power or develop endurance.

Weight training requires specific skills and knowledge, so it would be beneficial to seek expert advice on the correct use of equipment, the number of **repetitions** and **sets** to be undertaken and the types of exercises for each major muscle group. A weight training program can be designed to meet individual fitness requirements.



APPLICATION

Weight training

Participate in a weight training session at your local gym or in your weights room at school that incorporates the three types of weight training, then complete the following.

1. Identify the exercises that were isotonic, isometric and isokinetic.
2. Identify the muscle(s) each exercise was designed to work.
3. How many sets and repetitions did you do of each exercise?
4. Identify safety guidelines for weight training.
5. What are the benefits of each type of weight training?

Tai chi

Tai chi is one of the martial arts systems. It is enjoyed by many people and, due to its slow controlled movements, is popular with all age groups. It involves slow, even, circular and coordinated movements. Tai chi is an exercise incorporating movements in coordination with your mind and respiration.

Tai chi is a series of exercises combined into a routine. Instruction with a master over a period of time is necessary to become proficient. Practising some simple tai chi forms repeatedly improves physical well-being.

In the tai chi practice, the principles of balance, which include joint involvement (ankle, knee, hip), lower body awareness and posture, are explored. The benefits from this type of exercise are particularly applicable to older people, although the benefits can be enjoyed by all. Due to its focus on controlled, correct movement and balance, tai chi can benefit people who suffer from arthritis, lower back pain and stress. Tai chi is a great exercise option, particularly for people seeking a holistic approach to improved health and fitness.



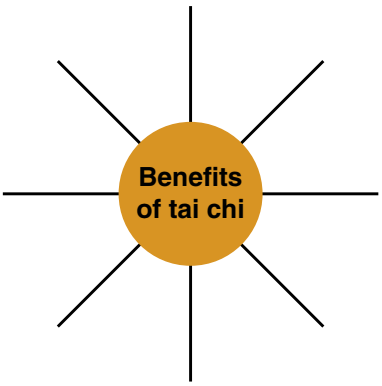
INQUIRY

The health benefits of tai chi

eBookplus

Use the **Tai chi** weblink in your eBookPLUS to read about the health benefits of Tai Chi.

1. What is tai chi?
2. Use the web diagram at right to help you identify the potential benefits of tai chi.
3. List the disorders that tai chi may be able to improve.
4. What special considerations need to be taken into account before beginning tai chi?

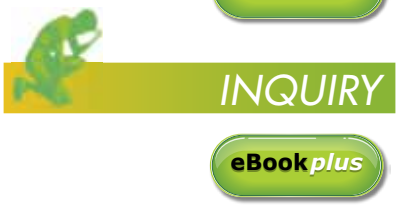


Pilates

Pilates is a program that focuses on the development of core muscles, resulting in improved body balance, posture and alignment. Added strength and flexibility to the large torso muscles enables better control of the back and limbs, leading to improved coordination and balance.

In recent years, Pilates has become popular with people from all sports including golfers, footballers and gymnasts as well as dancers. In activities where core strength is important to stabilise the spine and enable safer, more forceful movements to be made, Pilates is an ideal fitness choice.

To gain a better insight into Pilates, watch some exercises being performed using the **Pilates** weblink in your eBookPlus.



Pilates

Use the **Pilates — health benefits** weblink in your eBookPLUS to learn more about this form of exercise, then answer the following questions.

1. What is Pilates?
2. From the list, identify what you consider to be the 10 most important health benefits of Pilates.
3. Describe the two forms of Pilates.
4. What precautions do people need to take before engaging in a Pilates program?

Yoga

Yoga originated in India. Today, many different types of yoga exist. Yoga is holistic in nature, emphasising the body's energy flow. It focuses on breathing exercises, known as pranayama, and physical postures called asanas. The specific breathing exercises address poor breathing habits and better utilise the muscles used in breathing. The physical postures and exercises improve muscular tone, strength and flexibility allowing energy to flow more freely throughout the body.

Yoga is beneficial because it: re-energises the body, giving a feeling of being more powerful; reduces stress; induces calmness; improves flexibility and muscle tone; and improves immunity.

As yoga ranges from gentle to demanding, it is suitable for everyone. It is important to choose a teacher and a class that suit your specific needs. Yoga is a popular form of exercise with people of all age groups and fitness levels.

The benefits of yoga have been recognised by the fitness industry. As a result, many commercial fitness centres offer classes in yoga. An example is the 'yoga/stretch' class available at some centres. This class involves traditional yoga postures and stretching exercises. It is designed to be a total mind and body experience where you improve your flexibility, increase your strength and relax your mind while learning proper breathing techniques.

Emerging individual fitness activities

While activities such as swimming, running and cycling represent traditional ways of improving fitness, alternative methods are constantly being promoted, many with considerable appeal. Fitness facilities and home gyms offer an array of equipment and activities that challenge our physical demands, often with the lure of burning fat or expending kilojoules.



Figure 9.16: Personal trainers can assist people to reach their fitness goals.

Treadmills, rowing machines and cross-trainers can be used in the privacy of your home to provide challenging cardiovascular workouts. These are also available in fitness centres, along with elaborate weight training machines, free weights, sport-specific training equipment, step machines, and warm-up and stretch rooms. Many fitness establishments promote fitness activities that combine aspects of self-defence with gruelling fitness workouts that challenge our highest levels of fitness. Individuals can do martial arts, shadow boxing and, with the help of personal trainers, individual circuits.

There has been a rapid growth in the personal training industry in recent years. With expansion of the fitness industry, many people engage personal trainers, to provide individual assessment, develop an appropriate program, instruct on equipment usage and act as a motivating partner.

APPLICATION

Individual fitness activities

Investigate the range of individual fitness activities available in your local area. Determine two activities that would suit your ability and fitness needs and participate in them.

INQUIRY

Assessment of fitness activities

1. List the benefits of each activity you located in the above application.
2. Who would these activities suit?
3. How much does each activity cost?
4. What is the time commitment involved for each?
5. Where could you get further information about each activity?
6. Evaluate each activity in terms of your personal needs.

INQUIRY

Ranking fitness activities

The section of work just completed focused on individual fitness activities, namely power walking, running, swimming, cycling, weight training, tai chi, pilates and yoga. Use the following ranking chart to prioritise the activities in terms of interest to you as part of an individual fitness program. Justify your ranking. In the final column, insert a 'yes' or 'no' regarding whether you have access to these facilities in your area. Use the information for a class discussion about fitness activity preferences.

Ranking	Justification	Access (yes or no)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

GROUP FITNESS ACTIVITIES

For those people who seek the company of others in their quest for fitness, there are numerous group fitness activities to choose from. Fitness and leisure centres provide a range of fitness classes including step, pump, flex, power boxing and dance.

Many communities have the facilities to offer a range of team sports such as netball, soccer and hockey. Indoor facilities provide the opportunity to participate in indoor sports such as indoor cricket and basketball. Tennis and squash courts can also be found in most communities. They provide the individual with the opportunity to join a friend for a social game without being part of a formal competition.

Group fitness activities provide the opportunity to meet new people and establish friendships. They allow the individual to feel part of a group. Group activities are an appealing fitness option for many people.

Aerobics

Aerobics classes incorporate various conditioning exercises performed to music. A typical aerobics routine involves a warm-up phase, conditioning phase and cool-down phase. Aerobics can cater for a variety of ability and fitness levels. Classes can be designed to be low impact or high impact. Individuals within the class can change the intensity of the exercise being performed to meet their needs. Aerobics improves cardiovascular efficiency, strength, flexibility and agility. The use of energetic music and the instructions and encouragement of the instructor help to increase motivation.

A variation on the traditional aerobics class is the 'fat burner', which is a combination high and low impact class. The exercises are designed to increase participants' heart rate to between 130 and 140 beats per minute to promote greater kilojoule expenditure. Benefits include improved cardiovascular endurance, strength and muscle tone. This class is suitable for everyone, but is specifically for those people who want to improve cardiorespiratory fitness and lose weight. 'Blitz tech' is a combination of high and low impact aerobics with very little choreography. It includes easy movements and equipment keeping the intensity high. This type of class is suitable for everyone as you can work at your own fitness level.



Figure 9.17: Aquarobics is a popular fitness activity for all age groups.

Aquarobics

Aquarobics or water aerobics evolved from aerobics. It involves doing conditioning exercises similar to those performed in an aerobics class in water. As water is much more resistant than air, aquarobics provides a good whole body workout. Participants move in the water following an instructor.

Aquarobics is an excellent fitness option for people who have back or joint problems, the elderly and the overweight due to the cushioning effect of the water. The use of hand weights can increase the intensity of exercise.

Aquarobics

Aquarobics classes have proved popular with people who may not have otherwise been involved in exercise.

Aquarobics is an extremely enjoyable class from which many benefits such as rehabilitation, fitness and social integration can be gained.

Benefits

- Exercise in water is easier as it supports body weight
- Reduces stress on joints
- More comfortable environment to exercise in
- Allows a full range of movement without excessive strain
- Increases circulation and promotes relaxation
- Reduces stress levels
- Potential weight loss through caloric expenditure and increased muscle tissue

Class descriptions

Power

A high energy workout for overall fitness and toning guaranteed to increase the heart rate.

Tone

A toning and firming class using weights and water as a resistance. Suitable for all fitness levels.

Deep water

Using buoyancy belts there is no impact on joints.

Gentle

Designed for seniors. Beneficial for those with blood pressure, arthritis, joint problems or injury rehabilitation.

Seniors

Designed for the more active seniors.

Special needs

Designed for people suffering from MS, stroke, Parkinson's and arthritis, back, hip, knee injury, pre- and post-operation.

What to bring

Swimwear and towels are required.

Who can participate

Aquarobics is for all levels. The program offers a variety of options so that you can work out at your own level. It is essential that each participant is able to swim.

Source: Sutherland Shire Council, brochure for Sutherland Leisure Centre, New South Wales.



INQUIRY

Aquarobics

Read the snapshot about aquarobics, then use the PMI chart below to list points that you consider to be favourable, unfavourable and worthy of further consideration. Summarise the points considered 'interesting' from the group and use them as the basis of a class discussion in evaluating aquarobics as a group fitness activity.

Plus	Minus	Interesting

Pump classes

Pump classes are non-aerobic fitness classes that use barbells to improve muscle tone, strength and endurance. The instructor leads participants in working out the major muscle groups of the body to music. The weights are adjustable to suit all fitness levels. This type of class is suited to people

who would like an introduction to weight training and who wish to improve muscle tone and body shape.

Another non-cardiovascular fitness class is the ABT or abdominal, butt and thigh class. Participants use hand weights to direct the workload to specific areas such as the abdominals, buttocks and upper legs. The movements are slow and lead to improved muscle tone, strength and muscular endurance.



Figure 9.18: The original step class incorporates aerobic movements done on a stepped platform. It is designed to improve cardiovascular fitness.

Step classes

This class incorporates aerobic moves to music using a stepped platform. The platform is adjustable to suit the individual's fitness level. Step classes improve cardiovascular fitness and muscular endurance. As the moves are choreographed to music, classes are divided into advanced and beginners, depending on the complexity of the moves. Step classes provide a further challenge for people who want a variation to the standard aerobics class. This class is suitable to all levels of fitness. Variations on the step class include easy step, which is designed for beginners as it has less choreography, and step moves, which is for advanced participants. Step moves is highly choreographed, incorporating high intensity and dynamic movements.

Spin classes

Spin is also known as cycle classes or RPM. In this demanding fitness activity, participants or 'spinners' perform routines on stationary exercise bicycles that simulate outdoor cycle training. Music is often used to enhance the atmosphere while the instructor leads the group through a range of cycling speeds designed to engage both the aerobic and anaerobic energy systems.

A typical session consists of a warm-up followed by instructor-led routines that imitate hill climbs, sprints and interval training. How hard you exercise is up to you, but it is important for spinners to set their own goals for each session. Should you wish to focus on your aerobic fitness, your level of intensity will be moderate, interspersed with infrequent bursts of speed. If you wish to focus on both anaerobic and aerobic fitness, there will be frequent periods of high intensity combined with periods of moderate effort. Intensity is raised by both increasing the speed at which you cycle and/or increasing the cycling resistance using the dial on the cross-bar of the bike.

Spin is excellent for improving cardiorespiratory fitness. It is also beneficial as a form of exercise for people who experience joint injuries or tendonitis. To watch a typical spin class, use the **Spin class** weblink in your eBookPLUS (seven minutes).

eBookplus

Circuit training

Circuit training can be used to improve both fitness components and skill level. It involves the progressive use of a circuit of different types of exercise. Each exercise is performed for a specified number of repetitions or for a prescribed time period before moving to the next exercise. The exercises are

separated by a brief timed rest interval. Each circuit is separated by a longer rest period. The total number of circuits performed during a training session may vary from two to six.

Circuits can be anaerobic or aerobic in nature, depending on the type of exercise, the time spent on each exercise and the number of circuits performed. Circuits can be designed to focus on strength and muscular endurance or cardiovascular fitness and flexibility.

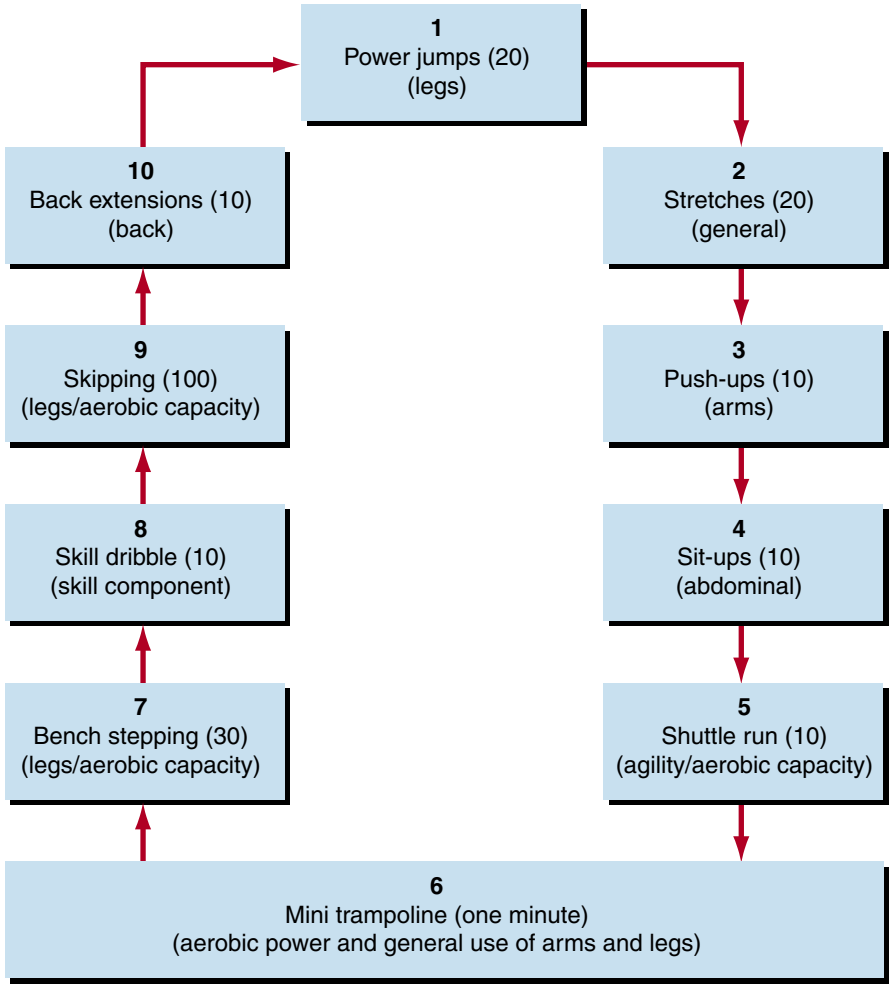


Figure 9.19: A typical conditioning circuit

Team games

Participating in team games is one of the most popular types of exercise available. Team games provide the opportunity to participate at various levels from social to high level competition. The social aspect of exercising with others is very appealing to some people. Team games provide the opportunity to develop new friendships and be a part of a team. Often people are more motivated to exercise if they know other team members are reliant on them.

A vast range of team games is available in most communities. Netball, soccer, basketball, rugby league and rugby union are examples of team games that are played by a range of people with varying ability levels. Indoor sports such as European handball, indoor soccer, indoor cricket and indoor netball offer the benefit of being able to play all year round regardless of weather conditions.

Participating in a team game requires people to participate at set times and usually involves a cost to cover affiliation fees and uniform. Depending on the level of competition, the individual may be required to devote a lot of time to training. Before joining a team, it is important to be clear about the commitment required. For many people who decide to participate in team games, the social and physical benefits provide the motivation to continue playing.



Figure 9.20: People enjoy team games for the competition and the social benefits they provide.

APPLICATION

Participation in team games

Investigate the range of team games available in your community and interview people who participate in them. The interview questions should include the following:

- Why do you participate in this team game?
- What are the benefits of participating for you?
- How did you first get involved in this team game?
- How often do you play and train?
- How much does it cost to participate?

Exercise for specific groups

The exercise and fitness needs of people change over time. Young children and the aged are limited by their physical capacities. Pregnant women need to alter their exercise regime to accommodate their changing body. The competitive athlete needs to exercise at a much higher intensity to achieve a competitive fitness level. These groups need to modify their exercise type and intensity to meet their specific needs. Regardless of the capabilities of people, exercise should be encouraged and made available to ensure everyone has the opportunity to improve their health and well-being.

Pregnant women

Exercise during pregnancy used to be considered dangerous. New research shows that exercise is not only safe, it should be undertaken. Research has found that there is no substantial difference in the pattern of delivery of the baby between non-exercising women and women who exercised at a moderate level during pregnancy. Women who exercised heavily during pregnancy are more likely to give birth at full-term. Like everyone else, pregnant women benefit from regular physical activity.

An exercise program can benefit pregnant women in many ways. The maintenance of healthy heart and blood vessels and improved muscular strength (particularly upper body and abdominal strength) can aid in posture and carrying the baby. Common disorders associated with pregnancy, such as lower back pain and leg cramps, can be eased. Exercise can help prevent varicose veins by improving circulation. By maintaining or improving fitness, pregnant women are able to control unnecessary weight gain, feel better about themselves and cope with the demands of labour.

Following are guidelines for maintaining fitness during pregnancy.

- Consult your doctor about your exercise program.
- Listen to the messages your body gives you.
- Work on good posture.
- Exercise gently.
- Exercise for fun.
- Realise that slowing down is normal.
- Do not overextend your joints beyond their normal range of movement.
- Always warm up and cool down.
- Strengthen your abdominal and pelvic floor muscles.
- Exercise carefully if you are lying on your back.
- Drink plenty of water.
- Modify your exercise program. (*Mum's the Word. Exercising During Pregnancy*, NSW Sport & Recreation.)

Children

The age of children impacts on their:

- capacity to learn skills
- level of motivation to be active
- physiological capabilities
- susceptibility to injury.

Children have lower levels of motor control and are unable to process much information at one time. For young children, the focus should be on fun, skill development and activity, not competition and 'win at all costs'. If children enjoy activity when they are young and are taught how to perform fundamental movement skills correctly, they are more likely to continue exercising as they get older.



Figure 9.21: Children need to enjoy exercise so they are encouraged to keep exercising.

People training for fitness

For athletes whose primary goal is to maintain a high level of fitness so that they can be competitive, it is essential that a specific training program be followed. This program includes fitness activities that reflect the energy system being utilised in competition and needs to be of high intensity. Following the FITT framework (see chapter 5) for program design is necessary. The principles of progressive overload and specificity need to be applied in the design of a program. People who train for fitness need to be constantly challenged so that they continue to improve as they train towards their peak.

The aged

Regular physical activity can be very beneficial for older people. As we age there is a gradual decline in our physiological capabilities, such as reduced heart/lung capacity, bone density and muscular strength. However, if people remain active as they age the rate of decline can decrease or be delayed.

The reasons why older people exercise need to be considered when designing exercises specific to this group. Most older people exercise to be with others, make new friends and have some fun in addition to the health benefits gained. This has implications for fitness service providers when designing exercise classes for older people. A general exercise class (for example, super circuit, aerobics, aquarobics) requires a longer warm-up and cool down together with a reduced aerobic segment. A specific relaxation component will also be popular. Without doubt, the principal focus of such classes should be the pursuit of fun and enjoyment.

Modified low to moderate exercise can be beneficial to older people. The physical, social and psychological benefits lead to improved well-being. Older people will be encouraged to exercise if they are able to participate in gentle exercises designed specifically for their needs.



Figure 9.22: Modified low to moderate exercise can be beneficial to older people.

Emerging group fitness activities

Motivation to improve and maintain fitness often requires the support of activities that are different, interesting and challenging. Traditional fitness activities such as circuits and team games are popular with most, but may be inconvenient, time consuming or may not have personal appeal. Group fitness activities such as boot camps have an emphasis on fun, challenge and opportunity for maximal workout and are becoming popular because classes are conducted over a short period, usually four weeks, and offer quick results. Within fitness centres, classes such as dance and core are also popular, the latter due to its focus on strengthening the abdominal and back regions of the body through controlled exercises such as pushing, pulling and rotating.

Other popular group fitness activities offered by fitness centres include classes where many of the essential moves can be learned well before attending. The instructor then incorporates the moves with music, making the session interesting and challenging. Examples of these classes are listed opposite. Using the weblinks for each of the following classes, you can see a video of what happens in a typical class and even learn the moves before attending.

eBook*plus*

- **Body attack**
- **Body combat**
- **Body pump**
- **Body step**

Many emerging group fitness activities are supported by child-care facilities, massage, sauna, spa and perhaps a physiotherapist and nutritionist. In addition, sessions are conducted by qualified instructors who not only motivate the group, but ensure that participants work within their fitness level. Fitness gyms for women are also becoming popular and attract clientele who may feel intimidated in some gyms that may be male dominated.



APPLICATION

Group fitness activities

1. Identify the types of fitness class available in your local area.
2. On separate days, participate in two of these classes.
3. Write a report comparing the two types of fitness class. Include the following in your report:
   - the benefits of each class
   - the availability and cost
   - the nature and difficulty of each
   - who it would suit
   - time commitment required
   - sources of further information for each
   - your personal reflections on participation.



SETTINGS FOR EXERCISE

The environments in which people exercise vary according to their fitness needs, facilities available and cost of activities. People who do not have the time or desire to go to a fitness centre to exercise may prefer to exercise at home. In addition to fitness centres, many communities offer other sporting and recreational facilities. Tennis courts, squash centres, leisure centres, golf

courses, indoor sports centres and bicycle tracks are just some of the facilities that may be available.

For people who prefer to exercise in a group, exercise clubs and cultural groups provide a range of physical activities. It is important that the setting chosen to exercise in is an enjoyable and convenient environment that meets the individual's needs. If not, the likelihood of the person continuing exercise is reduced.

Exercise at home

It is often difficult to find time to go out and exercise. For people with children or those who work long hours, exercising at home may be the most practical option. Many people who can afford the equipment have set up home gyms. Weights and weight machines are available at most sports stores. Aerobic exercise machines such as treadmills, steppers and stationary bicycles can also be purchased. If exercising at home is the only option available, weights combined with an aerobic machine provides a better workout.

Not everyone who wants to exercise at home can afford expensive exercise equipment. A range of exercises can be done with relatively little equipment. Another option is an exercise video or DVD. There are many exercise video and DVDs on the market that provide exercise instruction. Aerobics, step and pump classes can be done in the home by following the instructor on the video or DVD.

One of the downsides to exercising at home is maintaining the motivation to regularly exercise. It is easy to be distracted so it is important to plan a set time in the day that is devoted to exercise.

Community facilities

Availability of and access to community exercise facilities vary. In larger communities the existence of a wide range of facilities provides the individual with greater exercise choice. The likelihood of finding a fitness activity that suits your needs is greater for people who live in large towns and cities.

Fitness centres and personal trainers

Fitness centres are a popular choice for many people who exercise to improve fitness. Most fitness centres provide a range of fitness classes and weight training facilities. Classes can include aerobics, step, pump, flex, body sculpt, yoga, tai chi, cycle and power boxing. Each class varies in intensity of exercise and level of choreography and there is generally a class suitable to every ability level. For people who prefer resistance training, most fitness centres have a range of weights and weight training machines. Treadmills, steppers and stationary bicycles can be used to improve aerobic fitness. Fitness centres provide the convenience of being able to combine an aerobic workout with resistance training to achieve a good whole body workout.

Commercially run fitness centres provide many services designed to aid customers in their efforts to improve their fitness. The inclusion of

Exercise guru labels outdoor fitness groups 'embarrassing'

By Nicole Hasham

Outdoor personal training is a 'middle class' indulgence that can embarrass onlookers and deter others from exercising, one of Australia's leading fitness experts says.

Garry Egger, who has advised the federal government on exercise and weight control, said councils should crack down on trainers who monopolise areas such as beaches.

'There are obviously people who do it because it does send a statement and make them look good,' he said. 'We need better programs to appeal to the majority of the population who are inactive, rather than visible high-cost programs to a small minority who can afford it.'

Dr Egger's comments came as Waverley Council met on Tuesday night to discuss a crackdown on exercise groups that flout rules. Several councils have established policies limiting group sizes and imposing exclusion zones.

He said councils needed to stringently enforce their rules 'where trainers are interfering with other people's right to common recreational services'.

Egger wrote Australia's physical activity guidelines in 1999 and developed the Gutbusters weight-loss program. He now says personal training is an 'elite approach' to fitness, describing it as 'a very middle class, indulgent thing to do'.

Outdoor fitness groups could be 'embarrassing' for people to watch and could turn others off exercise, he said.

Waverley councillor Paula Masselos said exercise groups were training on children's play equipment, used benches for step routines, hung ropes from trees or allowed class sizes to blow out.

Libby Babet, who own Bottoms Up! Fitness, a women-only group with a permit to train on Bondi Beach, said most trainers complied with council regulations. She said group training was affordable — less than $10 a session for regular clients — and while personal training was more expensive, it helped people reach specific goals, such as getting in shape for a wedding.

Trainer Scott Gooding, who operates legal 'boot camp' training at Bondi Park, said his clients did not come to show off but to lose weight and get fit.

Source: Sydney Morning Herald, 13 March 2013.



INQUIRY

Outdoor fitness training

1. Do you think fitness trainers should be allowed to conduct group programs using equipment on public facilities such as beaches?
2. Do you agree that outside fitness groups may be 'embarrassing' and possibly turn people off exercise?
3. What is your preferred setting for exercise? Why?

Community leisure centres provide the convenience of a large number of activities at one venue. These centres cater to a range of needs by providing a variety of activities such as aerobic classes, step and pump classes, weight training, swimming, boxing, yoga, martial arts and circuit training. Centres can include pools, indoor courts that cater for basketball, badminton, volleyball and gymnastics. Some open out to running tracks.

The popularity of team sports for both player and spectator has ensured that playing fields and sporting facilities exist in many communities. Running tracks, golf courses, tennis courts and squash courts are other facilities that may be available. Most communities recognise the importance of regular exercise and encourage participation by providing facilities and keeping costs relatively low compared to commercial facilities.



child-minding facilities is an appealing service to many parents. Fitness centre personnel can provide information on training, technique and nutrition.

Personal trainers are available either as a centre employee or a self-employed trainer. For people who have little knowledge of resistance training and general exercise principles, personal trainers are an excellent resource. Not only do they have the expert knowledge, they are great motivators for many people. It is important to check the credentials and experience of personal trainers before employing them. There are a number of qualified organisations that teach fitness professionals. You can contact the Fitness Industry Association for verification of qualifications. As with any service provider, there are good and bad personal trainers. It is important to choose one that meets your needs.

Figure 9.23: Personal trainers provide exercise, fitness and diet expertise, as well as being motivators for many.

SNAPSHOT

Why PTs are your best choice

By Pete Tansley

What do Novak Djokovic, Michael Phelps and Stephanie Gilmour have in common?

Apart from being No.1 in their sport, they all have a team of personal trainers to help them stay on top.

If the world's best athletes have a personal trainer, then you, too, could benefit from one. Having a personal trainer used to be reserved for the elite and mega-rich. Today, they're a necessity rather than a luxury.

Here are six reasons why you should invest in a personal trainer:

1. A personal trainer will offer an objective eye.
   Personal trainers are not paid to make you feel good. No tennis player hires a coach to commend them on their swing and shout 'well done old, chap!' as they mis-hit another serve.
   A personal trainer will offer technique corrections and constructive criticism to improve your workouts and meal plan. When you're not on the right track, they won't go easy on you, and nor should they. They will tell you where you're going wrong, offer positive encouragement, suggest improvements and keep you accountable for your actions.
2. A personal trainer will help you master your technique.
   While a training partner (or even a mirror) can help you with form correction, nothing beats live coaching from a trainer.
   A recent client of mine, who has been lifting weights longer than I have been alive, managed to increase his personal best on his deadlift by 10% after just one personal training session. Sure, that might not be the case for every single session with a trainer, however, it proves a point; there is nothing quite as powerful as coaching during a session. A training partner or a mirror will often not pick up on the intricacies of some exercises.
3. A personal trainer will prevent a plateau.
   Two months have gone by and you have made fantastic progress. You've improved your aerobic capacity, doubled your strength, and friends are asking what your secret is.
   Then it strikes; the dreaded plateau. No matter how hard you exercise or how closely you adhere to your meal plan, nothing changes. A personal trainer is your best defence against reaching a

(continued)

plateau and will employ two key techniques to prevent it: variety and assessment.

Variety is used to shock your body, both physically and mentally, as workouts can become stale after some time. A personal trainer will change your program when necessary to ensure progress.

Ongoing assessments can also prevent a plateau. Don't worry; it's not HSC maths. The assessment may include body fat percentage, weigh-ins and strength or fitness tests to track progress. If progress slows, your personal trainer can use this feedback to design the next phase of training.

4. A personal trainer will create a customised plan.

   Anybody can download a workout and meal plan from the internet and get started. The problem with these cookie-cutter plans, however, is they do not take your requirements into account.

   What injuries do you have? How many times per week can you work out? Are you able to access a commercial gym, or are you confined to training in the park or living room? Do you have any food sensitivities or allergies? Are you a total beginner in the kitchen, or a budding Masterchef? All of these questions need to be answered before a plan can be devised.

   I even ask the relationship status of my clients before creating their plan. This is not for my benefit; I am happily married! However, a client's relationship status can have an impact on eating habits. Somebody who is single tends to eat out more often than somebody who enjoys meals at home with their partner.

   All of these angles need to be considered for both training and nutrition, which is why customisation is the key.

5. A personal trainer has been there before.

   It amazes me how often people select personal trainers without looking at their experience. Think about it; would you hire a skydiving instructor who had never jumped before? I doubt it.

   You want someone with plenty of skydiving experience before you put your life in their hands. A personal trainer is no different. They should be in good shape themselves and have a list of clients they have helped.

6. A personal trainer will create more than just workouts.

   As you can see, hiring a personal trainer is much more than just a workout. They will cover all angles of your lifestyle, from training and nutrition through to supplements and lifestyle management.

Choosing a Personal Trainer

There is no obvious place to find a trainer. Here are some pointers so you do not get stuck at this stage:

Firstly, tap into your network. Ask your friends, family and co-workers if they have someone they are happy to recommend. You can also look around your gym or park. Watch to see who looks approachable and who seems to be offering workouts that suit your level.

Do they seem present in the session? Does it look like they actually care about their client? If they are looking around or checking their mobile phone during the session, keep searching. If the trainer seems to have the same repeat clients week after week, that is a good sign.

Online can also be an effective search tool.

Secondly, it's about finding the right price, personality fit and location that suits your needs. Most trainers will provide an initial consultation to begin with. Don't feel pressured; if they are the right fit for you then get started right away to reap the rewards. If not, do not feel obliged to begin. Keep looking until the right trainer comes along.

Education and qualifications are also important, and so is their track record. Ask to see some recent testimonials of clients they have worked with. A trainer is always going to tell you how fantastic they are but a current or former client will give honest, transparent feedback without any sales jargon.

Source: www.ultrafitnessmag.com.au, accessed 11 February 2014.



APPLICATION

Personal trainers

Investigate the services and expertise of two personal trainers in your local area. Use the profile of a personal trainer (in the following case study) as a guide, then complete the questions in the following inquiry.

CASE STUDY

Profile of a personal trainer

Name: Mary Lougis
Qualifications:
- registered fitness instructor
- Diploma, Sports Science
- registered nurse
- level one swim coach.

Experience:
- 10 years experience as a personal trainer
- 15 years experience as a registered nurse
- State level swimmer
- Winner, New South Wales bodybuilding competition; runner-up in Australian NABBA.

Location: inner west, Sydney area and mobile service.

Cost: $50 per hour at gym, $60 per hour mobile service.



INQUIRY

Selecting a personal trainer

1. What qualifications has each trainer achieved? Do you think there is a need for standardisation of qualifications for personal trainers?
2. Do they have any particular areas of expertise; for example, rehabilitation?
3. What are the benefits of using a personal trainer?
4. Identify the different methods of the trainers being investigated.
5. Which personal trainer would you select as the best to meet your fitness needs? What factors led you to this decision?

Exercise clubs

Exercise clubs have grown in popularity as they are an excellent way to enjoy exercise on a regular basis in the company of friends. They provide organised activity and the opportunity to meet others with the same exercise interests. There are many clubs in New South Wales that cater to both the social exerciser and the competitive athlete. Running, walking and cycling clubs can be found in most communities.

The focus on walking as a form of exercise to improve health and fitness is apparent in New South Wales. The establishment of walking for pleasure clubs by the New South Wales Department of Sport and Recreation promotes walking as a good health and fitness exercise option. These clubs plan weekly

or fortnightly walks in settings such as national parks, beaches and other places of interest. Exercise clubs are a great way to get into exercise on a regular basis.

Cultural groups

Multiculturalism is a part of Australian society. The establishment of a variety of cultural groups provides many benefits not only to people of that culture but to every Australian. Cultural groups keep alive many different aspects of the culture. Included in this is the opportunity to participate in culturally based forms of physical activity and exercise. The formation of cultural dance groups is a good example of the activities that cultural groups offer.

A variety of factors influence people's choices of fitness activities. People participating in the same sport or activity may have totally different reasons for participating, such as physical abilities, cost, availability, health benefits and friendships.



INQUIRY

Evaluating the appropriateness of my fitness program

eBookplus

Using the information you have read in the section 'Settings for exercise', complete a draft of the type of fitness activities that are available in your area and that you like. Use the following questions to evaluate the appropriateness of your choices. You might find it helpful to use the **Start exercise** weblink in your eBookPLUS, which raises issues about starting an exercise program. These could relate to your activity choices.

1. Does this fitness activity suit my fitness needs?
2. Could I continue to participate in this fitness activity? Why or why not?
3. Are other fitness activities more suitable for me?



ADVERTISING AND PROMOTION

Advertising is a powerful tool. A good advertisement can be very persuasive in influencing people to buy a particular product. Advertisements for fitness and exercise services can be found in or on magazines, newspapers, television home shopping channels, commercials, radio and the internet. Commercial fitness centres do letterbox drops of flyers promoting their facilities.



Figure 9.24: Advertisement for a personal trainer

Promotions aimed at enticing the consumer to buy a product or service can often sound too good to be true. It is important that consumers take the time to investigate the product or service they wish to buy before committing time and money to it.

How do you know who to believe?

The first step in finding out who to believe is by checking to see if the product or service is endorsed by a recognised fitness or health institution. Does the person offering the service have any qualifications? What is the basis of their expertise? These are things you should investigate when determining the reliability of the source of information. Generally, well-recognised brands and products endorsed by Australian fitness industry or health organisations such as the Heart Foundation are reliable.



INQUIRY

Fitness and exercise services

eBookplus

Examine figure 9.24 and use the **Personal trainers — how to choose one** weblink in your eBookPLUS, then answer the following questions.

1. What information is provided about the personal trainer in figure 9.24?
2. Who is the advertisement targeting?
3. What does the advertisement offer?
4. Using the website information, list other information that you require to make an informed decision about the use of a personal trainer.
5. What do you think would be the benefits of the service?
6. How would you establish if the claims are believable?

Promotional techniques

Promotional techniques are often used to attract customers to products and services. Targeting specific groups and offering limited offers are some promotional techniques used. Don't be fooled by the slick advertising of products. Take the time to:

- compare products
- seek advice from people in the fitness industry
- investigate the quality of the product or service advertised.

Accuracy of information

One technique used in advertising is to promote products through glossy, attractive advertisements that appeal to the senses of the consumer, but really give little information about the product. Compare advertisements of similar products or services to determine the amount of information given. It is wise to talk to the service providers and ask questions regarding their expertise and qualifications before using that service. It is illegal to give false information in advertising, although information can often be misleading. If you have concerns about the accuracy of information, investigate the information supplied by asking people with more knowledge or experience in that area.



APPLICATION

Advertising and promotion of fitness products

Collect a number of advertisements of fitness equipment, fitness centres and fitness services from print media, or compile a video collection from television. Analyse the advertisements, considering the following points.

- What is being promoted? How does it help to improve health and fitness?
- What promotional techniques are used?
- How accurate do you think the information is?

Present your information to the class.

Ethics of advertising

As with any commercial industry, the fitness industry uses many advertising techniques to attract customers and make money. There are many genuine fitness products and service providers available. It is important that people understand that there is a range in the quality of service and product available. The claims made in advertising can be misleading and may even be false.

INQUIRY

Advertising and promotion

Critically analyse the advertisement in figure 9.25.

1. What information is provided?
2. Who is the advertisement targeting?
3. What does the advertisement offer?
4. What promotional techniques are used?
5. What are the benefits of this fitness centre?
6. How can you determine if the information is believable?
7. From the information provided, do you think this gym would suit your fitness needs? Explain your answer. What other information would you require?



Figure 9.25: Online advertisement for a fitness centre

MOTIVATORS AND BARRIERS TO PARTICIPATION

For some people regular exercise is a difficult task. There are many barriers that exist that prevent or deter people from participating in regular physical activity. Figure 9.26 summarises recent findings concerning people's reasons for low or non-participation in physical activity in Australia.

The major barriers to participation among inactive people are a lack of time, lack of interest, injury or disability and beliefs about being too old to exercise.

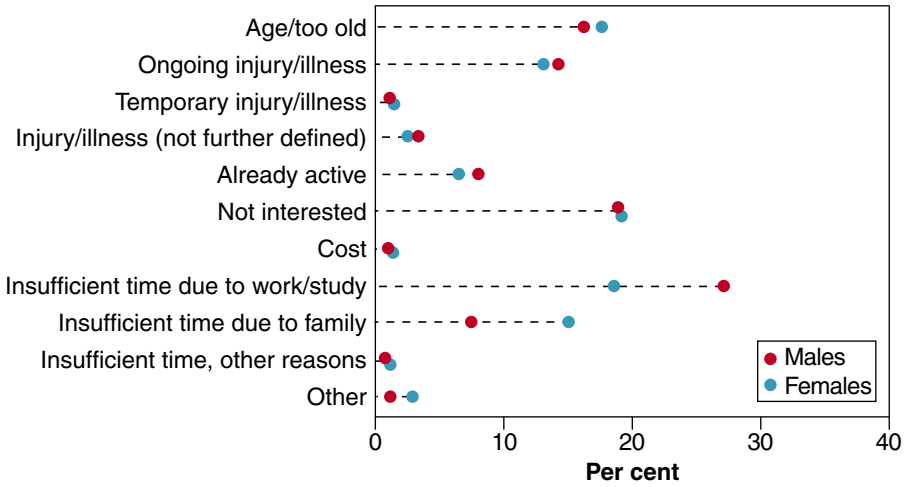


Figure 9.26: Constraints on participation in sports and physical recreation, as reported by non-participants and low-level participants, by sex (*Source:* Australian Bureau of Statistics, 'Participation in Sports and Physical Recreation', cat. no. 4177.0, 2005–06, p. 11.)

INQUIRY

What are your barriers to participation in physical activity?

eBookplus

Use the **Barriers to exercise** weblink your eBookPLUS to access an online quiz. Print the sheet and answer each of the questions by selecting and circling a response. Complete the score chart at the end.

1. How many barriers do you need to overcome?
2. How do you think you might overcome these barriers?

Access to facilities

The availability of and access to exercise facilities impacts on participation in exercise. Physical isolation and financial circumstances can limit access to facilities. For people who live in isolated communities, the facilities available are limited or even non-existent.

Convenience of use

The issue of time can affect people's ability to exercise. People are more likely to participate in exercise, join a team or use a gym if it is convenient to do

so. This may mean it is close to home or on the way home from work. For adolescents, it may mean that they can get there easily by public transport. If it is difficult to get to and from facilities, people are more likely to opt out of exercising.

Cost

The ability to afford to join a fitness centre, and buy fitness products or exercise clothing and shoes can be a barrier to people exercising. Lack of money can restrict the range and type of activities available. Many physical activities are very costly. Playing in a social competition, using a fitness centre or a swimming pool means a financial commitment. Some people are not able to make this commitment. The limited range of exercise choices that are left may not be appealing, so participation in regular exercise decreases.

Feelings about fitness and exercise

The exercise experiences people have when they are young can affect their attitudes to exercise. When these experiences are unpleasant, negative feelings about fitness and exercise develop and can form a barrier to exercise for adults. It is important that exercise is fun and not intimidating to young people, so that they develop positive attitudes to exercise.

Exercise as a priority

In people's busy lifestyles today exercise is not a priority. Some people work long hours at stressful jobs. They do not perceive exercise as a priority, as they have more important deadlines to meet and work to do. For some people who do not recognise the important health benefits of regular exercise, exercise is not important. The challenge is to educate people about the benefits of regular physical activity and to introduce them to enjoyable activities that suit their fitness needs.

Influence of other responsibilities

For many parents, particularly mothers, the commitment of raising children can be a barrier to exercise. Lack of personal time is especially an issue when caring for small children. In some cases, parents do not get time to themselves until early evening. By then they are often too tired to exercise. It is not uncommon for parents to become spectators as their children grow and begin to participate in activity and sport.

Parents need to manage their time to include some activity in their lifestyle. They can become active by increasing their incidental activity; for example, doing the housework more vigorously, walking the children to the shops or getting involved in their children's sport in some capacity. Sharing family responsibilities between the two parents allows each time to engage in exercise.



INQUIRY

Overcoming barriers to exercise

Some of the common barriers to exercise we hear are:

- 'I don't have enough time'
- 'Exercise is boring'
- 'I don't know how to be active'
- 'I'm too tired'

- 'It's too hot', 'It's too cold', 'It's raining'
- 'I don't feel like it'.

eBookplus

Use the **Physical activity barriers** weblink in your eBookPLUS to prepare a positive response to each of the barriers listed above.

SUMMARY

- Children and youth up to 15 years of age should exercise for 60 minutes per day, every day. The time can be accumulated.
- Adults should exercise for 30 minutes on most or all days of the week.
- Regular moderate to vigorous physical activity and exercise should be a life-long behaviour that starts in childhood and is carried on throughout life.
- Regular physical activity has many positive health benefits. Improved fitness is linked with reduced risk of all-cause morbidity and mortality.
- The value that people place on exercise and fitness varies across the population and may result from a combination of many factors.
- A significant section of the Australian population does not value fitness and exercise. This is reflected in statistics that reveal a large group of people fail to meet the recommended levels of physical activity.
- People of all ages gain health benefits from regular, moderate physical activity.
- The commodification of fitness has led to the availability of a much wider range of fitness products and services.
- There are many ways in which the individual can choose to exercise for fitness. They include a wide variety of individual and group fitness activities that can be done in a variety of settings.
- Individuals need to determine their fitness needs and investigate the range of exercise types on offer so that they choose an activity that meets their needs, is enjoyable and that they will be likely to continue.
- The fitness industry advertises and promotes many fitness products and services. Quality and value for money is something consumers should consider before making a financial commitment. Consumers need to investigate the accuracy of the information being provided, the qualifications and expertise of people providing the service and the quality and reliability of products being offered.
- There are a number of barriers to people's participation in fitness activities, many of which can be overcome.

QUESTIONS

Revision

1. **Explain** how we can improve our health through physical activity. (P6) (3 marks)
2. Briefly **explain** the extent to which exercise should be a part of lifestyle. (P15) (3 marks)
3. **Discuss** what it means to be fit. (P15) (1 mark)
4. 'Australians value exercise and fitness.' **Discuss** this statement. (P17) (5 marks)
5. Has the commodification of fitness been beneficial in improving people's attitudes to fitness? **Discuss**. (P17) (5 marks)
6. **Identify** and **discuss** four factors influencing people's attitudes to fitness. (P17) (4 marks)
7. How has your attitude to fitness been formed? **Discuss** the factors that have influenced your attitude. (P17) (5 marks)

(continued)

8. **Identify** two individual and two group fitness activities and **outline** the benefits of each. (P15) (4 marks)
9. **Identify** the important considerations of designing exercise for the aged, children and pregnant women. (P5) (3 marks)
10. **Explain** the exercise needs of a person intent on improving their fitness. (P5) (3 marks)
11. **Investigate** your local fitness centre. What services does it provide? Does it meet your fitness needs? **Explain**. (P15) (5 marks)
12. **Describe** the role of a personal trainer. (P15) (1 mark)
13. **Identify** one cultural group in your community. **Investigate** the activities it offers. (P16) (3 marks)
14. What benefits does regular physical activity provide? (P15) (3 marks)
15. **Outline** the things you should consider before believing an advertisement for a fitness service or product. (P16) (2 marks)
16. **Identify** and **describe** three barriers to participation in regular exercise. **Explain** how these might be overcome. (P17) (6 marks)

Extension

1. **Describe** your main motivations for exercising. How do these compare to people of different age groups and activity levels? (P17) (5 marks)
2. **Investigate** methods by which aerobic fitness can be improved within a fitness centre. (P5) (5 marks)
3. **Determine** why it might be necessary to be critical of advertisements for fitness products and services. (P15) (3 marks)

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

eBookplus

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

CHAPTER 10
Outdoor recreation



OUTCOMES

On completion of this chapter, you will be able to:

- propose actions that can improve and maintain an individual's health (P6)
- develop plans for participation in physical activity to satisfy a range of individual needs (P10)
- demonstrate the technical and interpersonal skills necessary to participate safely in challenging outdoor recreational activities (P14)
- utilise a range of sources to draw conclusions about health and physical activity concepts (P16)
- analyse factors influencing movement and patterns of participation. (P17)

OVERVIEW

REASONS FOR PARTICIPATION IN OUTDOOR RECREATION
Stress management and relaxation; Enjoyment, challenge and excitement; Social interaction; Appreciation of the environment; Health and fitness

PLANNING SKILLS
Environmental planning; Emergency management planning; Food and water considerations; Resources for safe participation; Legal and administrative requirements

CAMP SITE SELECTION
Geographic, environmental and climatic conditions; Establishing the camp site; Tree fall evaluation

CONSERVATION SKILLS
'Leave no trace' camping; Minimal impact practices; Ethical issues

NAVIGATIONAL SKILLS
Check list for navigation; Map reading; Grid bearings; Magnetic bearing; Measuring distance; Natural navigation

EMERGENCY MANAGEMENT SKILLS
Wilderness first aid; What to do when you are lost; Bushfire procedures; Lightning; Flooded rivers; Skills needed for other outdoor activities relevant to the experience

LEADERSHIP STYLES

UNDERSTANDING GROUP DYNAMICS
Conflict resolution; Team building; Cooperation

FACILITATION SKILLS
Communication skills; Decision making; Flexibility

UNDERSTANDING STRENGTHS AND WEAKNESSES
Participant readiness; Self-efficacy; Balancing challenge and safety; Pushing the comfort zone



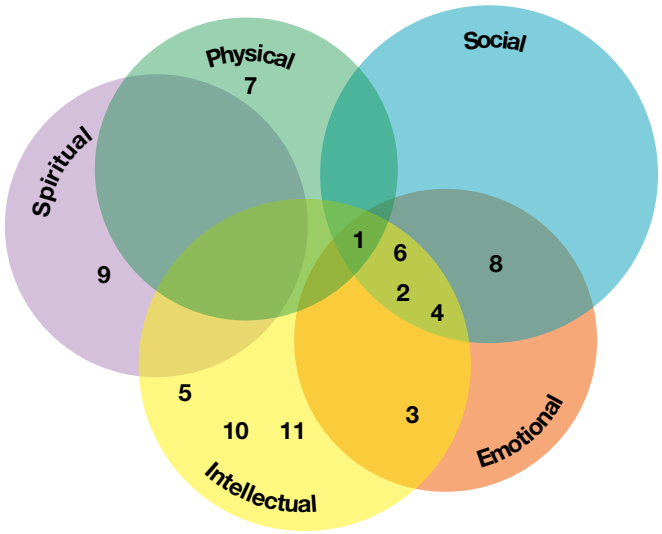
REASONS FOR PARTICIPATION IN OUTDOOR RECREATION

Outdoor recreation includes a wide range of activities undertaken for leisure outdoors. Australia has a great history of participation in outdoor recreation, with most people enjoying the wide range of suitable natural environments, including snowfields, rivers, beaches and mountain ranges.

People of all ages can benefit from participation in a range of outdoor pursuits, which can result in considerable physical, social, intellectual and emotional outcomes, including:

- enjoyment
- fitness
- challenge
- spiritual growth.

Some people prefer activities for relaxation like fishing and bird watching, while others seek more vigorous and adventurous activities including rock climbing, hang-gliding and sailing. Some outdoor recreational activities require detailed planning to ensure the safety of participants on extended expeditions or in potentially high-risk situations, while other activities involve little or no planning, such as surfing or a game of cricket on the beach.



1. Enjoyment
2. Challenge and excitement
3. Self-sufficiency
4. Stress management
5. Decision making
6. Communication
7. Health and fitness
8. Social interaction
9. Spiritual growth
10. Observation skills
11. Appreciation of the environment

Figure 10.1: Venn diagram showing physical, social, intellectual, spiritual and emotional outcomes that may result from participation in outdoor recreation

Stress management and relaxation

Feelings of anxiety and stress are increasingly common in society today. Some of the reasons for these feelings include the following.

Urbanisation refers to the trend towards more people living in cities.

- **Urbanisation** has led to individuals and communities being subjected to overcrowding and pollution. Large cities can be lonely places to live, particularly for elderly people, migrants and people from country areas forced to move to the city to find employment.
- Unemployment contributes to higher stress levels, with many individuals suffering low self-esteem, poverty and family pressures as a result of being unable to find work.

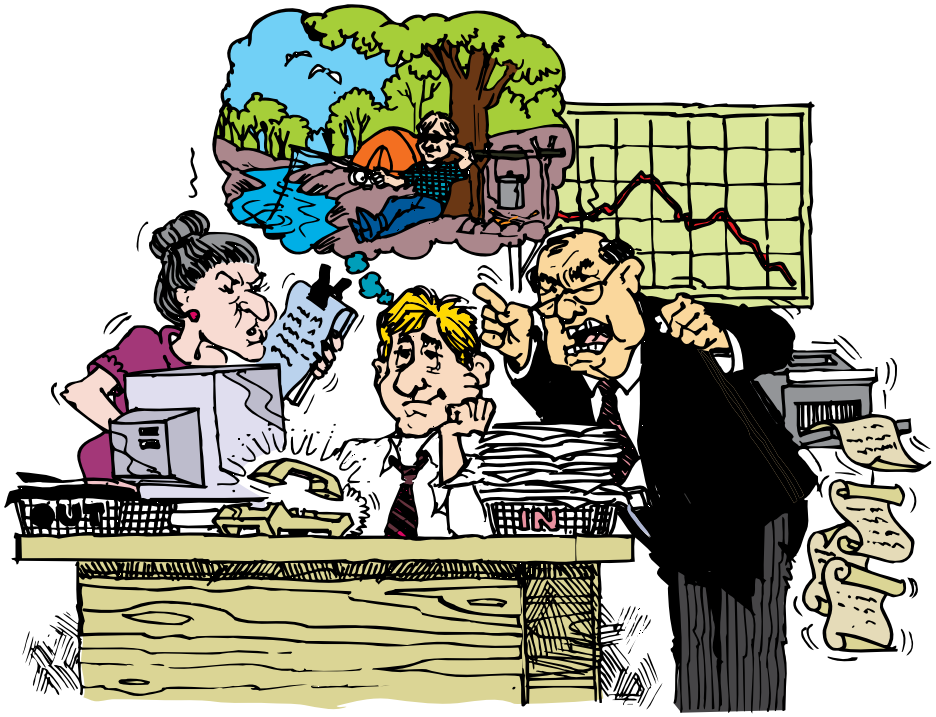


Figure 10.2: Outdoor recreation can provide a valuable source of stress release.

- Increased responsibility in the work force means working longer hours, commuting greater distances to work and experiencing traffic delays. All of these factors lead to less time at home with the family.
- Social changes, including changing traditional family roles and family breakdown, contribute to the stress levels of members of our modern society.
- Disadvantaged groups may experience discrimination and harassment, as well as the problems associated with living in cities, drug abuse, poverty and unemployment.

Young people may have additional areas of stress in their lives, possibly caused through:

- pressures from school or parents to achieve
- breakdown in relationships
- confusion about their sexuality
- conflicts with peers and the desire for acceptance.

Participating in outdoor recreational activities is often seen as an escape to the outdoors and an opportunity to 're-create' yourself. Interacting with the natural environment generally means fresh, unpolluted air and feelings of relaxation or excitement that can help to distract an individual from their daily life and pressures. The benefits for stress management are that the individual removes themself from the areas of stress in their lives. For many in our community, the outdoors is a wonderful place to do this.

Enjoyment, challenge and excitement

Participating in many forms of outdoor recreation offers opportunities for considerable enjoyment. Some individuals may find outdoor recreational activities to be fun because they are relaxing, while others may enjoy the strenuous and challenging nature of other activities.

Many outdoor recreational activities, such as rock climbing, mountaineering and white water canoeing, involve considerable challenge and risk.

The element of risk inherent in many of these activities provides a thrilling adventure and is an enormous attraction for some participants. The range of environmental conditions associated with participation in outdoor activities, including the shape of the land and weather patterns, adds to the challenge and risk.

The human spirit is capable of considerable challenge and risk taking. Throughout history, people have sought exciting and adventurous outdoor activities through their work or leisure. Individuals and communities have undertaken some incredible explorations into unknown environments, such as space and Antarctica, as well as arduous expeditions in all parts of the world, from Mt Everest to the South Pole. These types of human achievements generate considerable excitement and inspiration in the community. Many individuals deliberately pursue activities that differ from their work environment. More and more Australians are living and working in urban communities, most often in 'safe', indoor environments. Therefore it becomes important for these people to interact with nature, test personal limits and participate in activities with adventure in mind.



Figure 10.3: Many outdoor recreational activities involve challenge and excitement.



INQUIRY

Challenge and excitement in recreation

1. Reflect on any experiences you may have had in outdoor recreation that filled you with a sense of excitement and challenge. Share these with a classmate.
2. In groups, research and discuss the feats of one or more of the following outdoor adventurers. Consider the role of challenge and excitement in their motivation to complete their expeditions.
   (a) Paul Caffyn (kayaked around the coast of Australia, mostly solo)
   (b) Kay Cottee (first woman to sail solo around the globe) or Jessica Watson
   (c) Sir Edmund Hillary (first successful mountaineering expedition to climb Mt Everest)
   (d) Brigitte Muir (first Australian woman to climb Mt Everest)
   (e) Gerrard Gosens (blind adventurer and Paralympian, climbed Everest and other feats)

Social interaction

Individuals choose activities according to their needs, personality and lifestyle. Some people enjoy the opportunities for social interaction that outdoor recreation can bring. Joining with friends who have similar interests, such as camping or sailing, is appealing to many. Meeting new people while skiing or playing beach volleyball may add value to the activity for other people. Many people enjoy the teamwork, companionship and cooperation required in social recreational pursuits. In contrast, other people prefer to escape from crowds and seek out isolated wilderness areas, often participating in individual recreational pursuits such as cross-country skiing. For these people the solace and isolation can be a valuable spiritual experience.

Appreciation of the environment

The Australian environment offers some of the world's most spectacular and varied scenery, including alpine, tropical, desert and coastal landscapes. Individuals and communities do not have to venture far from home to enjoy and appreciate some magnificent natural environment settings.



Figure 10.4: Magnificent Australian landscapes offer wonderful opportunities to appreciate the natural environment.



INQUIRY

Appreciating the natural environment

1. Prepare a list of recreational activities that can be enjoyed in Australia's varied landscapes. Circle the activities that are within a two-hour drive of your home.
2. Which activities appeal to you? Why?
3. What outcomes could result from participation in these activities?
4. In which activities could a person in a wheelchair or an elderly person participate?

Health and fitness

Many outdoor recreation pursuits involve physical activity and can contribute to the development and maintenance of fitness. The components of fitness developed vary depending on the activity chosen. For example, cross-country skiing is an excellent aerobic activity. In contrast, rock climbing and canoeing develop muscular endurance, while surfing enhances balance and coordination, in addition to aerobic conditioning and strength. More passive forms of outdoor recreation, such as fishing, may offer health benefits generated through enjoyment and relaxation, rather than benefits to fitness.

Fitness requirements for many outdoor recreation activities are quite specific. While regular involvement in sport and fitness activities is beneficial for general conditioning, it may not be adequate to prepare for specialised activities, such as a hard bushwalk over several days. This will test even the fittest person who is not conditioned to carry a heavy pack, walk up and down steep slopes and balance on uneven ground. As with any activity, training needs to closely resemble the 'real thing' for effective gains to be made. The dynamic nature of the environment also needs to be considered, with extremes in weather including rain, wind, cold or heat adding demands on the body.



INQUIRY

Participating in outdoor recreation

Using the information in the text and your own ideas, think of reasons for participating in outdoor recreation. Prioritise your reasons in the ranking chart below and provide an explanation for each of your choices.

Priority chart

Reason for participating in outdoor recreation	Justification
1.	
2.	
3.	
4.	
5.	
6.	



PLANNING SKILLS

Many outdoor recreational activities involve considerable planning to ensure that participants are safe, enjoy themselves, are adequately prepared for conditions, meet their goals, interact with minimal impact on the natural environment and develop positive relationships with authorities. Most of this planning needs to be done before the trip even begins; for example, finance, rations, equipment and transport. During the expedition, plans may need to be changed due to weather or group capabilities. A successful party needs knowledge and skills to adapt, survive and make alternative plans if necessary.

Environmental planning

Planning for environmental hazards depends on the activity being undertaken and the venue chosen. Local knowledge of weather conditions in the area to be visited is essential. Leaders must consider the hazards of the chosen venue. It is important that the venue is suitable for the ability level of the participants, therefore leaders must have prior experience in the area and research it thoroughly before taking a group of less experienced participants. Equipment suitable for conditions likely to be encountered should be taken.

The type of activity determines the planning for environmental conditions. For instance, a party of sea kayakers may need to take extra supplies in case they are stranded due to high seas for an extended period. Canoeists on a river may finish their trip sooner or later than planned, depending on water levels. Touring cyclists need to take clothing and equipment suitable for all weather conditions, as they may be delayed by strong head winds. Bushwalkers may strike high winds, snow, rain, floods or high temperatures.

CASE STUDY

Caving tragedy

Expeditions in the outdoors are often delayed by poor weather. In some situations, groups are advised to stay where they are, rather than attempt to keep going in very poor conditions. Of course, it is important to be dry, have shelter and sufficient provisions. The following tragic story illustrates how poor weather conditions, combined with poor decision making, can be fatal.

A party of students and teachers became stranded in a cave after heavy rain raised water levels in the cave. The group was delayed and began to worry about their families and the authorities, who would be anxious and waiting for their arrival. Two people decided to get out of the cave to communicate the situation while the others remained in a high part of the cave. Tragically, the two who left the main party drowned as they tried to get out. The rest of the party survived and were rescued.



INQUIRY

Planning skills

1. What are the risks associated with caving described in the case study above?
2. What information could have been left with family and authorities before the group set out?
3. How could the tragedy have been prevented?

Emergency management planning

There are important safety risk management and organisational factors that must be addressed before and during a trip in order to manage the group's safety. In any outdoor recreational trip, it is essential that the group:

- stay calm at all times
- assess each situation logically.

Thorough research, planning, clear thinking and experience can enable a group to survive the toughest conditions. Panic can cause people to make mistakes. These mistakes may lead to tragedy for an inexperienced group.

Many outdoor recreational activities involve elements of risk. While the risks involved often make the activity more appealing and challenging, it is important that participants ensure that risks taken are controlled or calculated and individual needs and abilities within the group are considered. This means that although the activity itself may be potentially dangerous, the level of danger can be reduced by ensuring that:

- equipment is regularly checked to ensure it is safe and suitable to the environmental conditions
- participants have the necessary physical and mental skills needed to complete the challenge
- routes are carefully planned
- participants are skilled in navigation and have options for early exit if the weather turns bad or someone is injured
- communication modes with external authorities are established, including mobile phones, emergency contact numbers and a contingency plan to notify authorities if help is needed
- participants recognise their own capabilities. Failure to do this can place the whole group in danger.
- at least one member of the party is qualified in first aid
- the group should carry a comprehensive first aid kit and individuals should carry their own first aid supplies.

An **escape route** is an alternative way out of an area. It is best if a road or settlement is nearby.

A group may need to use an **escape route** if:

- the weather changes
- participants are not coping with the terrain
- an injury is suffered.

An escape route provides the group with an alternative way out of the area. Thorough planning of the route to be taken is paramount for overnight trips. Leaders should know the area well and be familiar with road access points and some alternative routes. If all participants are new to an area, they should study maps carefully before leaving and talk to the National Parks and Wildlife Service, other experienced people who know the area well, or local residents to familiarise themselves with the terrain and access points.



Figure 10.5: Groups should establish safety procedures and understand in advance how safe the environment is for the activity.

APPLICATION

Using escape routes

Read the following account and study figure 10.6, which shows the route planned for an inexperienced canoeing group attempting their first overnight expedition.

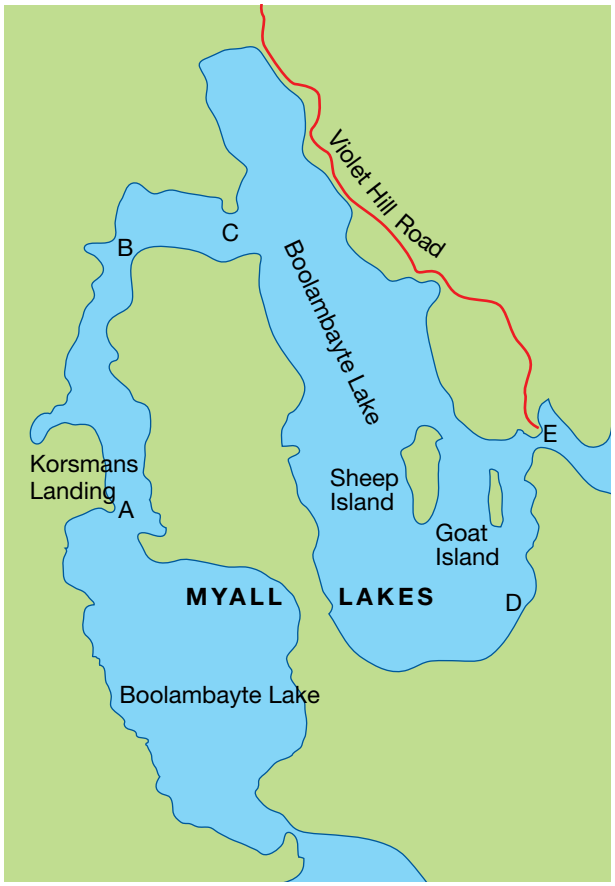


Figure 10.6: Map of the Myall Lakes area showing the planned route of the canoeists

A canoeing group had participated in some short trips to learn techniques and become familiar with the lake conditions. They were well prepared with food, camping supplies in waterproof drums and bags, and good quality canoeing equipment. They set out at 9.00 a.m. from point A when the weather was fine and mild and the water calm. The group kept together and had lunch at B before exploring the creek at C and then heading to D for the overnight camp. The leaders had noticed some high level cloud building up from the south during the day and thought the weather could change overnight and into the next day. They were right. After a peaceful overnight camp the group awoke early to drizzling rain, cold temperatures and strong southerly winds. The winds had made the water in the lake quite choppy, very unsuitable for the open Canadian canoes that most of the inexperienced members of the group were paddling in. The wind change meant that the group would be heading straight into the strong winds for the return journey, which was not good for beginners.

The group leaders held a conference and decided to use the escape route at E that linked to a major road. This would still involve some canoeing but would be in relatively sheltered water and the group would be moving in the same direction as the wind. Two of the leaders who were experienced paddlers returned to point A and drove the vehicles around to escape route E to collect the group. The wind and rain increased steadily throughout the day and the lake became extremely turbulent by the afternoon. The group averted a potential tragedy by being prepared and using the escape route.

INQUIRY

Planning an escape route

1. Identify the parts of the account in the application above that indicate the group was well prepared.
2. The leaders made the correct decision to use the escape route. What may have happened to the group if they had decided to continue with the trip as planned?
3. Identify the pressures that the leaders may have faced in making the decision to cut short the trip. Consider the opinions of the participants and parents.

First aid preparation

All groups should have first aid knowledge. It is preferable that participants be trained to senior first aid level. Specific emergencies in outdoor recreation expeditions could include:

- snakebites
- cuts and grazes
- bites and stings
- hypothermia
- hyperthermia
- sprains
- strains
- blisters.

The group needs to have the knowledge and skills to cope with such problems.

A comprehensive first aid kit should be carried by the group. Each member of the group should also have their own first aid supplies. For camping, overnight canoeing or bushwalking for a group of five to six, the group first aid kit should be stored in a waterproof, durable container. It should contain:

- triangular and crepe bandages
- cotton bandages (to secure dressings to wounds)
- two packets of wound closures (steri-strips) for cuts
- sterile nonstick dressings
- one roll of tape (secure bandages, tape joints)
- scissors, tweezers, safety pins
- antiseptic lotion and insect repellent
- small first aid manual
- instant cold compress
- a pain relief cream in case of stings.



In addition to the group first aid kit, every person should carry a personal first aid kit containing the following items:

- paracetamol tablets
- moleskin or foam strip for blisters
- survival blanket
- sunscreen
- bandaids
- personal medication, such as an asthma relief puffer
- antiseptic cream.

Figure 10.7: First aid preparation should be thorough, but lightweight and ready to meet the immediate demands resulting from injury.

Food and water considerations

The length and type of the expedition, possible weather conditions and the season will determine the consideration given to food and water. It is worth remembering that most humans can live for up to three weeks without food, but will survive for only one to three days without water, depending on the temperatures. If the temperature is 20 °C, a person would need 1.2 litres of water if resting in the shade, whereas if the temperature increased to 30 °C the need for water increases to 2.5 litres.

At least one day's supply of emergency food should be carried for most expeditions; more should be taken for extended trips. Many expedition foods require water for cooking (for example, to cook rice) and this needs to be taken into consideration. Unfortunately in many places, water from rivers is not safe to drink, due to pollution caused by sewage and domestic and industrial waste from humans. The water therefore needs to be boiled for 10 minutes or purified using soluble iodine or commercial tablets such as Puritabs, which tend to have a strong chlorine smell and taste. Where possible, overnight camps should be near a reliable water supply to save carrying more than 1.5 to two litres per day each. Route planning should therefore include reliable water sources.

It is essential that participants prepare a balanced intake of food during extended activity. Kilojoule intake needs to be high in physically demanding activities to provide energy for activity and to keep the body warm. Carbohydrates should be the dominant food group consumed, followed by protein and fats. Vitamins and minerals are also essential. Menus should include meals that are nutritious, light to carry and quick to prepare. Packaging should be minimised and only foods that do not require refrigeration should be taken. If the expedition is bushwalking with packs, keeping weight to a minimum is vital for comfort and well-being.

Food should be grouped into meals of equal weight and distributed evenly among the group to carry. It is therefore very important to consider the size and weight of food packaging. Weight should be kept to 750–900 grams per day per person when carrying all food in a backpack.

Rice, pasta and cereals can be carried in plastic bags that can be easily compressed and carried out or used to carry rubbish. Spreads like honey can be carried in small plastic containers or in tubes that are available from camping stores. **Scroggin** should be packed in small snaplock bags, one for each day. Tins should be small and kept to a minimum, as they are heavy.

Scroggin refers to high energy foods such as dried fruit, nuts and chocolate that are suitable for snacks on expeditions.

When selecting food and planning menus for the outdoors, it is necessary to consider the following questions.

- Is the food nutritious?
- Is the food lightweight?
- Is it easy to prepare?
- Will you enjoy the food — do you like the taste?
- Is packaging kept to a minimum?

Consider the following suggestions in food selection and menu planning.

Breakfast:

- cereal, porridge, muesli
- fruit — fresh for the first few days then rehydrated dried fruit or packaged snack-pack or tinned fruit (can be heavy)
- muffins, bread, pita bread
- baked beans, eggs (will keep for two days if carefully packaged).

Lunch:

- bread, dry biscuits like Ryvita or pita bread
- cheese (processed cheese with preservatives is not as healthy as fresh cheese but keeps better)
- tinned salmon, tuna or salami
- toppings including chutney, peanut butter, jam, honey
- fast-cook noodles or soups.

Dinner:

- use rice, pasta or legumes as a base and create a sauce using vegetables, tomato paste, curry powders, miso, garlic, herbs or powdered milk with cheese
- use fresh vegetables that will keep for a few days; for example, carrots, onions, zucchini and garlic
- custard, packaged cheesecakes, tinned puddings, fruit cake and rehydrated dried fruit (soak overnight and lightly simmer in water) make tasty desserts.

There are many commercially available ready-made meals such as pasta and rice meals to which you add water or powdered milk and simmer. These are convenient and quick to prepare, but are often high in salt and fat and low in nutrients. With a little more preparation you can add fresh vegetables or create your own pasta and rice dishes which are a healthier alternative for a main meal. For longer expeditions, many people use freeze-dried or dehydrated meals; however, they often lack flavour and nutrients and are expensive.



Figure 10.8: Some foods suitable for a short outdoor trip



Figure 10.9: A metho burning trangia stove is ideal for lightweight camping.

APPLICATION

Expedition food

Choose one of the following recipes and make the meal at home. Evaluate its suitability as an expedition food.



Minestrone soup

handful of fast cooking noodles
1 tspn vegetable stock powder
freeze-dried kidney beans
sachet of tomato paste
parsley flakes, dried basil and oregano
fresh garlic and onion
parmesan cheese

Mix dry ingredients at home and carry in a snaplock bag. In camp, chop the onion and garlic. Add all of the ingredients and two to three cups of water. Simmer for three to five minutes until the noodles are tender.



Lentil tomato stew

½ cup split red lentils
handful of dried noodles
sachet of tomato paste
parsley flakes
1 tspn stock powder or a stock cube
pepper
fresh garlic and onion

Combine all dry ingredients in a snaplock bag at home. In camp, chop the onion and garlic. Boil two to three cups of water, then add all of the ingredients. Simmer for 10–15 minutes.



Macaroni cheese and tuna

1 cup macaroni
1 tin tuna
1 cup grated cheese
½ cup milk
parsley flakes
garlic and onion

Chop the garlic and onion. Bring three cups of water to the boil and cook the macaroni. Drain and add the other ingredients. Return to the heat for two to three minutes. Stir continuously.



Rice curry

1 cup rice
fresh onion and carrot chopped in camp
curry powder
handful dried apricots, sultanas, raisins, almonds, cashews, peanuts

Combine all of the ingredients except the vegetables in a snaplock bag at home. In camp, boil three cups of water. Add the rice mixture, chopped onion and carrot and simmer for 15 minutes. Stir frequently.



Pasta with tomato vegetable sauce

tomato paste (sachet or tube)
fresh carrot, zucchini, onion, mushrooms, garlic chopped in camp, or dried variety
pepper, oregano, basil
pasta
parmesan cheese

Chop all of the vegetables. Add the tomato paste and herbs and simmer until soft. Boil three cups of water in another pot and boil the pasta for 10 minutes. Combine with the sauce. Sprinkle with cheese.



Damper

1 cup flour
1 tblspn butter
½ cup milk

Rub together the butter and flour. Mix in the milk, then form a dough. Use a flat surface to knead the dough for several minutes. Add extra flour if it is too sticky, then wrap in foil if cooking in the fire or place in a pot and cook over low heat for 30–40 minutes. Alternatively, wrap around a stick like a rope and hold over fire. Try adding dried fruit and nuts, honey, cheese, onion and so on to achieve the taste you want.

Table 10.1: Sample menu for a three-day bushwalking or canoeing expedition

Meal	Day one	Day two	Day three
Breakfast	at home	porridge or Weetbix with warmed powdered milk small container fruit muffins with butter, vegemite or honey tea, coffee or Milo	porridge or other cereal container of fruit baked beans or spaghetti muffins tea, coffee or Milo
Lunch	prepacked sandwich apple muesli bar fruit drink	pita bread with cheese, chutney, tinned fish or salami orange or apple hot or cold drink	dry biscuits cheese, chutney, salami orange or apple hot or cold drink
Dinner	Cup-a-soup pasta tomato paste chopped carrot, onion, zucchini tin of tuna fruit cake and custard	Cup-a-soup satay rice with peanut butter, onion, potato, carrot, sultanas, dried apricots small tin pudding	hopefully you will be safe at home
Snacks	scroggin mixture of dried fruit, chocolate and nuts	scroggin mixture apple or orange	scroggin mixture apple or orange
Emergency	two rice or pasta packs two-minute noodles rolled oats or Weetbix chocolate		

Resources for safe participation

The choices made about the clothing and equipment taken on an expedition can save lives. Equipment needs vary depending on the expedition undertaken. In general, outdoor recreational activities demand lightweight, durable equipment and clothing that protect you from environmental conditions. It is important that the loads carried are manageable, therefore all equipment needs to be carefully chosen. Quality equipment is often expensive; however, it will generally last a lot longer and be more comfortable than cheap equipment. It is important to be selective when packing and consider what you really need. It is vitally important to minimise weight and it is worth remembering that you can still enjoy yourself and meet the goals of the expedition, without a lot of unnecessary gear.

Legal and administrative requirements

Expeditions may involve travel on private land or in national parks. If this is the case, participants need to consider the following:

- booking of camp sites
- permission from the land owner to drive, camp, ski, walk, paddle or cycle on their land
- entry permits
- attention to detail; for example, leaving camp sites clean, leaving all gates as you find them, respecting privacy and avoiding disturbing domestic plants and animals.

If a leader is acting in an official capacity (for example, if they are being paid by the participants) or has a duty of care over the group, such as a teacher with students, they are accountable for the planning and management of the trip. In this situation, the leader could also be held legally responsible if something went wrong on the expedition and they were found to be negligent. Most often negligence involves poor planning and decision making and can be avoided by having a leader who is qualified or experienced in the activity. The leader should:

- conscientiously check all equipment, routes and weather
- know the capabilities of the party
- have first aid qualifications
- be aware of medical conditions in the group
- ensure that all required permissions have been sought through liaison with appropriate authorities and trip intention forms have been lodged. Included here will be:
  - permission notes if taking school students or people under the age of 18
  - risk assessment forms; that is, forms detailing areas of possible risk and measures that will be adopted should problems occur (schools)
  - trip detail forms providing information about where the group is going, how long they expect to be away, mobile phone contact numbers, modes of transport and other relevant information.



INQUIRY

Expedition equipment

The growth in manufacture and sales of outdoor equipment has boomed in the last decade or two. Some of the early adventurers would be amazed to see the huge range of available gear on the market today. Research an expedition from the past and provide details of the equipment used.

Provided that it is cared for properly, good quality equipment is a good investment for the years to come and may even last a lifetime. All equipment should be stored in a cool, dry location and completely dried off after use. Synthetic clothing will melt and leather boots may crack if placed close to direct sources of heat. Mud should be removed from packs and tents.

Essential equipment for bushwalking expeditions includes the following:

- comfortable, well-fitting rucksack
- waterproof pack liner (a strong garbage bag is suitable)
- warm sleeping bag that is compact and light to carry
- sleeping mat (foam mat is suitable, or 'therm-a-rest' for a really comfortable sleep!)
- lightweight tent with sewn-in floor and waterproof fly
- lightweight cooking and eating utensils
- lightweight cooking stove (metho burning trangia is ideal) and fuel
- torch
- plastic bags for rubbish
- toilet paper and trowel for burying faeces
- fire lighting kit (candle, matches)
- map, compass, whistle, signalling mirror, pencil and notepad
- first aid supplies
- general purpose repair kit (shoelace, cotton and strong needle, waterproof tape)
- food, including at least one day's emergency rations

- sunscreen and lip balm
- camera
- water (each person will use 1.5 to four litres per day depending on the weather conditions).

A clothing check list should include:

- wet weather jacket
- waterproof overpants (these may be needed for wet weather or snow expeditions)
- warm jacket or jumper that is not bulky
- beanie and gloves, as well as a sun hat and sunscreen
- trackpants
- thermal underwear. These are made from synthetic material that is designed to dry quickly and keep you warm, even when wet.
- shorts, T-shirts to walk in
- underwear
- swimmers
- thick socks
- lightweight shoes for around camp (optional)
- comfortable boots. The style of boots chosen largely depends on personal choice and the location of the walk. For many areas, lightweight canvas sandshoes or soft leather boots are sufficient. However, in snow, wet or muddy terrain, full leather boots that enclose the ankle are necessary. The addition of gaiters that attach onto the boots and protect the lower leg can be beneficial in these conditions.

The choice of clothing on an expedition needs to be carefully considered, with proposed weather conditions in mind. The weather in New South Wales tends to be unpredictable and participants in outdoor activities need to be prepared for sudden changes in weather. In order to adjust to weather conditions, it is advisable to wear layers of clothing that can be easily shed or added. A wet weather jacket is always advisable and in cold weather it is best to wear at least three layers of clothing rather than one bulky layer, along with beanie, gloves and warm socks. In this way, your body heat is trapped within the layers. In warm weather, light coloured clothing needs to be worn to reflect the heat, along with hats, sunglasses and sunscreen.



Figure 10.10: Protective clothing suitable for a bushwalking expedition

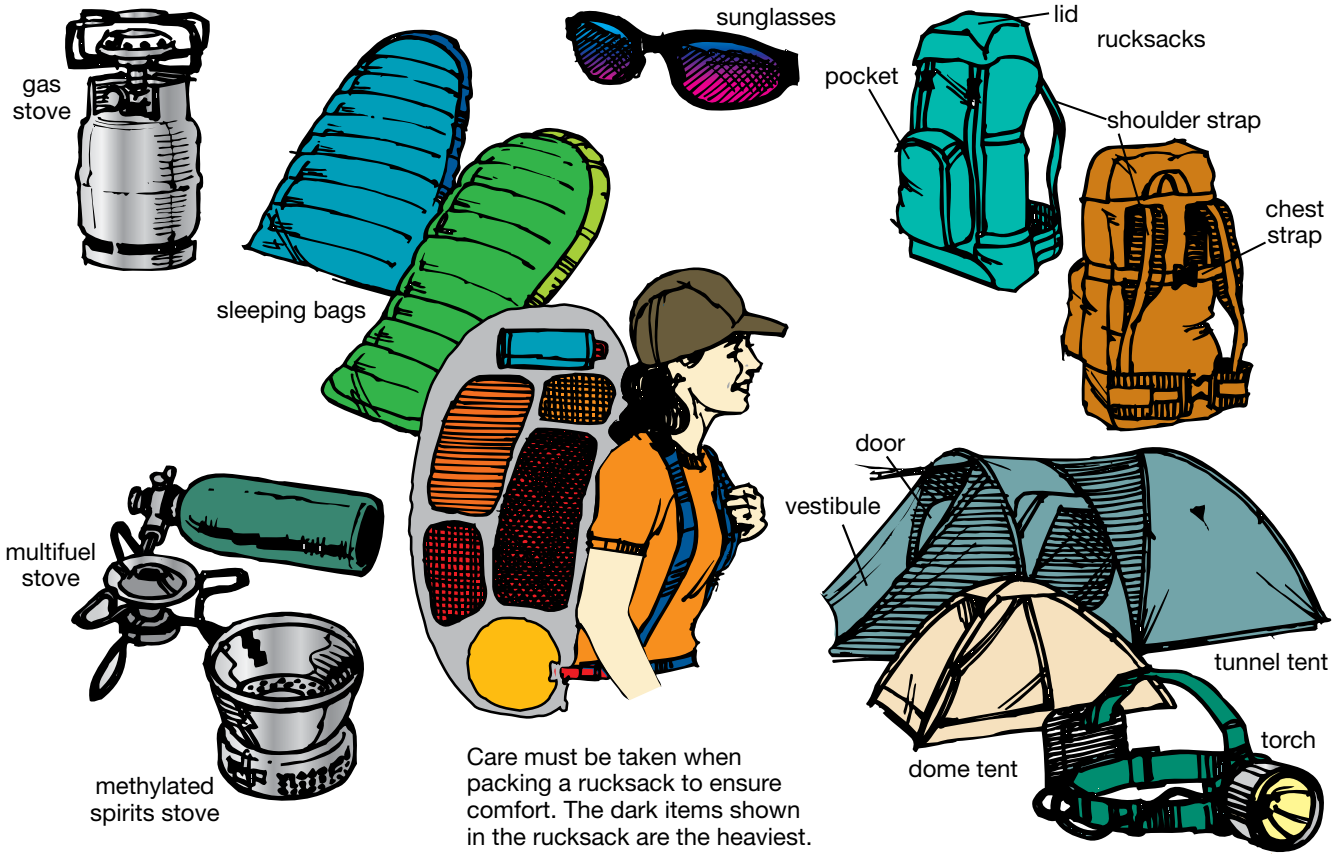


Figure 10.11: Common camping equipment

Canoeing safety check list

Canoe equipment

- ❒ Canoe in good condition with flotation and end loops
- ❒ Paddle/s to suit canoe/kayak
- ❒ Spare paddle
- ❒ Repair kits (wide tape)
- ❒ Waterproof bags/drums
- ❒ Ropes (to secure drums, etc.)
- ❒ Leader should carry rescue equipment (rope, karabiners, knife, prusiks, throw bag)

Personal canoeing equipment

- ❒ Buoyancy vest
- ❒ Wetsuit (optional)
- ❒ Spray jacket
- ❒ Helmet (white water)
- ❒ Spray skirt (white water kayaking)
- ❒ Shorts, swimmers
- ❒ Old sandshoes/neoprene boots
- ❒ Sunglasses with strap
- ❒ Thermal top/woollen jumper
- ❒ Cap/straw hat

Camp clothing

- ❒ T-shirt
- ❒ Flannelette shirt
- ❒ Long sleeved shirt (sun protection)
- ❒ Tracksuit pants
- ❒ Thermal underwear
- ❒ Underwear
- ❒ Waterproof jacket (can use spray jacket)
- ❒ Beanie

Camping equipment (plan this with your paddling partner)

- ❒ Tent
- ❒ Sleeping bag and mat
- ❒ Water bottle/bladders (four litres per day per person)
- ❒ Fire lighting kit
- ❒ Map, compass, pencil
- ❒ Torch/candles
- ❒ Billy/s
- ❒ Trangia
- ❒ Cup, knife, spoon, plastic bowl
- ❒ Toilet paper, trowel
- ❒ First aid kit
- ❒ Toothbrush and paste, small travel bag
- ❒ Personal toiletry items (small and compact)
- ❒ Insect repellent
- ❒ Fishing gear (optional)
- ❒ Camera (optional)

Remember: keep gear light and compact

Figure 10.12: An example of a comprehensive equipment list distributed to participants by group leaders

CASE STUDY

Drinking too much water probably killed bushwalker, coroner declares

A 30-YEAR-OLD Victorian man who died while bushwalking in north-west Tasmania last year most likely died from excessive consumption of water, a coroner has found.

The findings have come with a strong warning about the dangers of drinking too much water while exercising, and calls for better education about how much water the human body can safely take in.

Coroner Michael Brett said that Jonathan Paul Dent died on or about April 19 last year while bushwalking in the Dial Ranges, near Devonport.

In handing down his findings, Mr Brett said Mr Dent had most likely died from exercise-related hyponatremia, 'which itself resulted from excessive consumption of water during the course of the prolonged exertion of the bushwalk'.

After an initial autopsy failed to determine Mr Dent's cause of death, Mr Brett arranged for the evidence to be reviewed by Professor Anthony Bell, whose report noted that the autopsy showed a swollen brain with signs of herniation, which was consistent with excess water consumption.

According to Mr Brett, Mr Dent had set out for a bushwalk alone about 9.30am on April 19 from Wings Wildlife Park with the intention of following the track to Foggs Flat, a walk of about four hours.

Mr Brett said Mr Dent appeared to be in good health and was well equipped for the walk — he carried a mobile phone and was appropriately dressed for the conditions.

During the course of the day, Mr Dent's wife, Katherine, had several telephone calls from him indicating that he was lost but was still hopeful of making his way to a planned meeting spot with her later in the day.

By about 4pm he called his wife saying he was tired and dehydrated.

Further conversations indicated that he was lying down and his breathing was heavy and he was coughing, Mr Brett said.

By 8.25pm, Mrs Dent reported to Ulverstone Police that her husband was missing.

Mr Dent's body was found at 1.10pm the next day on a track just north of Foggs Flat.

Mr Brett said the case highlighted two specific concerns, including a general perception, particularly among people involved in athletic activities, 'that one should drink as much as possible and avoid becoming dehydrated during prolonged strenuous exercise'.

He said that there was a need for greater education in relation to the danger associated with excessive consumption of fluid during exercise.

Mr Brett also highlighted the issue of bushwalking alone.

'Had Mr Dent been in company, whilst it cannot be said that he would not have suffered the condition that led to his death, I suspect that he would have been in a substantially better condition to cope with the disorientation and fear that arose from being lost,' he said.

Source: The Examiner, Launceston, 18 September 2012.



INQUIRY

Water: getting the right amount

Read the case study above and answer the following questions.

1. Why is it important to carry sufficient water when going bushwalking?
2. Why can it be dangerous to drink 'as much water as possible'?
3. While it is very important to consume water while bushwalking, how do we get a balanced intake?
4. Use the **Water intoxication** weblinks in your eBookPLUS to find out more about what happens when we drink too much water and how we can better establish the right amount.

eBookplus

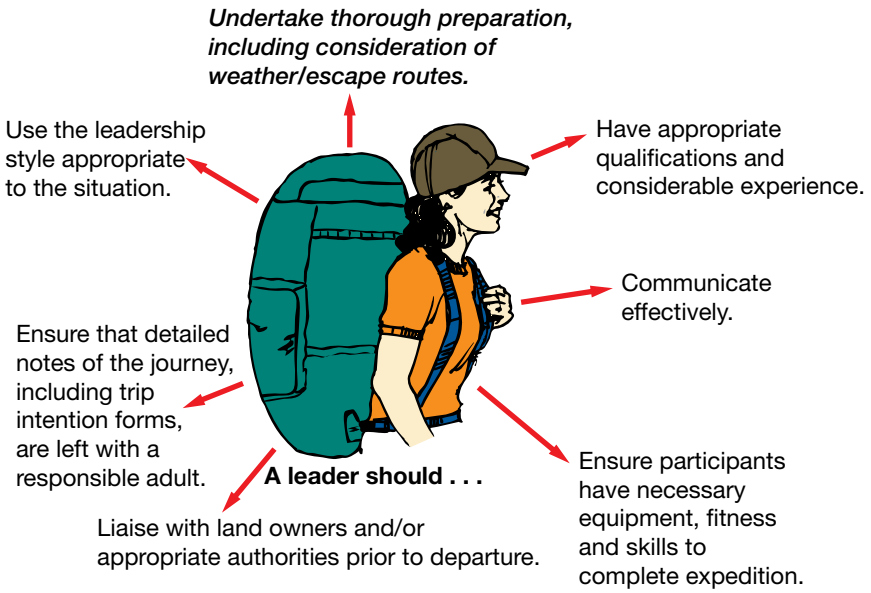


Figure 10.13: A leader has a duty of care over the group.

INQUIRY

Guidelines for bushwalking in schools

eBookplus

Investigate the New South Wales Department of Education and Training's guidelines for the safe conduct of sport and physical education in schools with reference to bushwalking. Use the **Bushwalking safety** weblink in your eBookPLUS.

1. In what areas do you need instruction before you participate in an overnight hike?
2. What is a risk assessment and why is it necessary?
3. What equipment do you require for an extended walk?
4. What is the maximum weight of a loaded pack to be carried by an individual on an extended walk by school students? Why do you think the Department of Education and Training has made this recommendation?
5. What additional safety considerations can you identify in this document? Discuss these with the class.

CAMP SITE SELECTION

It is worthwhile spending time in planning and searching for a good camp site on an expedition. If the weather becomes unfavourable, the group could end up staying longer than expected. Effective planning is essential to ensure that groups leave enough time to set up camp in the daylight. A comfortable camp can increase the morale of any group and is important for group dynamics. Most often it is difficult to find a spot that encompasses all the points mentioned below. Sometimes compromise is needed.

Geographic, environmental and climatic considerations for establishing a camp site

Consider the following points when choosing the 'perfect spot' for your camp. Also consult the bushwalkers' code (see pages 352–4) to ensure that your camp site has minimal impact on the natural environment.

Water

- Is there adequate water nearby?
- Is the site at least four metres above the river bank in case of heavy rain? Some rivers can rise much more than this and rapidly — look for signs of debris in trees. It is also worth remembering that you may not get rain where you are camping, but if it is raining higher up in the catchment area, unexpected flooding can occur.

Site

- Ensure that the ground is flat and free from sticks, stones, animal nests or burrows and is not in a drainage area. Also be careful of camping under trees with dead limbs that may fall.
- Is there a fairly open area with interesting views? Is the area slightly elevated? Does the site have grass or sand — clay will turn to mud during rain! Old water channels should be avoided.

Fires

- Are there fire bans in operation? If not, is wood plentiful?
- Fires are not permitted in many areas that are sensitive; for example, alpine regions or in heavily used areas. Potentially they can impact on the area by causing significant disturbance to the natural ecosystem.
- Is an existing fireplace available? (See notes in the bushwalkers' code, page 353, for more information about fire management.)

Toilet facilities

- Are there toilet facilities? If not, are there suitably private places for people to use?
- Can you successfully set up a group latrine?
- Position the toilet well away from the water supply and down wind from camp. Human excrement can pollute rivers and spread disease. (See notes in the bushwalkers' code, page 353, for guidelines on managing human excrement.)

Camp site waste disposal

- Carry out everything that is carried in. This is a simple rule that is easily obeyed. (See notes in the bushwalkers' code, page 353, for more information.)
- Never be too proud to pick up other people's rubbish. It improves the area, teaches others and helps you to care for the environment.

Privacy and shelter

- Is the area secluded? Many people seek a wilderness experience and are unhappy if other groups are close by.
- Does the site provide shelter from prevailing winds? Will you get sun or shade? In winter it can be important to get morning sun to get the group going and dry out tents, but in summer some afternoon shade is advisable.
- In winter, mist and fog often form over water. Therefore, it may be advisable to camp higher up.

Hazards

- Are there swampy areas that may attract mosquitoes?
- Are there any potential hazards like cliffs, dead trees, falling rocks and mine shafts?



INQUIRY

Camping safety



Use the information above and the **Camping safety** weblinks in your eBookPLUS to create a PowerPoint or Prezi presentation that could be delivered to novice campers.



Figure 10.14: Check all regulations for national parks before camping and lighting fires.

Tree fall evaluation

While the risk of injury from falling trees and their branches is minimal during good weather, the potential for injury and even death increases considerably during heavy rain and wild winds. Tree fall evaluation should be included in the risk assessment made prior to conducting expeditions. Students and other



Figure 10.15: A safe camp site should eliminate the risk of tree fall.

campers should be given training in safe camp site selection strategies prior to leaving and choose established camp sites where possible. Tents should ideally be pitched in open spaces, well away from large trees and overhanging branches that can snap anytime, particularly in strong winds.



INQUIRY

Planning for hazards

1. In 2005, a 16-year-old schoolgirl on a school camp was crushed by a tree while she slept during a storm. What features would you look for when making a camp site selection that might enhance comfort and safety?
2. How might you be more aware of changing climatic conditions?
3. What prior planning skills might help you avoid dangers associated with sudden weather changes?



CONSERVATION SKILLS

All campers have a responsibility to have minimal impact on the environment. Participants need knowledge and skills in relation to waste management, erosion control, protecting flora and fauna and managing fires. Waste in the form of human excrement and rubbish from food packaging is potentially disastrous for the natural environment. Everything that is carried in, must be taken out. If you find rubbish left by others, clean it up as you go. For large amounts, report it to authorities such as the National Parks and Wildlife Service. Before leaving your camp site ensure that all rubbish is cleaned up, toilet pits are filled in and fires are fully extinguished. In some countries, camp fires are banned and faeces must be carried out in plastic bags.

SNAPSHOT

The bushwalkers' code

Be self-reliant

- Enjoy the natural landscape as it is, on nature's terms. Carry with you the things you need for your comfort and safety.
- For shelter carry a lightweight tent or fly, or use a cave or rock overhang. Avoid huts except when weather conditions are really bad.

Tread lightly

- Keep walking parties small; four to six people is ideal.
- Avoid popular areas in holiday periods when camp sites are crowded.
- Use existing tracks; don't create new ones. On zig-zag paths, don't cut corners as this creates unsightly damage that leads to erosion.
- In trackless country, spread your party out; don't walk in one another's footsteps. Avoid easily damaged places such as peat bogs, cushion moss, swamps and fragile rock formations.
- Wade through waterlogged sections of tracks; don't create a skein of new tracks around them.
- Except in really rough terrain, wear lightweight, soft-soled walking shoes or joggers rather than heavy boots.
- Become proficient at bush navigation. Do not build cairns, blaze trees, place tags, break off twigs, or tie knots in clumps of grass to mark your route. If you need to do this you are lacking in bush navigation skills.

Watch your safety

- Know what to do in emergencies. Rescue operations often cause serious damage, so take care to avoid the need for rescue.
- Acquire knowledge of first aid so you know how to handle illness and injuries.
- Carry clothing and equipment to suit the worst possible conditions you are likely to encounter.
- Carry a mobile phone if you want to, but use it only for summoning aid in an emergency.

Pack it in, pack it out

- Don't carry glass bottles and jars, cans, drink cartons lined with aluminium foil and excess packaging. If you can't resist carrying such things, don't leave them in the bush. Remember, if you carry a full container in, you can carry the empty one out.
- Remove all your rubbish including food scraps, paper, plastic, aluminium foil and empty containers. Don't burn or bury rubbish. Burning creates pollution and buried rubbish may be dug up and scattered by animals. Digging also disturbs the soil, causing erosion and encouraging weeds.
- Carry a plastic bag for your rubbish. If you find litter left by irresponsible people along the track or around a camp site, please remove it.

Always remember

- Fire doesn't destroy aluminium foil and plastics release toxic gases when burnt. Carry foil and plastics out in your pack with all your other rubbish, including food scraps.

Be hygienic

- Ensure you are at least 50 metres from camp sites, streams and lakes, when going to the toilet. Wait until you get out of sensitive areas such as caves and canyons before defecating or urinating.
- Bury all faeces and toilet paper at least 15 centimetres deep. In snow, dig through the snow first, then dig a hole in the ground.
- Carry out things that won't easily decompose, such as used tampons, sanitary pads and condoms.
- Carry a lightweight plastic trowel or a large aluminium tent peg to make digging easier.

Keep water pure

- Wash well back from the edge of lakes and streams so waste water falls on soil where it will be absorbed.
- Prevent soap, detergent or toothpaste from getting into natural water systems. Similarly, when washing cooking utensils, don't use detergent and don't let oils and food scraps get into streams or lakes.
- Always swim downstream from where you draw drinking water.

Be *very* careful with fire

- Have a fire only when you are absolutely certain you can light it with safety. A fuel stove is preferable for cooking and thermal clothing is better for warmth.
- Always use a fuel stove in places where even a tiny fire may cause permanent damage.
- Do not light fires in hot, summer conditions; dry windy weather; declared 'fuel stove only' areas; when there is a declared fire ban.

If you must light a camp fire, follow these rules

- In popular camp sites, light your fire on a bare patch left by previous fires. Don't light it on fresh ground.
- Light your fire on bare soil or sand, well away from stumps, logs, living plants and river stones (which may explode when heated).
- Definitely don't build a ring of stones as a fireplace.
- Sweep away all leaves, grass and other flammable material for at least two metres around your fireplace.
- Burn only dead wood that's fallen to the ground. Don't break limbs from trees or shrubs.
- Keep your fire small — remember, the bigger the fool, the bigger the fire.

Before you leave

- Douse your fire thoroughly with water, even if it appears to be already out. Don't try to smother a fire by covering it with soil or sand as the coals will continue to smoulder for days. Only water puts a fire out with certainty.
- Feel the ground under the coals. If it is too hot to touch, the fire is not out. Douse it some more.
- Scatter the cold charcoal and ashes well clear of your camp site, then rake soil and leaves over the spot where your fire was. You should aim to remove all trace of it.

Choose camp sites carefully

- Think twice about using a popular camp site to avoid overuse. If possible, vary your route slightly so you can find an alternative site in a less frequented area.
- Find an open space to erect your tent so it is unnecessary to clear vegetation. In difficult overgrown areas, trample undergrowth flat rather than pull plants out of the ground. A trampled spot soon recovers.
- Use a waterproof groundsheet or tent with a sewn-in floor and you won't have to worry about surface runoff in wet weather. Avoid the temptation to dig drains around your tent. This environmentally damaging practice is no longer acceptable.

(continued)

- If you have to remove branches or rocks to create a tent site, replace them before you leave.
- Leave your camp site pristine. After a few days it should be impossible to see where you were camped.

Protect plants and animals

- Try not to disturb wildlife. Remember, you are the trespasser.
- Give snakes a wide berth and leave them alone. They have more right to be there than you do.
- Watch where you put your feet. Walk around delicate plants.
- Don't feed birds and animals around camp sites or they may become pests. Unnatural food can be harmful to many species.

Respect Aboriginal heritage

- Many places have spiritual or cultural significance for Aborigines. Treat such places with consideration and respect.
- Obtain permission from traditional landowners or the relevant land manager to visit sensitive areas.
- Leave Aboriginal relics as you find them. Don't touch paintings or rock engravings.

Be courteous to others

- The sound of radios, CD players, mobile phones and similar electronic devices is out of place in the natural environment.
- Ensure your behaviour and activities don't disturb or offend others.
- Camp as far away from other groups as conditions allow. Don't use another group's camp fire without permission.
- Leave gates and slip rails as you find them. When you open a gate, make sure the last person through knows it has to be closed.
- Respect the rights of landholders and land managers. Don't enter private property without permission. In national parks, abide by plans of management and encourage others to do so too.

When in camp

- Do your share of getting firewood and water. When breaking camp, help to remove the remains of your fire (if you had one) and clean up the site.
- Don't step over other people's uncovered food.

Minimal impact bushwalking means do nothing and leave nothing that shows where you have been.

Source: Extracts from The Bushwalkers' Code, © Confederation of Bushwalking Clubs, New South Wales, Inc. pp. 12–19. Reproduced with permission — www.bushwalking.org.au.

'Leave no trace' camping

Participation in outdoor recreational activities must be accompanied by a respect for the natural environment and a willingness to interact with nature with minimal impact. Individuals who participate in activities in the natural environment have a responsibility to ensure that they don't damage, destroy or change it. Many of our native plant and animal species are facing threat and extinction from diminishing habitats and we must be vigilant in minimising disturbance. For example, when setting up a camp site, a clear area should be chosen rather than clearing vegetation. When rock climbing, vegetation or animal and bird nests should not be destroyed to make it easier to complete the climb. Rubbish should be removed after camping — the only things that should remain behind are footprints!

Minimal impact practices

Extended bushwalks offer opportunities to explore remote wilderness locations with your 'house on your back'. In order to enjoy the wilderness experience and ensure the enjoyment of others who use the area after you, it is vital that attention is paid to conservation issues to minimise the impact of your

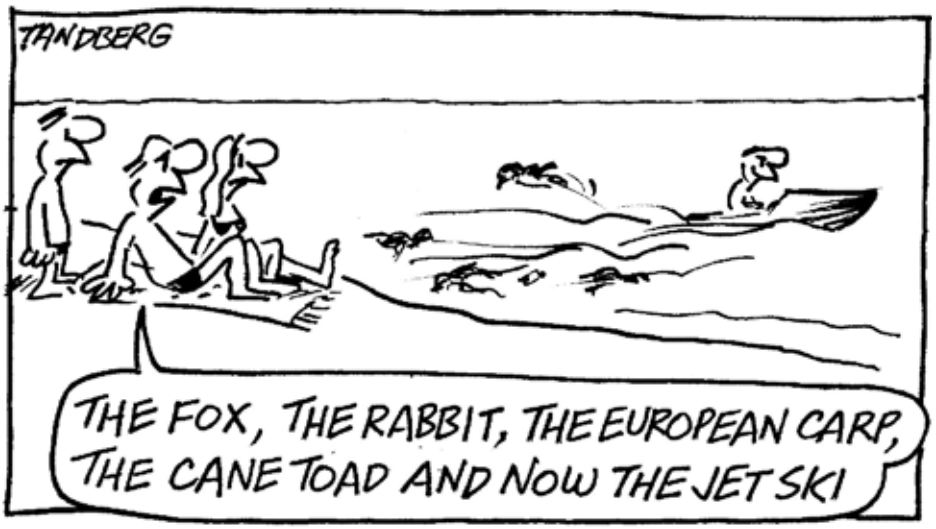


Figure 10.16: Some outdoor recreational activities are more conducive to conservation than others!

party on the area. Particular attention needs to be paid to camp fire control, waste disposal and disturbances to vegetation and flora.

Ethical issues

People who participate in outdoor recreational activities have a wide range of attitudes and values towards conservation. They all may feel that they are conserving and protecting the environment, but in different ways. For example, some people believe that camp fires are a waste of valuable timber resources and scar the landscape. Therefore, they always carry portable stoves. Other people see benefits in using a renewable resource such as timber for warmth and cooking rather than using fuel. They may enjoy the atmosphere of the camp fire. Some activities are more conducive to conservation than others. For instance, canoeing or bushwalking could be seen to be more environmentally friendly than water skiing or jet skiing, which impact on the environment through noise and increased wave action on the banks. The choice of activity generally reflects the values and attitudes of the participants in relation to the environment.

In all outdoor recreational activities, people have a responsibility to 'tread lightly' and ensure that their activities have a minimal impact on the environment. Consideration for waste disposal, fire hazards, biological disturbances and erosion are responsibilities of participants in outdoor activities. It is essential that these things are treated responsibly if we are to conserve and preserve our natural environments for future generations to enjoy.

APPLICATION

Ethical issues

Conduct a class debate on one of the following topics that relate to conservation, ethical issues and the environment.

(a) Horse riding and four-wheel driving have no place in national parks.
(b) Our national parks should be protected by permit systems and a fee structure to limit the number of visitors and help preserve the parks.
(c) Speed boats, jet skis and trail bikes should be restricted to less fragile areas to minimise harm to the natural environment from erosion and noise pollution.
(d) Alpine resorts, such as Thredbo and Perisher, should have been built below the snow line, rather than in the main range, to minimise disturbance to vegetation and pollution in waterways.

Selling adventure

I recently returned to [a] cliff after many years of absence only to be firstly angered then dismayed at the transformation of what had been a wilderness climbing area. At one end of the cliff is a cemented series of benches and retaining walls. At the other, a picnic bench is set in the middle of a large cleared area which had been cut out of the scrub with what I deduced to be a whippersnipper. The same tool had been used to slash new tracks along the clifftop, which is now littered with bolts and other ironmongery used in commercial abseiling.

At one point the clifftop is totally denuded of vegetation, as the result of intensive use. At the same site, in what I regard as an act of wilful vandalism rarely encountered in the world of outdoor recreation, ironstand bands . . . had been smashed off and other sharp edges cemented over, presumably in the attempt to reduce the wear and tear on abseil ropes . . . I then discovered that the character of classic climbs had been fundamentally transformed by ring bolts and belay chains installed to facilitate the techniques of commerical rockclimbing operations . . .

Through the selling of adventure, many more people now have access to the experiences and skills of outdoor activities. In many ways, this is a welcome development, because it makes those experiences available to anybody who chooses to use their money in this way. By introducing larger numbers of people to new ways of relating to the natural world, a wider environmental appreciation may be fostered.

Source: OutThere, issue 6, pp. 86–8.

INQUIRY

Impacts of recreational activities

1. Read the snapshot titled 'Selling adventure'. Identify the positive and negative aspects of commercial adventure operations in our wilderness areas.
2. Discuss ways in which commercial adventure companies could minimise their impact on natural environments (for example, group sizes, toilet practices).
3. Contact commercial adventure companies in your local area, or find them on the internet. Ask them what measures they take to minimise the impact of tour groups on the environment.

INQUIRY

Camp site planning and behaviour

Examine the following statement: 'Take nothing but photos and leave nothing but footprints. Leave the area cleaner than you found it.' Critically examine this statement in light of the photograph below.



Figure 10.17: Camp site behaviour should include respect for the environment and consideration for other users.

NAVIGATIONAL SKILLS

The ability to navigate is an essential bushcraft skill. Many people seek wilderness areas without roads and tracks and therefore need to have the skills to find their way using a map and compass. Skills of navigation include observation, concentration and knowledge of map and compass work. They are best developed through practice. The use of satellite navigational equipment (global positioning systems or GPS) is increasing. However, the ability to read a map and use a compass is still essential.

Check list for navigation

To successfully find your way in the bush, you should learn to:

- understand map scales and how to measure distance
- recognise symbols used on topographic maps
- understand how contour lines represent the height and shape of the land
- be able to calculate grid reference bearings to give location
- orientate your map to match the real world
- recognise and understand true north, magnetic north and grid north
- know how to take a bearing
- understand how to take magnetic variation into consideration when calculating bearings.

The following equipment is needed for navigation:

- compass
- map (in a waterproof bag or specially designed map cover)
- whistle
- notepad and pencil.

eBook*plus*

eLessons

Introducing topographic maps
Searchlight ID: **eles-2265**
Reading topographic maps at an advanced level
Searchlight ID: **eles-2268**

Map reading

Maps are models or pictorial representations of the Earth's surface. They are made using information from photographs taken of the Earth's surface from aircraft flying overhead. Features on the Earth's surface are represented by symbols on the map.

Maps used in outdoor recreation are topographic maps that have standard symbols. They contain information about:

- the natural landscape, such as hills, rivers, forests and swamps
- the artificial landscape or constructed environment, including towns, roads, railways and bridges.

Scale is the ratio between the distance measured on a map and the actual distance measured on the Earth's surface.

Scale is the ratio between the distance measured on a map and the actual distance measured on the Earth's surface. Topographic maps generally state scale as a line scale as well as a representative fraction or ratio. The line scale is a numbered line showing how many kilometres are represented by a centimetre on the map.

Most topographic maps used for outdoor recreation have a scale of 1:25 000, which means that one centimetre on the map is equal to 25 000 centimetres on the land. Two centimetres on the map is equal to 50 000 centimetres; therefore, four centimetres on the map represents one kilometre.

The map scale is used to measure distance. Smaller scale maps show less detail and may be used for a road map (1:100 000) or country map in an atlas (1:500 000).

APPLICATION

Using a topographic map

Examine the legend below that shows the symbols commonly found on a topographic map and what they represent.

1. Identify the symbols for (a) swamps, (b) cliffs and (c) areas of vegetation.
2. Identify the symbols for (a) sealed roads, (b) unsealed roads and (c) mines.

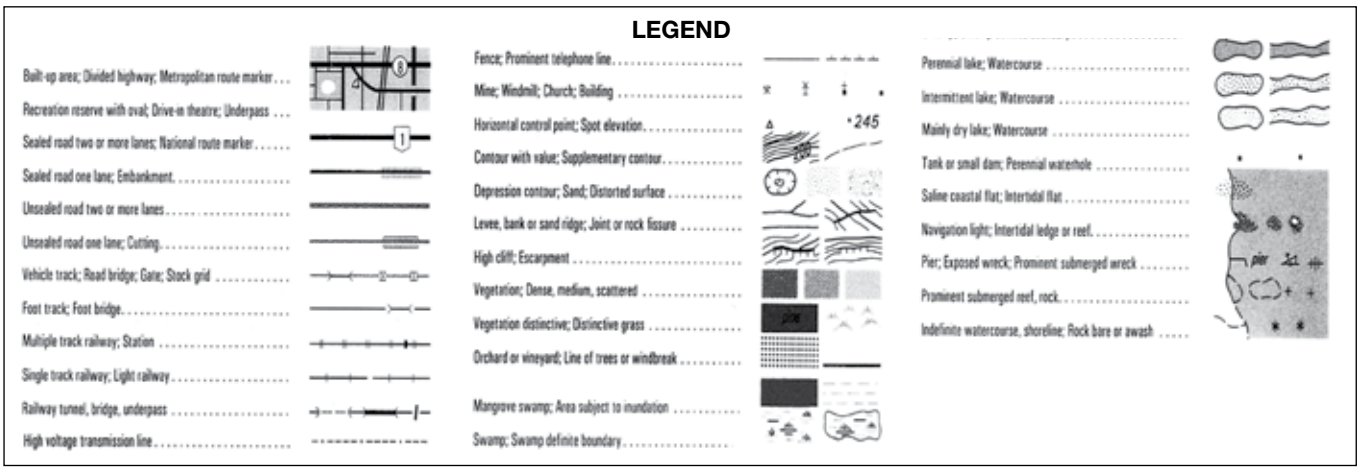


Figure 10.18: Legend from a topographic map

Contour lines join all places of equal height on a map, above sea level. They provide information about the shape, steepness and height of the land. When the lines are close together this means that height is gained (or lost) quickly and therefore the slope is steep. When contour lines are spaced further apart, then the land is gently sloping or even flat. Evenly spaced contours indicate uniform slopes.

eBookplus

eLesson
Using contour maps
Searchlight ID: **eles-2267**

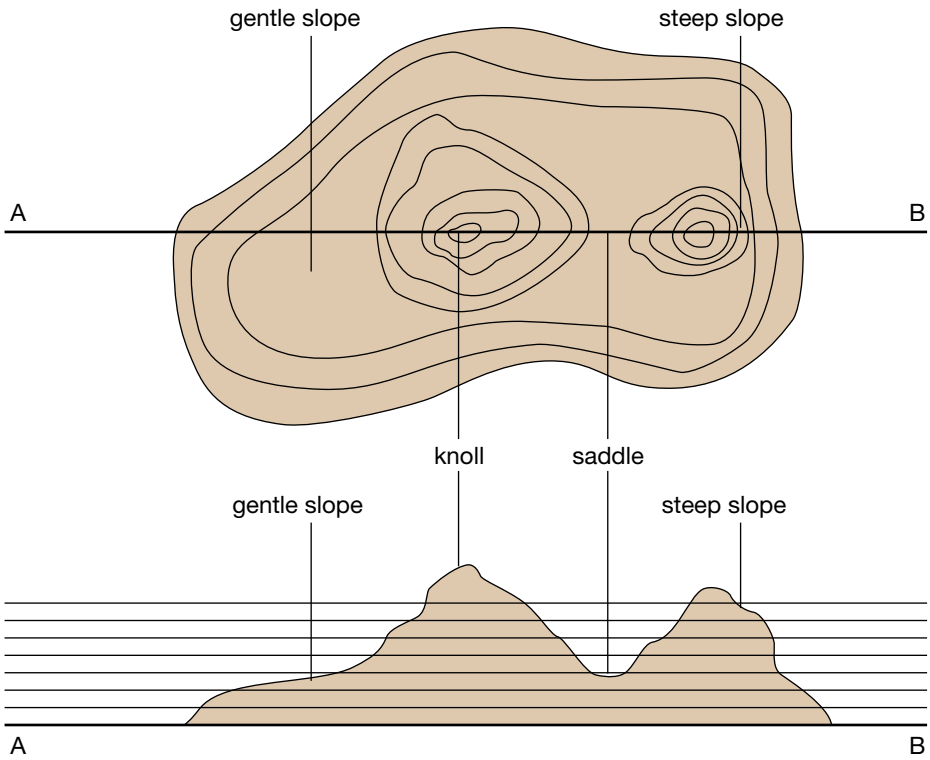
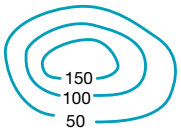
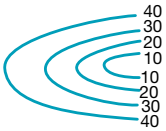
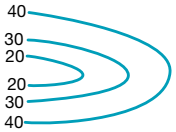
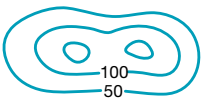
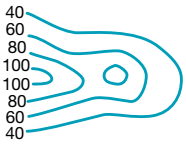
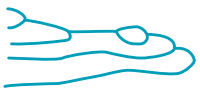
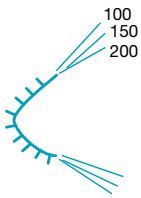
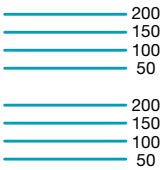


Figure 10.19: Diagram showing how contour lines represent the shape and height of the land

Figure 10.20: A range of land forms and contour representations

Name of land form	Contour pattern	Explanation of contour pattern	Side view	Explanation of land form	Sketch of land form
Round hill		Contours in a circle or oval shape		High, round area of land; not as big as a mountain	
Spur		Contours in a U or V shape that point away from high land		Area of high land that sticks out like a finger from the side of a mountain or hill	
Re-entrant		Contours in a U or V shape that point towards high land		Dip between two spurs; a small valley	
Two hilltops and a saddle		Two circle-shaped contours with a space between them		Two areas of high land with a shallow dip between them	
Knoll		A circle-shaped contour located on a spur		Low, knob-like hill located on a spur	
Cliff		Contours on top of or almost on top of each other		Almost vertical fall in the land	
Gorge		Contours go down very steeply then back up very steeply		Deep valley with steep sides	



Identifying land forms on a map

Match the following names of land forms to the correct diagram in figure 10.21 (you may need to refer to figure 10.20).

(a) Valley
(b) Hill or knoll
(c) Ridge
(d) Cliffs
(e) Spur
(f) Saddle

eBookplus

eLesson
Recognising land features
Searchlight ID: **eles-2266**

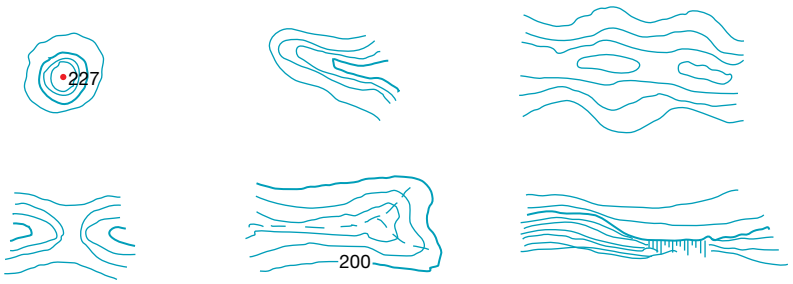


Figure 10.21

Grid bearings

Grid references are a quick and accurate method of locating places or features on a map. On a typical 1:25 000 topographic map, these vertical and horizontal lines are every four centimetres on the map and represent one kilometre on the land, making them useful for measuring approximate distance. However, the main function of grid references is for locating features.

APPLICATION

Locating features using grid bearings

1. Examine the map in figure 10.22, which illustrates how grid reference lines may be used to give a location. The location of X on this map would be 316 667. Each grid reference line is numbered and each square is divided into 10 imaginary squares. The top of a map is always north. The horizontal grid lines are therefore called northings because they increase in value to the north. The vertical grid lines increase in value to the east and are called eastings. The GR (grid reference) is always read from the bottom first (eastings), followed by the side readings (northings).
2. Give the grid bearing of the following features on the map in figure 10.22:
   (a) bridge
   (b) building
   (c) river junction.

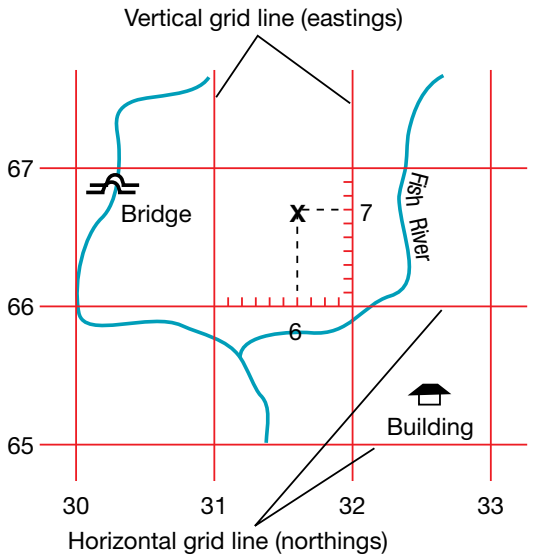


Figure 10.22: Sample map showing grid reference lines

Magnetic bearing

Using a compass to find magnetic north and true north

Magnetic north is in the direction of the North Pole and changes slightly every year. A compass needle points towards magnetic north.

True north is the direction of the North Pole.

Grid north is the top of the map. It is usually the same as true north.

Magnetic variation refers to the difference between true north and magnetic north. When navigating we need to take this difference into consideration.

A compass is a valuable navigational tool if it is used accurately. It can provide direction and assist in determining location. A compass can assist in navigation by providing the location of magnetic north. The compass needle always points to **magnetic north**, which is in the direction of the North Pole. It is a position that changes slightly every year. **True north** is the direction of the North Pole. The top of a map is always **grid north**. There is a slight variation between magnetic north and grid north, which is due to the fact that maps are flat, but the Earth's surface is curved. This variation between the two is known as the **magnetic variation**.

The position of magnetic north is constantly changing, although at a very slow rate, taking 20 years to move just one degree. However, this variation must be taken into consideration when using a map and compass to give accurate readings and enable a location to be found. In New South Wales, it is generally assumed that the amount of the variation is 11–12° unless the map is particularly old. It is worthwhile checking the information displayed in the map legend about magnetic variation.



Using a compass

1. Examine the diagram of the compass (figure 10.24) to identify the main components.

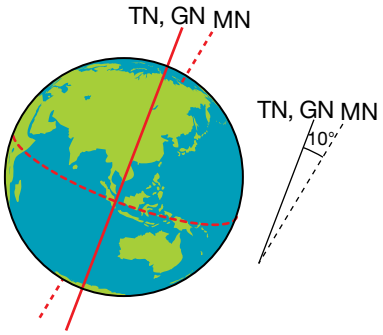


Figure 10.23: Diagram showing the difference between grid and magnetic north (MN). This difference is referred to as magnetic variation.

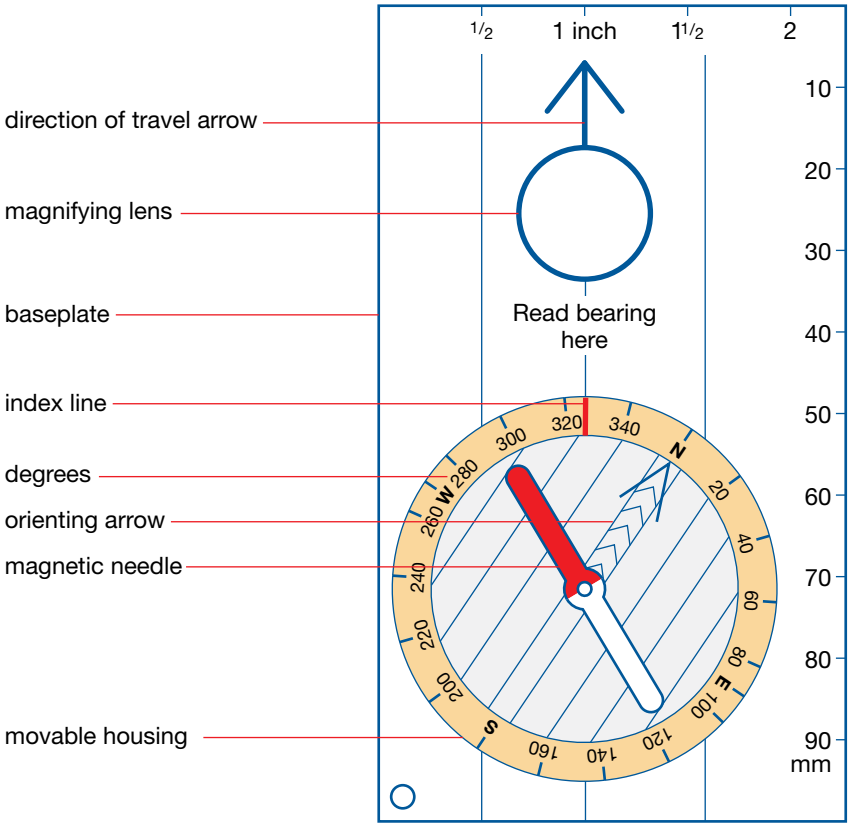


Figure 10.24: Components of a compass

Cardinal points on the compass are the major directional points; that is, north, south, east and west.

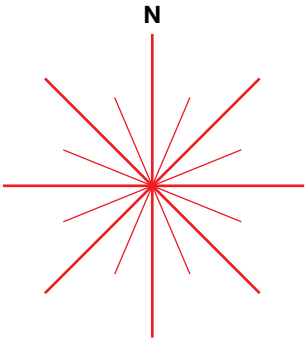


Figure 10.25: Cardinal points and their compass bearings

A **bearing** is the direction of travel measured as the angle from 0° (north) and recorded in degrees. For example, to travel south the bearing would be 180°.



2. To use the compass to find north:
   - hold the compass flat in your hand about waist height
   - the red end of the moving needle will always point to the north
   - align the direction of travel arrow on the top of the compass with the red end of the compass needle by turning the compass housing until the two (usually red) lines match up.
   - the bearing should be 0°. This indicates north.
3. Identify objects in your school grounds that are found in a northerly direction. Identify the compass bearing of other **cardinal points** on the compass.
4. Complete the following diagram showing the cardinal points and their compass bearings.
5. To use the compass to orientate the map:
   - lay the map out flat and place the compass on top of it, with the red end of the moving needle pointing to the direction of travel arrow (which is north 0°) and pointing towards the top of the map
   - rotate the map until the grid lines on the map are parallel with the lines on the compass housing. North on the compass should face the top of the map.
   - the map is now orientated and land forms should be able to be identified in the appropriate direction.

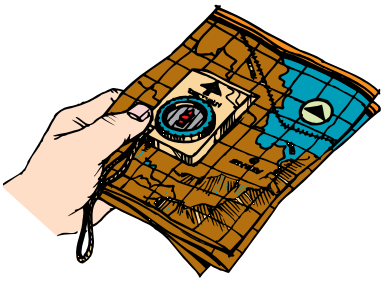


Figure 10.26: Using the compass to orientate the map to point north

Taking a bearing using the compass

In many situations, we can use only the map or only the compass to determine which direction to travel. However, for greater accuracy, it is best to use the two together. A compass can be used to calculate and follow **bearings**.

Taking a compass bearing

1. Practise taking bearings of objects in your school yard by following these instructions.
   - Hold the compass steady at chest level and point the direction of travel arrow at the object. The object in figure 10.27 is the bush.
   - Rotate the adjustable dial until the N on the compass housing lines up with the red end of the moving needle.



Figure 10.27: Taking a bearing from an object in the school yard

- Take the reading for the bearing from the direction of travel arrow. In figure 10.27 this would be 100°ESE.
- As you proceed towards the bush, you will be following the bearing of 100°.

2. Design an orienteering course for a partner or group to complete around your school grounds.

Considering magnetic variation when recording bearings

To check position in the field, a bearing can be taken from objects in the distance and then checked on the map to clarify where you are. However, whenever a bearing is calculated from the field and located on the map or calculated on the map and checked in the field, the magnetic variation must be considered to compensate for the difference between magnetic and grid north.

When converting a bearing from the field to the map, the magnetic variation must be added to the bearing. In New South Wales, this generally means that 11° is added.

When converting a bearing from the map to the field, the magnetic variation must be subtracted from the bearing. In New South Wales, subtract 11°.



Setting and following a course from a map

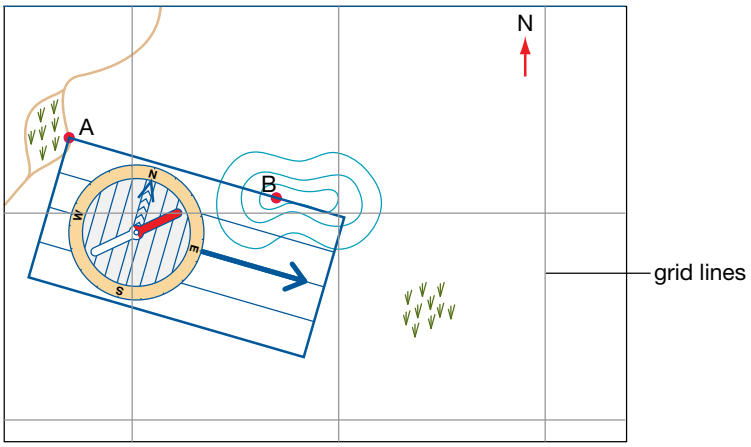


Figure 10.28

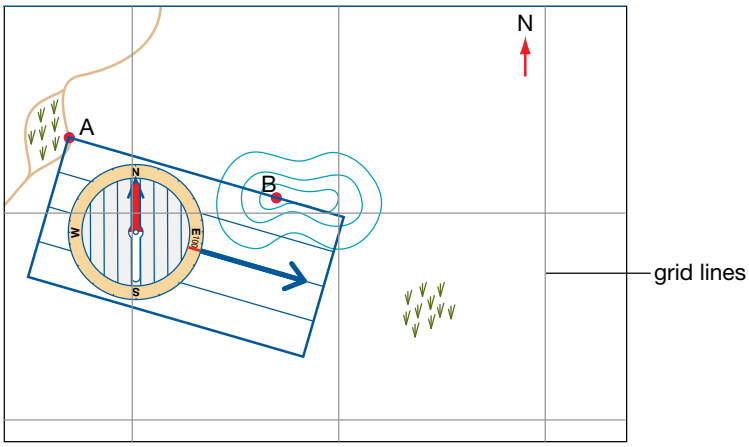


Figure 10.29

When contemplating a long bushwalk, the course needs to be planned before leaving. This can be done at home, selecting the course and using the compass to take bearings from the map. Consider the example in figures 10.28 and 10.29 in which the person is intending to walk from point A to point B.

Step 1

- Place the long end of the compass on the map to join A and B along the edge of the compass (figure 10.28).

Step 2

- Rotate the compass housing until the lines on the housing are parallel with the grid lines. Turn the map so that north on the compass needle is pointing in the same direction as north on the map.
- Read the bearing from the direction of travel arrow. The bearing in figure 10.29 is 100°.

Measuring distance

The scale on the map assists in the calculation of distance to be travelled. Most walking parties could expect to travel four to five kilometres per hour on flat, cleared ground. More time should be allowed for sloping and densely vegetated land, where it may take one hour to cover less than one kilometre. Naismith's rule (below) illustrates the relationship between distance travelled, time taken and terrain. It has been adapted to suit Australian conditions.

> *We all generally walk at a pretty consistent speed (usually between 3–6 kilometres per hour). This means that we will generally take between 10 and 20 minutes to walk a kilometre over flat terrain. For example, if we walk at 4 kilometres per hour, we will walk 4 kilometres in one hour, 1 kilometre in 15 minutes and 100 metres in 1.5 minutes.*
>
> *When we walk up hill, we generally slow down! To compensate for this, we can add time onto our estimate of the journey time. On most slopes, we can add 1 minute to our journey time, for every 10 metres of height gain. On very steep slopes, it may be more appropriate to add 1.5 mins per 10 metres of height gain or on lesser gradient, we may only add ½ a minute for each 10 metres of height gain. This formula is generally known as Naismith's Rule.*
>
> *Source:* Tollymore Mountain Centre website, www.tollymore.com.

Natural navigation

In addition to the map and compass, it is possible to navigate by using the sun, moon and stars to assess location and direction.

Navigation by the sun

In the southern hemisphere the sun always appears in the northern sky. In summer the position of the sun at midday will be much higher in the sky than in winter; however, it still appears in a northerly direction. Appreciating this, plus the fact that the sun always rises in the east and sets in the western sky, can give broad direction. The sun can also be used to determine direction if a shadow stick is used to map the movement during the day.

Navigation by the stars

The most useful stars for direction in the southern hemisphere are the Southern Cross and the Pointers.



Natural navigation using the stars

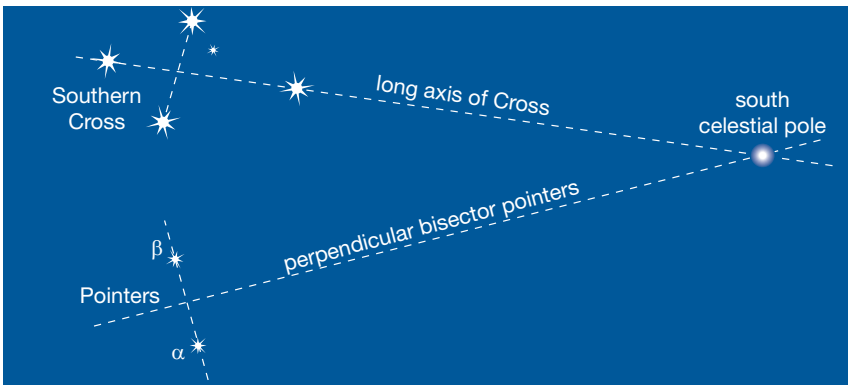


Figure 10.30: Using the Southern Cross and the Pointers to find south

To find south:

- draw a line between the long axis of the Southern Cross
- imagine a vertical line between the Pointers. Bisect the line and continue until the line meets an imaginary extension from the Pointers.
- at the point at which they meet, drop an imaginary line to the horizon, which indicates south.



EMERGENCY MANAGEMENT SKILLS

Many accidents and emergencies occur because of poor planning or inadequate knowledge and skills. Before leaving, refer to the following check list.

- Are all participants fit and healthy?
- Do any of the participants have medical conditions that may affect their performance?
- Has the group leader clearly communicated the nature and demands of the trip?
- Have equipment lists been issued and followed by all participants?
- Are food and water rations adequate and appropriate?
- Have weather forecasts been checked?
- Do participants have appropriate clothing and equipment to cope with predicted weather conditions?
- Have details including exact route, anticipated timing, transport arrangements and phone contact numbers been left with family, authorities including National Parks and Wildlife Service, or land owners?
- Are first aid supplies and knowledge adequate?

Wilderness first aid

Following are procedures for dealing with first aid emergencies.

- Ensure that you are not in danger of being hurt yourself.
- Assess the injury. Talk to the patient if possible and try to determine the extent of damage. Observe the injury and look for swelling, abnormal movement or redness.
- Treat the site of the injury — control bleeding, treat blisters, bandage the limb.
- Determine whether the injured person can continue. This depends upon the nature of the injury. The group may need to stop for a while or even set up camp for the night to allow the person to rest.
- If the injury is serious (for example, the person has a snakebite, is unconscious, has a broken limb or is suffering from severe exposure) and the person needs medical attention, then the group needs to alert authorities and monitor the patient's condition using DRSABCD (see chapter 7, pages 264–70).
- Depending on the situation, the remaining party may need to locate themselves near a clearing, in case a helicopter is needed. The patient needs to be made as comfortable as possible; for example, erect shelter and start a camp fire. Two experienced and responsible people should go to the nearest exit and seek help, making sure they know the exact location of the remaining party, including grid references and details about the patient's condition. At least one person, but preferably two people should remain with the injured person.

Thermoregulation

Hyperthermia and hypothermia are caused by adverse environmental conditions. Table 10.2 discusses the symptoms and treatment of hyperthermia and hypothermia.

Other first aid conditions

Table 10.3 discusses other first aid situations you may encounter in the wilderness. See chapter 7 for details on other first aid emergencies.

Table 10.2: Signs, symptoms and treatment of hyperthermia and hypothermia

Condition	Signs and symptoms	Treatment guidelines
Hyperthermia is a condition associated with raised body temperature that can result in death if it is not treated. It can be prevented by: • ensuring adequate hydration • planning routes where water sources are reliable • wearing a hat and light-coloured clothing • avoiding the heat of the day • resting in the shade. As long as the person keeps sweating, their body is cooling. Once sweating stops, the condition is very serious.	• flushed • headache • rapid, weak, irregular pulse • vomiting, blurred vision, dizziness • unconsciousness	If the victim is conscious • give them water to drink • rest them in the shade • remove unnecessary clothing • drape them with wet triangular bandages or light cotton clothing. If the victim is unconscious • DRSABCD • give nothing by mouth • continue the cooling process as described above. Medical help is needed as the person may suffer complications later.
Hypothermia is a condition associated with lowered body temperature that can result in death if it is not treated. Prevention is the key, so ensure appropriate clothing and equipment, sound knowledge and leadership. Layers of clothing with a waterproof coat and pants, as well as beanie and gloves are needed in cold environments. Wind increases cooling significantly. A combination of wind, rain and cold temperatures can be quickly fatal to the underprepared person. Exhaustion and lack of food can speed up the process. One of the most dangerous aspects of hypothermia is that a person may become very confused and become incapable of making decisions to treat the condition. It is vital to recognise signs early and treat the condition immediately.	Progression of the following: • sensation of chilliness • skin numbness • impairment of muscle function • shivering • stumbling • confusion • loss of speech • poor decision-making capacity. If untreated, the skin becomes blue and cold to touch, the pulse becomes weak and behaviour is irrational. Unconsciousness and death may result.	• stop at first sign of exposure • shelter from wind and rain • put on extra clothing (it may be necessary to remove wet clothing) • if recognised early, have something warm to eat or drink If the person does not warm themselves early using the above techniques, their core temperature continues to fall, which is very dangerous. The person needs to be warmed slowly by wrapping them in a survival blanket or sleeping bags, huddling together in the same sleeping bag or side-by-side, creating a shelter and adding warm, dry clothing. Monitor using DRSABCD. Do not place the person next to direct heat such as a fire or rub the body, as this increases heat at the skin's surface and removes it from the body core (brain, heart, lungs), which most needs the heat.

Table 10.3: Other conditions requiring first aid in the wilderness

Condition	Signs and symptoms	Treatment guidelines
Snakebite can generally be avoided by wearing shoes and socks and inspecting logs before lifting them. Most snakes move out of your path if you give them time and space to move. It is rare for them to be aggressive unless they are threatened.	• fang marks • pain at the area • headache, nausea, vomiting • unconsciousness	Apply a firm pressure bandage (see chapter 7, page 278) from the bite site all the way up the limb and back to the site, then use a splint to immobilise the limb. The person must lie still. Medical assistance is needed as quickly as possible.
Blisters can be avoided by wearing boots that fit properly and avoiding wrinkles in socks. Do not walk in wet socks. Cover areas with tape as soon as you notice blisters.	• burning, irritating feeling on pressure points, usually on toes and heels on the feet	• stop • clean and dry the area • use a sterilised needle to prick the blister along the bottom • apply disinfectant • cover with leucoplast tape • once in camp, uncover the blister and allow it to dry out

What to do when you are lost

If you become lost, follow the procedure below.

- If you become lost, STOP and do not panic.
- Find shelter and discuss the situation as a whole group.
- Examine maps carefully and consider retracing your steps back to the last known point on the route plan.
- If the group is not confident about retracing their steps
  - stay together
  - keep a smoky fire going to attract attention
  - conserve energy
  - set up shelter
  - listen for voices
  - stay where you are.
- Distress signals for search and rescue include three short whistle blasts, flashes of a signal mirror, smoke from fires and waving bright clothing.
- If conditions are bad and it is likely that anyone setting off will get into difficulty, the whole group should remain together. Part of effective planning is ensuring that others know your route and expected time of return. Provided you have stayed on the route, authorities should be able to locate you.



INQUIRY

Constructing an emergency shelter

eBookplus

1. Use the **Outdoor shelter** weblink in your eBookPLUS to learn how to construct a debris hut.
2. Discuss the importance of having shelter in emergency situations.



APPLICATION

Building a shelter

As a class, build a small emergency shelter using only materials you can find.

Bushfire procedures

Most injuries or loss of life in a bushfire are caused by ignorance and panic. The greatest danger is from radiated heat, hence it is vital to protect yourself by covering all of your skin. If caught out while bushwalking, remember the following points.

- Woollen clothing is best as synthetic materials may melt and bubble.
- Dampen your clothing (use wet mud if possible) and drink a lot of fluid.
- Breathing difficulties may be eased by using a damp cloth as a filter.
- If caught on a ridge line, it is best to stay low to the ground as the air there contains less smoke. Finding a hollow, wombat hole or cave can help.
- Fire generally burns fastest uphill. The fire will race up the slope, pause at the top and may be less intense as it passes over, so the leeward side of a ridge could be the safest.
- In a gully seek a stream, cave or damp bank, but avoid being halfway up a slope.
- If your clothing catches on fire, stop, drop and roll on the ground.
- Once the front has passed, danger remains from half-burnt logs, falling trees and frightened wildlife.
- If you are in your car, stay there. Cover yourself and lie on the floor until the front has passed.



Don't panic — stop and think.



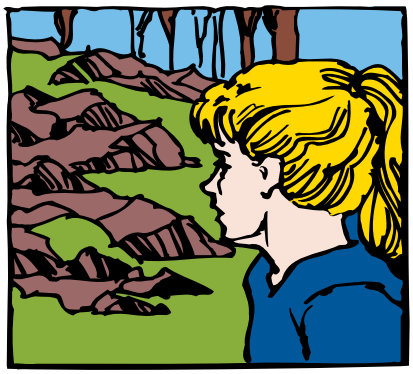
Find an open space.



If possible, dig a shallow trench,



find a fallen log, or



find a rocky outcrop.



Lie face down and cover all exposed skin.

Figure 10.31: Points for bushfire survival when on foot (adapted from brochure published by the Bush Fire Council of New South Wales)

Lightning

Lightning storms can be very frightening when camping outdoors. If storms are present, use the following guidelines.

- Erecting tents in sheltered locations of a grove of low shrubs is best.
- Avoid stopping under very large or isolated trees.
- Stay away from wire fences or rock crevices.
- If caught out in the open, remove all metal objects such as trangia stoves and sit on your backpack with your feet and hands off the ground.

Flooded rivers

It is best to plan routes to avoid crossing large rivers, which can be very hazardous. Possible hazards include:

- unstable banks
- fast-flowing water
- deep holes
- cold water
- debris caught on the river bed.

If the river is considered safe to cross, the following guidelines should be followed.

- Throw a stick in the flow to check the speed of the moving water.
- If the water is below knee height, cross the river as individuals, in a diagonal, downstream direction.

- Ensure your gear is in waterproof bags. Use a large plastic bag to line your pack.
- Leave your shoes on unless the river has a clear, sandy bottom.
- Release the waist belt on your pack. If you are swept off your feet, remove the pack from your shoulders.
- If the water is above knee height, try to find a long stick that four to five people can hold onto at waist height. Cross in a diagonal, downstream direction.
- Individuals may cross a river on their own, aided by a stick that they can plant on the upstream side and lean into as they cross.
- Packs can assist with flotation if sufficiently waterproofed inside. Lean back onto the pack and keep your legs and feet up. However, in many instances packs should be shed, as they can become very heavy and weigh down a weak swimmer.
- If in doubt, do not cross.



INQUIRY

Prevention and management strategies in risk situations

eBookplus

1. Use the **Scenarios** weblink in your eBookPLUS and download the document 'Unit 3: Participating safely'. Locate and print the 'Emergency situations' worksheet (page 39 in the downloaded document).
2. Divide into small groups and allocate a scenario to each group. Re-enact the scenario allocated to your group and propose prevention and management strategies.
3. Discuss your actions with the class.

Skills needed for other outdoor activities relevant to the experience

Canoeing, kayaking and abseiling are outdoor recreation activities whose popularity has increased significantly in recent years. All three activities can be performed as recreational activities, but lend themselves to increased risk taking when performed at the extreme level. Sometimes these activities are programmed as part of an expedition or adventure and require particular knowledge and skills to avoid injury.

Canoeing and kayaking skills

The basic difference between the canoe and kayak is that the canoe is an open vessel while the kayak is enclosed. It is usual to use a single-bladed paddle with the canoe and a double-bladed paddle with the kayak; however, this is not always the case and depends on the type of activity. Rivers, lakes, surf, white water rapids, sprint racing and marathons are some settings where canoes and kayaks are used. Some of these, such as sea and white water kayaking, can be both challenging and dangerous, requiring specific knowledge and particular skills before attempting.

Some skills and behaviours required by canoeists/kayakers include:

- always wear appropriate gear, including helmet, wetsuit, wetsuit shoes and personal flotation device (PFD)
- do not canoe/kayak by yourself and always tell someone if you intend setting out



Figure 10.32: Canoeing (left) and kayaking (right) should be carried out in groups.

- research the waterway, dam, river or surf area you intend to use and be aware of places nearby that might be able to provide access or first aid if required
- ensure your canoe/kayak is in good condition
- always challenge yourself within your level of ability, but avoid taking risks that could result in injury
- when paddling be careful to avoid hazards such as sticks, overhanging branches, submerged trees and rocks
- ensure you carry a first aid kit including mobile phone inside a waterproof container
- do not engage in canoeing or kayaking unless you are a competent swimmer
- ensure you have had lessons on entering and exiting the canoe/kayak, paddling and what to do if you capsize
- do not perform the activity if weather conditions are unfavourable or the forecast suggests deteriorating conditions such as thunderstorms, extreme temperatures, big swells or waves, or increased flow in inland rivers.



Figure 10.33: An abseiling wall is useful to learn basic skills prior to abseiling cliff faces.

Abseiling skills

Abseiling is an adventurous activity that requires the participant to descend a cliff or prefabricated wall using a fixed rope. Most sport and recreation facilities offer abseiling as a challenge activity, while in the bush it has the potential to be a more dangerous yet challenging experience. If you intend to go camping and abseiling, it is good practice to learn basic skills using indoor climbing and abseiling walls to establish proper techniques.

Some skills and behaviours of which the abseiler should be aware include:

- always ensure that the equipment has been checked for safety. This includes items such as harnesses, helmets, ropes, safety lines, gloves and footwear.

- never abseil alone
- develop your skill gradually and progress to greater heights and natural landscapes only after gaining basic abseiling proficiency
- check that you know which knots are required, how to tie them and when to use them
- ensure that all devices are securely in place before using
- avoid sharp edges on rocks when descending
- do not abseil if weather is windy or inclement as you are likely to lose your footing.



LEADERSHIP STYLES

The leader's task is to find the right balance between safety, enjoyment and achievement in a group. The leader must have sufficient experience, knowledge and skills to change their style of leadership as they evaluate situations and strive to assist the group achieve its outcomes. A range of different styles of leadership are appropriate to cater for different situations in outdoor recreation. Each style has strengths and weaknesses. An effective leader is able to assume different styles, depending on the situation. Examine table 10.4 which explains the styles of leadership and outlines the strengths and weaknesses of each.

Table 10.4: Leadership styles

Style of leadership	Strengths	Weaknesses
Democratic — the leader may call for a vote among the group and the majority wins. Alternatively, the leader may consult all participants and make a decision based on the majority of views without conducting a vote. He or she may try to persuade the group to achieve consensus.	• individuals feel important and valued • the whole group has a chance to give opinions and use their experience • gives the group responsibility and ownership of the decision • wider range of options identified • gives people the opportunity to learn through experience	• not all group members may have the relevant experience to make a decision • creates uncertainty • conflict may result from differing opinions • may take some time to reach a decision • a clear decision may not be reached • slow if safety issue is involved
Laissez-faire — this type of leader is often disorganised, very casual and leaves decisions to chance	• can promote leadership opportunities in the group	• can result in dangerous situations emerging due to lack of leadership • group may not pay enough attention to important issues such as conservation
Autocratic — the leader is clearly in charge. He or she makes decisions without consultation.	• saves time, which can be important in potentially dangerous situations such as bad weather • responsibility is clearly held by decision maker	• removes control from the group members — they have limited input and involvement • participants may have alternatives to the leader's decisions that are not considered • levels of dissatisfaction and frustration may cause conflict
Strategic nonintervention— the leader observes from a distance and steps in only if the situation is becoming dangerous	• promotes group decision making and teamwork • useful in assessment situations where participants are encouraged to display leadership, such as the Duke of Edinburgh Award	• situation may become dangerous if leader doesn't step in at the right time



APPLICATION

Debating leadership styles

Debate the style of leadership that would be most effective in each of the following recreation experiences:

(a) a 10 km alpine adventure requiring cross-country skiing and building snow caves
(b) an overnight camp in the mountains in hot weather
(c) a 10 km bushwalk involving abseiling and bushwalking
(d) a canoeing expedition that involved the need to navigate rapids and an overnight camp near the river bank.



UNDERSTANDING GROUP DYNAMICS

Many outdoor recreational activities involve working together in groups to achieve a common purpose. Relationships or the group dynamics between group members can determine the success of the expedition and also the extent to which participants enjoy the experience.

A successful model for understanding the stages of group development is summarised in the 'forming', 'storming', 'norming', 'transforming', 'adjourning' model originally developed by educational psychologist, Bruce Tuckerman. Table 10.5 shows a summary of this model.

Table 10.5: Stages of group development

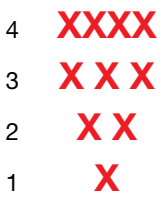
Forming	In this stage, most team members are positive and polite. Some are anxious, as they haven't fully understood what work the team will do. Others are simply excited about the task ahead. As leader, you play a dominant role at this stage, because team members' roles and responsibilities aren't clear. This stage can last for some time, as people start to work together, and as they make an effort to get to know their new colleagues.
Storming	Next, the team moves into the storming phase, where people start to push against the boundaries established in the forming stage. This is the stage where many teams fail. Storming often starts where there is a conflict between team members' natural working styles. People may work in different ways for all sorts of reasons, but if differing working styles cause unforeseen problems, people may become frustrated. Storming can also happen in other situations. For example, team members may challenge your authority, or jockey for position as their roles are clarified. Or, if you haven't defined clearly how the team will work, people may feel overwhelmed by their workload, or they could be uncomfortable with the approach you're using. Some may question the worth of the team's goal, and they may resist taking on tasks. Team members who stick with the task at hand may experience stress, particularly as they don't have the support of established processes, or strong relationships with their colleagues.
Norming	Gradually, the team moves into the norming stage. This is when people start to resolve their differences, appreciate colleagues' strengths, and respect your authority as a leader. Now that your team members know one another better, they may socialise together, and they are able to ask each other for help and provide constructive feedback. People develop a stronger commitment to the team goal, and you start to see good progress towards it. There is often a prolonged overlap between storming and norming, because, as new tasks come up, the team may lapse back into behaviour from the storming stage.
Transforming	The team reaches the transforming stage when hard work leads, without friction, to the achievement of the team's goal. The structures and processes that you have set up support this well. As leader, you can delegate much of your work, and you can concentrate on developing team members. It feels easy to be part of the team at this stage, and people who join or leave won't disrupt performance.
Adjourning	Many teams will reach this stage eventually. For example, project teams exist for only a fixed period, and even permanent teams may be disbanded through organisational restructuring. Team members who like routine, or who have developed close working relationships with other team members, may find this stage difficult, particularly if their future now looks uncertain.

Source: http://www.mindtools.com/pages/article/newLDR_86.htm.

APPLICATION

Solving an initiative challenge

1. Divide the class into groups of 10.
2. Each group stands in a triangular formation making a 4-3-2-1 arrangement (see diagram below).



3. From there, change the base with the apex by moving only three people.

Conflict resolution

Effective communication skills are needed to resolve conflict situations that often occur because of misunderstandings between individuals within the group, such as the agreed time to set off in the mornings. Whenever a group of people attempt a common task, there is potential for conflict to occur. Outdoor recreation offers opportunities to develop conflict resolution skills because teamwork and cooperation are essential if the group is to be successful in achieving its goals. In any conflict situation, a resolution occurs only if both parties acknowledge the conflict and are willing to take steps to resolve the problem.

Team building

Outdoor recreation offers considerable challenges and, in some cases, difficult obstacles that need to be overcome by participants working together as a team to achieve a common goal. Successful groups work together effectively by recognising and valuing the strengths and weaknesses of each other.

Cooperation

Successful groups can work cooperatively towards achieving a common goal. Experienced or capable members of the group can assist others who may be slower and less confident by offering encouragement and assisting with equipment. Meal preparation and camp site management are much easier and more enjoyable for all participants if they are tackled by all group members in a cooperative manner. In difficult expeditions, most group members require some encouragement from others in the group at some point.

APPLICATION

Team building

Visit an outdoor adventure centre that has a ropes course and problem-solving tasks. Work cooperatively to solve simulated initiative challenges. Alternatively, try some team building activities that are designed to enhance group cohesion when working in teams. Following is an example. The object of this task is to transport a group from A to E using boards. No part of the boards or of the participants' bodies may touch the ground. The boards must be slotted into the groove in the top of the posts. If any part of the boards or participants touches the ground, the group must start again at A.

You will need two boards. One board should fit the space between A and B and C and D; the other board should fit the space between B and C and D and E.

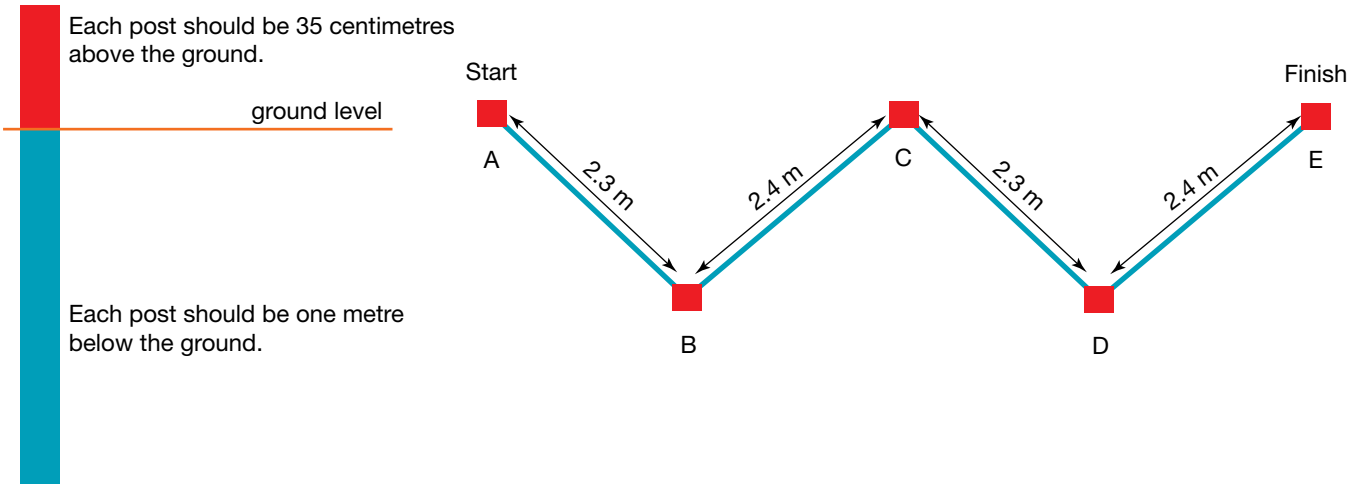


Figure 10.34: Course and equipment for the team building and problem-solving task



FACILITATION SKILLS

Communication skills

Effective communication could be the difference between a safe and enjoyable experience and an unhappy and dangerous expedition. Communication in outdoor recreation must involve all participants within the group, as well as relevant authorities and family who are staying behind. Participants need to ensure that all group members are aware of routes, camp sites and possible hazards in case they become separated. Open communication, where all participants feel free to express their opinions and ideas, contributes to effective decision making and group cohesion. Participants should ensure that communication with outside groups, including family and relevant authorities, is also clear.

Accurate details of plans should be left with responsible adults in case of emergency, and mobile phones should be carried for additional safety. It should be noted that in many remote regions, signals for mobile phones may be difficult to obtain and participants may need to climb to a high point to make a connection. In remote areas, participants should consider carrying additional forms of communication used to signal distress, including flares and an EPIRB, which is an emergency signalling device.

Decision making

Many outdoor adventure activities involve groups working together to solve problems, make decisions and judge various situations; for example, deciding whether to cross a fast-flowing river. It is important that the group can develop effective methods of communication and decision making, to ensure that they make progress and have a safe and enjoyable experience.

Flexibility

Weather conditions, ability levels of the participants and injury are just some of the variables that could make a change in plans necessary. Flexibility in planning is therefore essential. Groups need to ensure that they are adequately prepared to extend or change their trip as needed.

CASE STUDY

Group challenges

Josie, Tran, Yasser, Jill and Tony set off on a bush-walking expedition in the Snowy Mountains in October. They had organised to be picked up at their final destination in five days. The group were all very excited about the expedition, which they had been planning for several months. All had done some training in the Ku-ring-gai National Park, which was close to their homes, and felt confident in their fitness levels. Josie and Tran bought all the food for the group and had it organised into five packages of equal weight for the group to carry. Tony was a keen skier and had been to the Snowy Mountains several times in the past. Tony felt confident that he was familiar with the terrain.

The first day was very hard going and soon the group began to separate, with Yasser and Jill starting to lag behind. Yasser was having trouble with his new hiking boots and Jill was struggling with the weight of the backpack. Tony was getting anxious as some black clouds loomed in the distance and the group was still a long way from their planned destination to spend the first night. He suggested that the group not stop for lunch to save time.

As the group climbed higher they began to strike snow and found the walking to be very slippery on the snowy grass. The weight of their packs was difficult to manage in the conditions. The group thought that most of the snow would be melted and were surprised to find themselves trudging through knee-high sections.

At about 4.00 p.m., Josie suggested the group stop and have a rest and look at the map to find a closer place to camp. The wind was getting stronger and it looked like it might rain. Tony spoke out angrily and said that the group must keep going to reach the creek so that they could get water for their overnight camp. But Yasser and Jill were exhausted and refused to go any further. They began to set up their tents. Tony was furious and told them that they were not trying and should not give up so easily, before storming off in a huff.

Josie and Tran had been studying the map and found a waterway marked that was not too far from where the group had stopped. They scouted around the area and found a grove of trees suitable for a camp site and suggested that the group move to the spot. Tony returned and reluctantly agreed, but Yasser and Jill decided to stay where they were, having already unpacked their packs, despite the position being quite open and exposed.

It was getting late and cold and the group could not agree on a camp site. Finally Josie, Tran and Tony set off for the grove of trees and left Yasser and Jill at the spot, agreeing to meet again in the morning. During the night, the wind and rain increased.



INQUIRY

Group challenges

In small groups discuss the case study above, which involves a group facing challenges and needing to solve problems on their expedition. Then answer the questions that follow.

1. What problems, challenges and potential hazards did the group in the case study above face?
2. Identify and discuss any poor judgements or bad decisions that were made.
3. Comment on the communication and leadership skills displayed in the group.
4. Write a possible ending for the case study.
5. *Group challenge:* form groups of five. You will need a newspaper and a roll of sticky tape. One person in the group is allocated the role of an observer and the remaining four people are participants.
   (a) The group: using the newspaper and roll of sticky tape, your group has to construct an Australian animal in five minutes.
   (b) The observer: record your observations of the group dynamics displayed under the following headings — roles within the group, methods of communication, skills used to deal with conflict.
   (c) After five minutes the observer is to report to the group. Discuss the aspects of group dynamics, leadership styles and communication that emerged during the activity.

Participant readiness

Participants must understand the strengths and weaknesses of themselves and others in the group. People have different boundaries of comfort and respond to situations differently. Leaders must strive to ensure that group members are individually catered for. What is exciting and challenging for one individual may be terrifying for another.

Individuals must be given information to form choices surrounding their participation. Leaders need to ensure that participants have sufficient knowledge about what they are getting themselves in for and are therefore ready to face the challenges and take risks within the bounds of their own competence. Leaders must also be able to assess risks on behalf of their inexperienced group, who may not have the knowledge or personal fitness level to accurately assess the situation at hand.

Self-efficacy

Outdoor recreation offers many opportunities to develop self-confidence. Participants may face challenges and strive to overcome them individually or as a part of a group. Facing challenges and fears takes a certain amount of courage and self-efficacy, or confidence that you can complete the task. Participants need determination and tenacity to succeed in difficult conditions and this can contribute to motivation and personal growth in other areas in their lives.

Balancing challenge and safety

Safety considerations are very important to those involved in outdoor recreation as many activities are performed in remote locations a long way from medical assistance. It is imperative that groups who venture into the outdoors have sufficient knowledge and experience to participate safely. The level of risk involved in an activity depends on many factors including:

- prior experience and fitness of the party
- equipment
- weather conditions
- knowledge and skills within the group and group leaders
- choice of activity.

We can minimise risk by using state-of-the-art equipment. However, it would not be desirable to remove all risks in outdoor adventure activities, because this would remove much of the desire to participate in them! Many individuals and groups are attracted to outdoor adventure activities because of the risks and difficulties involved. They force participants to push the limits of their comfort zone. Indeed, many leaders in outdoor adventure activities deliberately set out to push the limits of the comfort zone and provide a thrilling experience with potential for personal growth. Therefore, while we must balance safety and challenge, to remove all risks would kill the excitement and adrenaline rush that participants feel are inherent in many outdoor adventure activities.

The benefits of teamwork and personal growth inherent in outdoor adventure activities have been recognised by many employers, who are increasingly choosing staff development opportunities that involve the challenge of the outdoors. Many outdoor enthusiasts believe that our society is becoming too

urbane and preoccupied with being safe, and therefore we miss out on many opportunities presented by undertaking some risk.

However, the role of the experienced person or leader is still to protect the group and sometimes the best option is to cancel the trip or activity in poor conditions, rather than risk injury. Prior to taking part in many outdoor recreational activities, it is the leader's responsibility to assess the level of risk in an activity and then minimise the possible dangers to ensure that challenge and safety are balanced.

Pushing the comfort zone

Our comfort zone refers to the level of risk in a situation that we can tolerate or feel comfortable with. A risky situation is one in which we feel that we may lose something. Assessing risk can be quite an individual thing, depending on the level of experience and confidence a person has. What may be risky for one person may seem perfectly safe to another, depending on prior experience and ability. In a group participating in abseiling for the first time, for example, some individuals may be confident and progress from a five metre to a 30 metre drop quickly, while others in the same group may be sufficiently challenged by simply putting on the harness and getting to the edge of the cliff, without actually proceeding down the cliff. The inexperienced person is challenged by the perceived risk associated with the activity, whereas the experienced person may consider the activity to be risky only if poor equipment or technique are used.

In addition to helping others to assess risk, leaders can also provide opportunities for pushing the comfort zone by introducing controlled or perceived risks. For example, in abseiling the leader would ensure safety ropes and helmets are used to promote the safety of the participants. In this way, the level of risk is controlled by the leader, but the participant still faces a perceived level of risk and is challenged. This means that the participants may still feel challenged and even scared, but the risks of injury are minimised.



APPLICATION

Challenging our comfort zone

Visit a sport and recreation or similar facility that offers challenging experiences such as abseiling, high ropes, giant swing and climbing frames. Participate in the activities under the supervision of the trained staff.



INQUIRY

Debating issues about risk and adventure

On return from the excursion in the application above, debate the following questions.

- How do you control risks while being encouraged to push beyond your comfort zone?
- What ethical considerations confront an instructor in balancing challenge and safety?

SUMMARY

- Participating in outdoor recreation activities is often seen as an escape to the outdoors and an opportunity to 're-create' oneself.
- Increasingly, more and more Australians are living and working in urban communities, most often in 'safe', indoor environments. Therefore it

becomes important for these people to interact with nature, test personal limits and participate in activities with adventure in mind.

- Outdoor recreation activities can offer new environments and unfamiliar activities that can assist a person to explore personal limits and capabilities.
- Many outdoor recreational pursuits involve physical activity and can contribute to the development and maintenance of fitness.
- Leaders must have prior experience in the area and research thoroughly before leading a group of less experienced participants. Equipment should be carried that will be suitable for conditions likely to be encountered.
- On an expedition, a group may need to use an escape route if the weather changes, participants are not coping with the terrain, or an injury is suffered.
- Specific emergencies in outdoor recreational expeditions could include snakebites, cuts and grazes, bites and stings, hypothermia, hyperthermia, sprains, strains and blisters. The group needs to have the knowledge and skills to cope with such problems.
- Hypothermia is a condition associated with lowered body temperature and is often called exposure. It can result in death if not treated.
- It is essential that participants prepare a balanced intake of food during extended activity. Kilojoule intake needs to be high in physically demanding activities to provide energy for activity and to keep the body warm. Carbohydrates need to be the dominant food group consumed, followed by protein and fats.
- Outdoor recreational activities demand lightweight, durable equipment and clothing that will protect you from environmental conditions.
- All campers have a responsibility to have a minimal impact on the outdoor environment. Participants need knowledge and skills in relation to waste management, erosion control, protecting flora and fauna, and managing fires.
- Everything that is carried in must be taken out.
- Contour lines join all places of equal height above sea level on a map. They provide information about the shape, steepness and height of the land.
- Many accidents and emergencies occur because of poor planning or inadequate knowledge and skills.
- A range of different styles of leadership are appropriate to cater for different situations in outdoor recreation. Each style has strengths and weaknesses. An effective leader is able to assume different styles, depending on the situation.
- It is important that the group can develop effective methods of communication and decision making, to ensure that they make progress and have a safe and enjoyable experience.
- Facing challenges and fears takes a certain amount of courage and self-efficacy, or confidence that you can complete the task.

eBook*plus*

Digital docs

A summary quiz and revision test on this chapter's content are available in Microsoft Word format in your eBookPLUS.

QUESTIONS

Revision

1. **Describe** the potential value that participation in outdoor recreational activities may offer individuals and society. (P6, P10, P16) (5 marks)
2. Choose one outdoor recreational activity. Prepare a list of the risks and potential hazards involved and how they could be reduced or overcome. (P14, P17) (6 marks)
3. **Construct** a check list of planning tasks that would need to be done before participating in a four-day bushwalking, canoeing or mountain biking expedition in a national park. (P14) (5 marks)
4. Camp fires have become a contentious issue for many participants in outdoor recreational activities. **Discuss** the positive and negative aspects of using

camp fires and identify steps that can be taken to minimise the harm from them. (P14) (6 marks)

5. **Describe** key behaviours and attitudes that are important in minimal impact bushwalking. (P14) (4 marks)
6. **Describe** the procedures your group could take if it becomes lost in a wilderness location. (P6, P14) (5 marks)
7. A group of inexperienced mountaineers, accompanied by two experienced leaders, is confronted by gale force winds and snow, reducing visibility to one metre. A decision needs to be made about whether to continue with the expedition, set up camp where the group are, or to proceed down the mountain and abort the expedition. Select the most appropriate form of leadership for the situation described. **Justify** your decision. (P6, P10, P14) (5 marks)
8. **Create** a code of conduct that could be used by commercial adventure companies to ensure that they have minimal impact on the natural environment. (P6, P14) (5 marks)
9. **Create** and present a practical demonstration to the class on one of these technical aspects of outdoor recreation:
   (a) camp site selection
   (b) menu planning and/or outdoor cooking
   (c) an aspect of navigation. (P14) (6 marks)
10. Use the contour map in figure 10.35 to answer the questions below. Each line on the map represents a 10 metre change in altitude.
    (a) Is A higher or lower than B?
    (b) What type of landform is C?
    (c) Could you see B from E?
    (d) Where would a trig station be located? (A trig station is a high point used as a point of reference by surveyors.)
    (e) Locate two spurs on the map.
    (f) Mark with an X a suitable place for a picnic lunch on a day with strong south westerly winds.
    (g) Which point would be the best place to camp? **Explain** your decision. (P14) (7 marks)
11. Use figure 10.36 to answer the following questions.
    (a) Draw the easiest route to the plateau at A.
    (b) Can you see B from C?
    (c) Label the saddle on the map with an S.
    (d) Use dotted lines to plot an interesting day walk. Remember it is easiest to walk up spurs and that precautions must be taken when crossing rivers. Include walking along the valleys as well as taking in some high points for coastal views.
    (e) Would D be a good camp site? Why or why not? (P14) (5 marks)

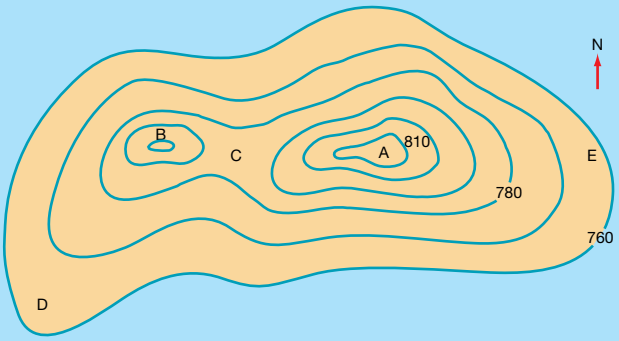


Figure 10.35



Figure 10.36

Extension

1. **Explain** the relationship between challenge, risk and safety in outdoor recreational activities. (6 marks)
2. Use the weblinks for the following organisations in your eBookPLUS to find more information relating to outdoor recreation. (10 marks)

eBookplus

- **The Wilderness Society**
- ***Wild*, Australia's Wilderness Adventure Magazine**
- **Australian Canoeing Online**
- **Greenpeace**
- **Australian Conservation Foundation**
- **New South Wales National Parks and Wildlife Service**

Note: For an explanation of the key words used in the revision questions above, see Appendix 2, page 384.

Appendix 1

Ottawa Charter for Health Promotion

First International Conference on Health Promotion, Ottawa, 21 November 1986

WHO/HPR/HEP/95.1

The first International Conference on Health Promotion, meeting in Ottawa this 21st day of November 1986, hereby presents this charter for action to achieve health for all by the year 2000 and beyond.

This conference was primarily a response to growing expectations for a new public health movement around the world. Discussions focused on the needs in industrialised countries, but took into account similar concerns in all other regions. It built on the progress made through the Declaration on Primary Health Care at Alma-Ata, the World Health Organization's Targets for Health for All document, and the recent debate at the World Health Assembly on intersectoral action for health.

Health promotion

Health promotion is the process of enabling people to increase control over, and to improve, their health. To reach a state of complete physical, mental and social well-being, an individual or group must be able to identify and to realise aspirations, to satisfy needs, and to change or cope with the environment. Health is, therefore, seen as a resource for everyday life, not the objective of living. Health is a positive concept emphasising social and personal resources, as well as physical capacities. Therefore, health promotion is not just the responsibility of the health sector, but goes beyond healthy lifestyles to well-being.

Prerequisites for health

The fundamental conditions and resources for health are:

- peace
- shelter
- education
- food
- income
- a stable ecosystem
- sustainable resources
- social justice, and equity.

Improvement in health requires a secure foundation in these basic prerequisites.

Advocate

Good health is a major resource for social, economic and personal development and an important dimension of quality of life. Political, economic, social, cultural, environmental, behavioural and biological factors can all favour health or be harmful to it. Health promotion action aims at making these conditions favourable through advocacy for health.

Enable

Health promotion focuses on achieving equity in health. Health promotion action aims at reducing differences in current health status and ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. This includes a secure foundation in a supportive environment, access to information, life skills and opportunities for making healthy choices. People cannot achieve their fullest health potential unless they are able to take control of those things which determine their health. This must apply equally to women and men.

Mediate

The prerequisites and prospects for health cannot be ensured by the health sector alone. More importantly,

health promotion demands coordinated action by all concerned: by governments, by health and other social and economic sectors, by nongovernmental and voluntary organisations, by local authorities, by industry and by the media. People in all walks of life are involved as individuals, families and communities. Professional and social groups and health personnel have a major responsibility to mediate between differing interests in society for the pursuit of health.

Health promotion strategies and programs should be adapted to the local needs and possibilities of individual countries and regions to take into account differing social, cultural and economic systems.

Health promotion action means:

Build healthy public policy — health promotion goes beyond health care. It puts health on the agenda of policy makers in all sectors and at all levels, directing them to be aware of the health consequences of their decisions and to accept their responsibilities for health.

Health promotion policy combines diverse but complementary approaches including legislation, fiscal measures, taxation and organisational change. It is coordinated action that leads to health, income and social policies that foster greater equity. Joint action contributes to ensuring safer and healthier goods and services, healthier public services, and cleaner, more enjoyable environments.

Health promotion policy requires the identification of obstacles to the adoption of healthy public policies in non-health sectors, and ways of removing them. The aim must be to make the healthier choice the easier choice for policy makers as well.

Create supportive environments — our societies are complex and interrelated. Health cannot be separated from other goals. The inextricable links between people and their environment constitutes the basis for a socio-ecological approach to health. The overall guiding principle for the world, nations, regions and communities alike, is the need to encourage reciprocal maintenance — to take care of each other, our communities and our natural environment. The conservation of natural resources throughout the world should be emphasised as a global responsibility.

Changing patterns of life, work and leisure have a significant impact on health. Work and leisure should be a source of health for people. The way society organises work should help create a healthy society. Health promotion generates living and working conditions that are safe, stimulating, satisfying and enjoyable.

Systematic assessment of the health impact of a rapidly changing environment — particularly in areas of technology, work, energy production and urbanisation — is essential and must be followed by action to ensure positive benefit to the health of the public. The protection of the natural and built environments and the conservation of natural resources must be addressed in any health promotion strategy.

Strengthen community actions — health promotion works through concrete and effective community action in setting priorities, making decisions, planning strategies and implementing them to achieve better health. At the heart of this process is the empowerment of communities — their ownership and control of their own endeavours and destinies.

Community development draws on existing human and material resources in the community to enhance self-help and social support, and to develop flexible systems for strengthening public participation in and direction of health matters. This requires full and continuous access to information, learning opportunities for health, as well as funding support.

Developing personal skills — health promotion supports personal and social development through providing information, education for health, and enhancing life skills. By so doing, it increases the options available to people to exercise more control over their own health and over their environments, and to make choices conducive to health.

Enabling people to learn, throughout life, to prepare themselves for all of its stages and to cope with chronic illness and injuries is essential. This has to be facilitated in school, home, work and community settings. Action is required through educational, professional, commercial and voluntary bodies, and within the institutions themselves.

Reorient health services — the responsibility for health promotion in health services is shared among individuals, community groups, health professionals, health service institutions and governments. They must work together towards a health care system which contributes to the pursuit of health.

The role of the health sector must move increasingly in a health promotion direction, beyond its responsibility for providing clinical and curative services. Health services need to embrace an expanded mandate which is sensitive and respects cultural needs. This mandate should support the needs of individuals and communities for a healthier life, and open channels between the health sector and broader social, political, economic and physical environmental components.

Reorienting health services also requires stronger attention to health research as well as changes in professional education and training. This must lead to a

change of attitude and organisation of health services which refocuses on the total needs of the individual as a whole person.

Moving into the future — health is created and lived by people within the settings of their everyday life; where they learn, work, play and love. Health is created by caring for oneself and others, by being able to take decisions and have control over one's life circumstances, and by ensuring that the society one lives in creates conditions that allow the attainment of health by all its members.

Caring, holism and ecology are essential issues in developing strategies for health promotion. Therefore, those involved should take as a guiding principle that, in each phase of planning, implementation and evaluation of health promotion activities, women and men should become equal partners.

Commitment to health promotion — the participants in this conference pledge:

- to move into the arena of healthy public policy, and to advocate a clear political commitment to health and equity in all sectors;
- to counteract the pressures towards harmful products, resource depletion, unhealthy living conditions and environments, and bad nutrition; and to focus attention on public health issues such as pollution, occupational hazards, housing and settlements;
- to respond to the health gap within and between societies, and to tackle the inequities in health produced by the rules and practices of these societies;
- to acknowledge people as the main health resource; to support and enable them to keep themselves, their families and friends healthy through financial and other means, and to accept the community as the essential voice in matters of its health, living conditions and well-being;
- to reorient health services and their resources towards the promotion of health; and to share power with other sectors, other disciplines and, most importantly, with people themselves;
- to recognise health and its maintenance as a major social investment and challenge; and to address the overall ecological issue of our ways of living.

The conference urges all concerned to join them in their commitment to a strong public health alliance.

Call for international action

The conference calls on the World Health Organization and other international organisations to advocate the promotion of health in all appropriate forums and to support countries in setting up strategies and programs for health promotion.

The conference is firmly convinced that if people in all walks of life, nongovernmental and voluntary organisations, governments, the World Health Organization and all other bodies concerned join forces in introducing strategies for health promotion, in line with the moral and social values that form the basis of this charter, Health For All by the year 2000 will become a reality.

Charter adopted at an international conference on health promotion*
The move towards a new public health, November 17–21 1986, Ottawa, Ontario, Canada

* Co-sponsored by the Canadian Public Health Association, Health and Welfare Canada, and the World Health Organization.

Source: World Health Organization.

Appendix 2

Syllabus key words

The following key words may appear in syllabus outcomes statements and in HSC examination questions. By becoming familiar with the key words and their meanings, students will better understand the types of response required.

Key words in exam questions

Account	Account for: state reasons for, report on. Give an account of: narrate a series of events or transactions
Analyse	Identify components and the relationship between them; draw out and relate implications
Apply	Use, utilise, employ in a particular situation
Appreciate	Make a judgement about the value of
Assess	Make a judgement of value, quality, outcomes, results or size
Calculate	Ascertain/determine from given facts, figures or information
Clarify	Make clear or plain
Classify	Arrange or include in classes/categories
Compare	Show how things are similar or different
Construct	Make; build; put together items or arguments
Contrast	Show how things are different or opposite
Create	Produce; design; invent; devise a new solution or plan
Critically (analyse/ evaluate)	Add a degree or level of accuracy, depth, knowledge and understanding, logic, questioning, reflection and quality to (analysis/evaluation)
Deduce	Draw conclusions
Define	State meaning and identify essential qualities
Demonstrate	Show by example
Describe	Provide characteristics and features
Determine	Make a decision or work out an answer after appropriate thought and investigation
Discuss	Identify issues and provide points for and/or against
Distinguish	Recognise or note/indicate as being distinct or different from; to note differences between
Evaluate	Make a judgement based on criteria; determine the value of
Examine	Inquire into

Explain	Relate cause and effect; make the relationships between things evident; provide why and/or how
Extract	Choose relevant and/or appropriate details
Extrapolate	Infer from what is known
Identify	Recognise and name
Interpret	Draw meaning from
Investigate	Plan, inquire into and draw conclusions about
Justify	Support an argument or conclusion
Outline	Sketch in general terms; indicate the main features of
Predict	Suggest what may happen based on available information
Propose	Put forward (for example, a point of view, idea, argument, suggestion) for consideration or action
Recall	Present remembered ideas, facts or experiences
Recommend	Provide reasons in favour
Recount	Retell a series of events
State	Describe the main points, clearly and specifically
Summarise	Express, concisely, the relevant details
Synthesise	Put together various elements to make a whole

Source: A Glossary of Key Words © Board of Studies, Teaching and Educational Standards NSW, 2014. The most up-to-date version of this document can be found at www.boardofstudies.nsw.edu.au/syllabus_hsc/glossary_keywords.html

Glossary

acceleration: the rate at which velocity changes in a given amount of time. p. 228
muscle **action:** refers to movement made at the joint when the muscle contracts. p. 148
adaptation: an adjustment made by the body as a result of exposure to progressive increases in the intensity of training. p. 205
advocate: to encourage support for a particular cause, issue or group. p. 105
aerobic: 'with oxygen'. p. 204
agility: the ability to move the body from one position and direction to another with speed and precision. p. 193
alternative medicine: refers to various medical methods and practices that are not recognised as being conventional or traditional approaches to medicine. p. 20
anaerobic: 'in the absence of oxygen'. p. 204
angular momentum: the quantity of angular motion in a body or part of a body. p. 230
applied forces: forces generated by muscles working on joints. p. 248
arteries: blood vessels that carry blood away from the heart. p. 164
articular cartilage: a firm, smooth, flexible connective tissue that covers the end of bones where they form joints. p. 138
average total body density: an average of all the specific densities of body components such as bones, teeth and lungs. p. 238
backspin: the opposite of topspin; occurs when a ball or object rotates backwards causing it to fall slowly at the end of flight. p. 245
balance: the ability to maintain equilibrium while either stationary or moving. p. 197
base of support: an imaginary area that surrounds the outside edge of the body when it is in contact with a surface. p. 235
bearing: the direction of travel measured as the angle from 0° (north) and recorded in degrees. For example, to travel south the bearing would be 180°. p. 362
binge drinking: the consumption of excessive amounts of alcohol in a short period of time. It commonly involves drinking to get drunk. p. 40
biomechanics: a science concerned with forces and the effect of these forces on and within the human body. p. 224
blood glucose: blood sugar. It represents the immediate supply of fuel for the working muscles. p. 187
body composition: the percentage of fat as opposed to lean body mass in a human being. p. 187
body image: the attitude or feelings we have about our body and the way we look or the way we think others see us. A person's body image can be positive or negative. p. 38
body mass index (BMI): the most common method of determining whether a person's weight fits into a healthy range. It is calculated by dividing their weight in kilograms by their height in metres squared. p. 38
bone marrow: a soft, fatty vascular tissue in which blood cells are made, located in the interior cavities of bones. p. 138
boundary layer: a layer of fluid whose speed is reduced because it is attached to the surface of an object that is moving through it. p. 241
built environment: buildings and spaces that are constructed within communities. p. 77
buoyant force: the upward force on an object produced by the fluid in which it is fully or partially submerged. p. 237
cancellous bone: the spongy or porous inner structure of bone that often contains and protects bone marrow. p. 138
capillaries: the smallest of all blood vessels. They function to exchange oxygen and nutrients for waste. p. 164
cardiac output: the amount of blood pumped by the heart per minute. p. 215
cardinal points: (on the compass) the major directional points; that is, north, south, east and west. p. 362
cardiopulmonary resuscitation (CPR): a life-sustaining procedure that uses rescue breathing and chest compressions to stimulate blood flow and oxygen delivery when a person has stopped breathing or their heart has stopped beating. p. 267
cardiorespiratory endurance: the ability of the working muscles to take up and use the oxygen that has been breathed in during exercise and transferred to muscle cells. p. 177
cardiovascular disease: disease that affects the heart or blood vessels. p. 34

centre of buoyancy: the centre of gravity of a volume of water displaced by an object when it is immersed in that water. p. 239
centre of gravity: (of an object) the point at which all the weight is evenly distributed and about which the object is balanced. p. 231
centrifugal force: a force directed away from the centre of a rotating body. p. 253
centripetal force: a force directed towards the centre of a rotating body. p. 253
chest compressions: downward thrusts on the centre of the chest that stimulate blood flow to vital organs in the body. p. 267
chlamydia: a sexually transmitted bacterial infection that can be passed on through unprotected sex and can cause infertility. p. 31
chronic: persisting over a long time, such as a long-term disease or illness. p. 26
circuit training: requires participants to perform set exercises at a number of stations, working through the course in the shortest period of time. p. 208
circulatory or **cardiovascular system:** a network that distributes blood containing oxygen and nutrients and collects wastes. It comprises the heart, arteries, blood and veins. p. 161
commodification: the process of turning something into a commodity that can be bought and sold. p. 300
commodity: a product that exists to generate profit. p. 300
concentric: the most common type of muscular contraction. During this contraction, the muscle shortens, causing movement at the joint. p. 153
connectedness: the sense of belonging or attachment an individual feels towards people and places they are frequently in contact with. p. 48
coordination: the ability to harmonise the messages from the senses (such as sight, feel and sound) with parts of the body to produce movements that are smooth, skilful and well controlled. p. 195
defibrillator: a device that provides an electric shock to a patient whose heart has stopped beating. p. 270
density: the mass per unit volume of a body or object. p. 238
dental dam: a rectangular piece of latex that acts as a barrier between the mouth and genital area. p. 45
diabetes mellitus: a chronic condition affecting the body's ability to take glucose from the bloodstream to use it for energy. Type 1 diabetes involves the body not being able to produce insulin or producing only minimal amounts. p. 30
diastolic pressure: the minimum or lowest pressure recorded when the heart is relaxing and filling (diastole). p. 167
displacement: the movement of a body from one location to another in a particular direction, or an 'as the crow flies' measurement. p. 226
diversity: variety, or difference, between individuals and groups of people. p. 131
drag: the force that opposes the forward motion of a body or object, reducing its speed or velocity. p. 240
dynamic: the constant fluctuations that occur in our level of health. p. 10
eccentric: a contraction that occurs when the muscle lengthens while under tension. The action often happens with the assistance of gravity. p. 153
empowerment: for individuals, means that they are aware of the choices they have, they can make decisions without relying on others or expecting others to make decisions for them and they can act in various situations in daily life to protect themselves and promote their health. pp. 70, 103
energy pathway: a system that converts nutrients to energy for exercise. p. 204
environmental factors: those things present in the environment in which people live and work that can affect their health in a positive or negative way. p. 75
environmental tobacco smoke: the smoke that comes from the burning end of a cigarette and the smoke exhaled by smokers. It is also referred to as second-hand smoke and passive smoking. p. 83
equity: the allocation of resources according to the needs of individuals and populations, the goal being to achieve equality of outcomes. p. 129
escape route: an alternative way out of an area. It is best if a road or settlement is nearby. p. 338
exercise: planned, structured and repetitive bodily movement. It is performed to improve or maintain one or more components of physical fitness. Exercise is a subset of physical activity. p. 293
expiration: air movement from the lungs to the atmosphere; breathing out. p. 157
FITT: an acronym for frequency, intensity, time and type. It embodies a fitness principle that ensures a program has the quantity and quality of movement necessary to produce the desired physical improvement. p. 204
flat bones: bones that have a broad surface and serve as places of attachment for muscles and to protect vital organs. p. 138
flexibility: the range of motion about a joint or the ease of joint movement. p. 185
float: to maintain a stationary position on the surface of the water. p. 237
fluid mechanics: a branch of mechanics that is concerned with properties of gases and liquids. p. 237
fluoridated tap water: the controlled addition of fluoride to public drinking water to reduce tooth decay. p. 77
force (biomechanics): the push or pull acting on a body. p. 248
freely movable or **synovial joint:** a joint that allows maximum movement. Most joints in the body are synovial joints; for example, the hip joint. p. 142
genetics: characteristics, features or hereditary diseases that are genetically linked and are passed on within a family. p. 60

grid north: the top of the map. It is usually the same as true north. p. 361
health determinants: the individual, socioeconomic, sociocultural and environmental factors that can have a positive or negative influence on the health of individuals or populations. p. 56
health literacy: the ability to understand and interpret health information and use it to promote and maintain good health. p. 57
health-promoting schools: schools where all members of the school community work together to promote and protect the health of students through the curriculum, the creation of a safe and supportive school environment, and the establishment of partnerships with parents, health services and the wider community to support improvements in student health. p. 118
health-promoting workplaces: workplaces where workplace policies, practices and activities are developed and implemented to improve the health and well-being of all workers. p. 121
health promotion: activities that are aimed at enabling people to increase control over their health, to improve their health and prevent illness. p. 100
heart disease: (also called cardiovascular disease) the term used for diseases of the heart and blood vessels. Common heart diseases include coronary heart disease (diseases of the blood vessels supplying the heart muscle), cerebrovascular disease (diseases of the blood vessels supplying the brain) and peripheral arterial disease (diseases of the blood vessels supplying the arms and legs). p. 34
heart rate: the number of times the heart beats per minute (bpm). p. 212
hepatitis: a disease that causes varying degrees of inflammation and subsequent damage to the liver. p. 285
human papillomavirus (HPV): a common sexually transmitted infection in both males and females. While a majority of HPV infections clear within a year, a small proportion lead to abnormalities in the cells which can, over years, progress to cervical cancer. p. 48
hydrogen ion: (or H+) a hydrogen atom that has lost its electron, the concentration of which determines the pH of a solution. p. 217
hypokinetic disease: a term given to modern lifestyle diseases associated with inactivity. p. 177
illicit drugs: drugs that are illegal to use, possess, produce or sell. The most commonly used illicit drugs include cannabis, ecstasy and amphetamines. p. 43
immovable or **fibrous joint:** a joint where no movement is possible. Examples of this type of joint include the bones of the cranium, which are fused in lines called sutures. p. 142
individual factors: those factors unique to each person that can determine their level of health. p. 57
inequality: the unequal distribution of illness or conditions throughout the population. p. 84
insertion: (of a muscle) the point of attachment at the movable end. This end tends to be away from the body's main mass. p. 148
inspiration: air movement from the atmosphere into the lungs; breathing in. p. 157
intensity: the amount of effort required by an individual to accrue a fitness benefit. p. 205
isometric: describes a contraction that occurs when the muscle fibres are activated and develop force, but the muscle length does not change; that is, movement does not occur. p. 153
isometric exercises: muscular contractions where tension is created in the muscle, but its length remains the same; for example, trying to lift a weight that is too heavy to be moved. p. 185
lactate: a salt formed from lactic acid that accumulates during intense anaerobic activity. p. 217
lactate inflection point (LIP): a point beyond which a given power output cannot be maintained. It is characterised by lactic acid accumulation and decreased time to fatigue. p. 218
laminar flow: a streamlined flow of fluid with no evidence of turbulence between the layers. p. 242
life expectancy: the average number of years of life remaining to a person at a particular age, based on current death rates. p. 17
lifestyle approach: (to health promotion) an approach that aims to reduce or prevent the incidence of risk behaviours that contribute to poor health. p. 115
lift: the component of a force that acts at right angles to the drag. p. 240
light exercise: activity that requires approximately three to four times as much energy as rest. p. 293
line of gravity: an imaginary vertical line passing through the centre of gravity and extending to the ground. p. 234
linear momentum: a property of a body that is moving. It is equal to (or a product of) its mass × velocity. p. 229
linear motion: takes place when a body and all parts connected to it travel the same distance in the same direction and at the same speed. p. 224
long bones: bones that are longer than they are wide and that function as levers. p. 138
magnetic north: in the direction of the North Pole; it changes slightly every year. A compass needle points towards magnetic north. p. 361
magnetic variation: the difference between true north and magnetic north. When navigating we need to take this difference into consideration. p. 361
Magnus effect: explains why spinning objects such as cricket and golf balls deviate from their normal flight paths. p. 245
mass: the amount of matter in a body. p. 229
Medicare: Australia's government-funded health scheme that subsidises the cost of medical services for all Australians. p. 75

mental or **emotional health:** a state of well-being where we can realise our abilities, cope with the normal stresses of life, work productively and make a contribution to the community. p. 7
mental health disorders: a group of mental illnesses in which a person experiences disturbances of mood or thought that lead to difficulties functioning normally. These disorders include depression, anxiety disorders and schizophrenia. p. 30
moderate exercise: activity that requires approximately five to six times as much energy as rest. p. 293
modifiable health determinants: determinants that can be changed or controlled so they have a different level of influence on our health. p. 85
momentum (biomechanics): the quantity of motion that a body possesses. p. 229
morbidity: the incidence or level of illness or sickness in a given population. p. 17
mortality: the number of deaths in a given population from a particular cause and/or over a period of time. p. 17
motion: the movement of a body from one position to another. p. 224
muscular endurance: the ability of the muscles to endure physical work for extended periods of time without undue fatigue. p. 183
muscular hypertrophy: an increase in the size of the muscle resulting from an increase in the cross-sectional area of the individual muscle fibres. p. 181
muscular power: the ability to combine strength and speed in an explosive action. p. 190
muscular strength: the ability to exert force against a resistance in a single maximal effort. p. 181
non-government organisations (NGOs): organisations that focus on a specific disease or health issue. p. 108
non-modifiable health determinants: determinants that cannot be changed or altered. p. 88
obese: having a body mass index of 30 or over. p. 38
origin: a muscle's point of attachment to the more stationary bone. In most cases, this point is nearer the trunk. p. 148
osteoporosis: a musculoskeletal condition in which there is deterioration in the bone structure, leading to an increased risk of bone fracture. p. 32
Ottawa Charter for Health Promotion: a document (see Appendix 1, pages 381–3) that represents a global approach to health promotion by the World Health Organization. It aims to enable people to increase control over their health. It outlines prerequisites for health and essential actions for health promotion. p. 100
overweight: having a body mass index of 25 or over. p. 38
ozone depletion: the decline in the ozone layer present in the atmosphere that shields the Earth from harmful levels of ultraviolet radiation. p. 83
perception: the way something is seen or viewed by an individual or group. p. 12
physical activity: any movement that results in some expenditure of energy. p. 293
physical health: the wellness of the body and the absence of chronic pain or discomfort. p. 6
plasma: a straw-coloured liquid mainly consisting of water (about 90 per cent). p. 161
platelets: fragments of cells found in blood that are responsible for clotting. p. 161
power (biomechanics): the ability of muscle groups to contract at speed. p. 250
preventative medical approaches: approaches that use medical treatments or interventions to promote health. p. 117
profile drag (also called **form** or **pressure drag**): drag created by the shape and size of a body or object. p. 242
protective behaviours: health behaviours that are likely to enhance a person's level of health. p. 31
public health: (approach to health promotion) involves establishing programs, policies and services that create environments that support health. p. 118
pulmonary circulation: the flow of blood from the heart to the lungs and back to the heart. p. 166
reaction forces: equal and opposite forces exerted in response to applied forces. p. 248
reaction time: the time taken to respond to a stimulus. p. 198
relative nature: (of health) how we judge our health compared to other people or other points of time in our life. p. 9
remote: areas with a population of less than 5000. p. 76
reorientation: adjusting the direction or focus of a service to create a fresh approach. p. 126
repetitions: the number of times an exercise is repeated without rest. p. 308
rescue breath: a breath given to a patient who is not breathing. The breath will take one second to deliver and will make the patient's chest rise. p. 267
resilience: the capacity of individuals to deal with adversity and challenges in ways that make it possible for them to lead healthy and fulfilling lives. p. 49
respiration: the process by which the body takes in oxygen and removes carbon dioxide. p. 155
risk behaviours: health behaviours that have been found to contribute to the development of health problems or poorer levels of health. p. 31
Royal Flying Doctor Service: aeromedical emergency and general health care service for people living in rural and remote areas of Australia. p. 78
rural: describes areas defined by the Australian Bureau of Statistics as having populations between 5000 and 99 000. p. 76
scale: the ratio between the distance measured on a map and the actual distance measured on the Earth's surface. p. 357
scroggin: high energy foods such as dried fruit, nuts and chocolate that are suitable for snacks on expeditions. p. 341

sedentary: describes a lack of regular physical activity and a lot of time spent sitting or resting. p. 33
self-efficacy: our belief in our ability to be able to carry out a particular task. p. 59
set: the number of repetitions done in succession; for example, one set may equal 12 repetitions. p. 308
short bones: bones that have a short axis and are found in small spaces such as the wrist. They serve to transfer forces. p. 138
sidespin: rotation around a vertical axis causing a ball or object to curve left or right during flight. p. 246
slightly movable or **cartilaginous joint:** a joint that permits limited movement. Examples of this joint exist in the vertebral column, where fibrous cartilage between discs allows a limited range of movement. p. 142
social construct: a concept that recognises that people have different views based on their social circumstances and ways of seeing, interpreting, interrelating and interacting with their environment. pp. 18, 93
social exclusion: when someone is denied resources, rights and services and is unable to participate in normal relationships and activities that are available to the majority of people in society. p. 75
social health: our ability to interact with other people in an interdependent and cooperative way. p. 7
social justice: a value that favours the reduction or elimination of inequity, the promotion of inclusiveness of diversity and the establishment of environments that are supportive of all people. p. 129
social marketing: the use of marketing techniques to improve health and well-being by changing attitudes and behaviour in relation to a particular product or issue. p. 116
social norms: the behaviours, beliefs and values that are expected or seen as acceptable within different social groups. p. 91
sociocultural factors: the society in which people live and the cultural practices and expectations that exist within these communities. p. 61
socioeconomic disadvantage: significant limitations to opportunity that can be experienced as a result of factors relating to social and economic circumstances, such as lower education, poorer education, unemployment, limited access to services, inadequate housing or lack of social networks. p. 25
socioeconomic status: a measure of an individual's place in society, based on their income, education, employment and other economic factors such as house or car ownership. p. 18
specific density: the density of a particular tissue type such as bone or lung tissue. p. 238
speed: (fitness) the ability to perform body movements quickly. p. 192
speed: the distance covered divided by the time taken to cover the distance. p. 226
sphygmomanometer: an instrument used to measure blood pressure. p. 168
spiritual health: a sense of purpose and meaning in our life; feeling connected with others and society. p. 7
steady state: a period of time during which oxygen uptake remains at a uniform level, such as swimming at a constant speed. p. 212
stereotype: a simplified and fixed image, opinion or concept to which people may feel expected to conform. p. 16
stroke volume: the amount of blood ejected by the left ventricle of the heart during a contraction. It is measured in mL/beat. p. 214
surface drag or **skin friction:** a thin film of the fluid medium sticking to the surface area of the body or object through which it is moving. p. 241
systemic circulation: the flow of blood from the heart to body tissue and back to the heart. p. 166
systolic pressure: the highest (peak) pressure recorded when blood is forced into the arteries during contraction of the left ventricle (systole). p. 167
target heart rate (THR): a predetermined pulse rate to be obtained during exercise, expressed as a percentage of maximum heart rate. p. 294
target heart rate zone: an area surrounding the target heart rate calculated using percentages of maximal heart rate. p. 205
topspin: occurs when a ball or object rotates forward on its horizontal axis causing it to drop sharply. p. 245
true north: the direction of the North Pole. p. 361
type 2 diabetes: the most common type of diabetes, characterised by too little insulin being made or an inability to use insulin effectively. p. 32
underweight: having a body mass index less than 18.5. p. 38
urbanisation: the trend towards more people living in cities. p. 332
veins: carry deoxygenated blood from the body tissues back to the right atrium. Pulmonary veins from the lungs differ in that they carry oxygenated blood to the left atrium. p. 165
velocity: displacement divided by time. p. 226
ventilation: our depth and rate of breathing, expressed in breaths per minute. p. 213
vigorous exercise: activity that requires seven times or more energy as rest. p. 293
wake: an area of turbulence behind an object moving through a fluid. p. 242
World Health Organization: a specialised agency of the United Nations that acts as the coordinating authority on international public health issues. It provides leadership on global health issues, helps countries address public health concerns, monitors disease outbreaks, assesses the performance of health systems around the world and promotes health research. p. 113

Glossary

Chapter 8 Composition and performance

appraisal: the process of determining the quality, quantity and status of a movement performance or skill. p. 31
composition: a movement pattern consisting of a number of movement sequences, with a beginning, middle and end. p. 2
dimension: the size or extent of the movement or performance space. p. 5
direction: the course our moving body follows or the direction in which we move. p. 3
duration: the time it takes to perform a movement or the time in which a movement must be performed. p. 12
dynamics: the flow and force produced by the body as it moves. p. 7
elements of composition: aspects of movement that can be changed or manipulated to produce movement patterns. They include space, dynamics, relationships, time and rhythm. p. 2
externally paced movements: skills where the pace and timing of the skill is controlled by outside influences such as music or an opponent. p. 14
flow: the control of movement through space. p. 9
force (composition and performance): the degree of energy applied to a movement. p. 8
formations: the designs groups of players or performers make while performing offensive or defensive moves or movement phrases. p. 6
general space: the space shared with other people or objects. p. 3
improvisation: the spontaneous discovery of movement. p. 20
level: the height of the movement in personal space. p. 4
locomotor: describes skills that involve moving or travelling. p. 22
momentum (composition and performance): the speed at which we perform a movement. p. 13
movement exploration: the guided discovery or exploration of movement. p. 23
movement mediums: physical activities that use gross motor movements as their medium. They include dance, gymnastics, aerobics and games. p. 2
nonlocomotor: describes skills that are performed while the body is in a stationary position. p. 22
patterns: the floor patterns made by a performer as they move from one point to another. p. 6
performance: the end result of learning a movement composition. It is the game, dance, gymnastics or aerobics routine. p. 2
personal space: the space immediately around you. p. 3
phrase: a number of related movement skills or actions. p. 26
repetition: (in movement) repeating a movement or movement phrase. p. 30
rhythm: the mathematical organisation of time in music, dance, aerobics and movement skills. p. 10
self-paced movements: skills where the performer has control over the timing of the skill, including when it begins and when it ends. p. 14
sequence: a group of related phrases. p. 26
sequencing: the organisation of single movements into short and long phrases, then into sequences and sections and finally into a completed performance. p. 29
space: the medium in which movement takes place. It is defined by shape and size. p. 3
transitions: a natural evolution from individual movements to phrases and major sections of a dance, game or routine. p. 30

Index

abdominal injuries 276
abseiling skills 370–1
acceleration 228–9
access to health services, as health determinant 78–80
adaptations 205
adults, physical activity recommendations 295
advertising
  ethics of 326
  fitness products and services 324–6
  promotional techniques 325
aerobic pathway 204
aerobics 311
aerobic training 204
aerobic training programs 210
aged people, physical activity 317
agility 193–5
agonists (muscles) 152
airways, clearing 266
alcohol consumption
  in Australia 69
  young people 40–3
anaerobic pathway 204
anaerobic training 208–10
anaerobic training programs 210
anaphylaxis 280
anatomical reference system 139–40
anatomical terms 139–40
angular momentum 230
antagonists (muscles) 152
applied forces 248
aquarobics 311–12
arm slings 277
arteries 164
articular cartilage 138
asthma 280
athletes, fitness activities 316–17
attitudes
  changes over life stages 91–2
  as health determinants 59–60, 86–8
  modification of 86–8
  to fitness 299–300
Australian Dietary Guidelines 34
average total body density 238
backspin 245, 246
balance
  improving 197
  types 19
balance and stability
  base of support 235–6
  centre of gravity 231–4
  line of gravity 234–5
bandages, applying 277, 278
base of support 235–6
bearings 362–3
bee/wasp stings 281
bicycle ergometry 178–9
binge drinking 40
biomechanics 224
bites
  pressure immobilisation bandaging 278
  symptoms and treatment 280–1
Black Dog Institute 58
bleeding, management 272
blisters 366
blood, components 160–1
blood-borne viruses 285
blood glucose 187
blood pressure
  diastolic pressure 167
  explained 167–8
  measuring 168–9
  systolic pressure 167
bluebottle stings 281
body composition 187–90
body image 38
body mass index (BMI) 38
body weight 37–8
bone marrow 138
bones
  major bones 139
  involved in movement 140–1
boot camps 318
boundary layer 241
breakfast at school 107
built environment 77
buoyancy 237–40
buoyant force 237
burns 276
bushfire procedures 367–8
bushwalkers' code 352–4
bushwalking
  equipment 345–6
  protective clothing 346
camping, 'leave no trace' camping 354
camping equipment 347
camp site selection
  geographic, environmental and climatic considerations 349–50
  tree fall evaluation 351–2
cancellous bones 138
cannabis use 44
canoeing
  safety check list 347
  skills 369–70
capillaries 164
cardiac output 215–17
cardinal points 362
cardiopulmonary resuscitation (CPR) 267, 272
cardiorespiratory endurance 177–81
cardiovascular disease 34
cardiovascular system 160, 161
carpals 141
cartilaginous joints 142
centre of buoyancy 239–40
centre of gravity 231–4
centrifugal force 253, 255
centripetal force 253, 254–5
challenge
  balancing with safety 376–7
  in recreation 332–4
chest compressions 267–8
chest injuries 276
children
  exercise 316
  physical activity recommendations 295
chlamydia 31
chronic diseases, in young people 26
circuit training 208, 313–14
circulatory system
  blood pressure 167–70
  components of blood 160–2
  heart, arteries, veins and capilliaries 162–7

circulatory system *(continued)*
pulmonary and systemic circulation 166–7
structure and function 160
clavicle (collar bone) 140
climate change 83
collar and cuff sling 277
comfort zone, pushing 377
commodification 300
Commonwealth Government, health promotion 109–11
communication skills 374
community actions, strengthening 125–6
community exercise facilities 319, 320
community groups, health promotion 107–8
compasses
taking a bearing 362–3
using 361–2
concentric contractions (muscles) 153
concussion 276
conflict resolution 373
connectedness 48–9
conscious patients, management 265
conservation skills
bushwalkers' code 352–4
ethical issues 355
'leave no trace' camping 354
minimal impact practices 354–5
contraception 47–8
cooperation 373
coordination 195–7
coronary circulation 163
counselling, for rescuers 289
CPR (cardiopulmonary resuscitation) 267, 272
crisis management
bleeding 272
care of unconscious casualty 274–5
CPR 272
medical referral 274
moving the casualty 273–4, 275
neck and spinal injury 273
shock 272–3
cultural background, influence on health 19–20, 66–9
cultural groups 324
cuts 275
cycling 305–6

death rates 26
debriefing, for rescuers 288
decision making 374
defibrillation 270
density 238
dental dams 45
determinants of health *see* health determinants
diabetes, symptoms and management 279
diabetes mellitus (Type 1) 30
diabetes mellitus (Type 2) 32
diastole action of heart 163
diastolic pressure 167
dietary habits 34–7
directional terms 139–40
dislocations 276
distance, measuring 364
diversity 131
drag 240, 241–5
DRSABCD action plan 264–70
drug use 39–45
dynamic balance 197

eccentric contractions (muscles) 153
ecstasy use 44
education, as health determinant 70–1
electricity, rescue and first aid 283
electrocution 276
elevation sling 277–8
emergency care, legal implications 285–7
emergency management planning, outdoor activities 337–40
emergency management skills
abseiling skills 370–1
bushfire procedures 367–8
for canoeing and kayaking 369–70
flooded rivers 368–9
lighting guidelines 368
procedure if lost 367
wilderness first aid 365–6
emergency situations
commonsense vs heroics 288
counselling 289
debriefing 288
moral obligations 287–8
emotional health 7
employment, as health determinant 71
empowerment 70, 103
energy pathway 204
environment, appreciation of 335
environmental determinants of health
access to health services 78–80
access to technology 80–3
climate change 83
geographic location 76–8
modifiability of 88
nature of 75–6
tobacco smoke 83
environmental planning 337
environmental tobacco smoke 83
epileptic seizures 280
equity 129–30
escape routes 338–40
ethical issues, outdoor recreation 355
excitement, in recreation 332–4
exercise
access to facilities 327
at home 319
definition 293
as form of physical activity 293–5
group fitness activities 311–18
individual fitness activities 303–10
intensity of 293–4
meanings of 292
motivators and barriers to participation 327–9
relationship to fitness 296–7
settings for 318–24
exercise clubs 323–4
expeditions
equipment 345–6
food and water 341–4
expiration 157–8
eye injuries 276

facilitation skills 374–5
families, influence on health 24, 61–2
femur 141
fibrous joints 142
fibula 141
first aid
crisis management 272–5
DRSABCD 264–70
injury management 275–9
legal and moral dilemmas 285–8
management of medical conditions 279–81
preparation for outdoor recreation 340
priority assessment procedures 263–4
safety issues and protective strategies 282–4
situational analysis 262–3
STOP regime 270–1
support following emergency care 288–9
wilderness first aid 365–6
fitness *see* physical fitness
fitness centres 301–2, 319–21, 327–8
fitness equipment 301, 309–10
fitness industry 300–3
fitness products and services, advertising and promotion 324–6
FITT principle 204, 205–8
flat bones 138
flexibility (fitness) 185–7
flexibility (planning) 374
flooded rivers 368–9
flotation 237–8
fluid mechanics
centre of buoyancy 239–40
flotation 237–8
fluid resistance 240–4
nature of 237
fluid resistance 240–4
fluoridated tap water 77
food insecurity 130–1
force
absorption by the body 250–2
application to an object 252–6
applied by the body 248–50
in biomechanics 248

form drag 242
fractures 275
freely moveable joints 142
frequency 205
fruit consumption 35
full-flip stick test 196
funnel-web spider bites 281

genetics, influence on health potential 60–1, 88, 92
geographic location
  and health 19
  as health determinant 76–8, 92
Global Outbreak Alert and Response Network (GOARN) 114
grid bearings 360
grid north 361
grip strength test 182
group challenges 375
group development stages 372
group dynamics 372–4
group fitness activities 311–18
gymnasiums 301–2

half-flip stick test 196
hand dynamometers 182
head injuries 276
health
  definitions 4–5
  dimensions 5–9
  dynamic nature of 10
  as individual's responsibility 94–5
  meanings of 4–11
  perceptions of 12–25
  relative nature of 9–10
  as social construct 93–5
health determinants
  changing influence throughout life 89–92
  definition 56
  environmental factors 75–84
  framework 94
  and individual control over health 84–93
  individual factors 57–61
  interrelationship of 57, 93–4
  key determinants 56
  modifiable health determinants 85–8
  non-modifiable health determinants 88–9
  sociocultural factors 61–9
  socioeconomic factors 69–75
health knowledge and skills
  access to health education 51
  impact on health 57–9
  modification of 85–6
health literacy 57
health-promoting schools 118–20
health-promoting workplaces 121–2
health promotion
  by community groups and schools 105–8
  by non-government organisations 108–9
  Commonwealth government responsibilities 109–11
  international organisations 113–15
  lifestyle and behavioural approaches 115–17
  local government role 112–13
  nature of 100–2
  preventative medical approaches 117–18
  public health approaches 118–23
  responsibility for 102–15
  role of individuals 103–5
  State government responsibilities 111–12
  traditional approaches 115
  see also Ottawa Charter for Health Promotion
health service access, as health determinant 78–80
health services, reorienting 126
health status, young people 26–31
healthy environments, creating 125
heart
  action of 163
  blood supply 163–4
  structure and function 162
heart attack 279
heartbeat 163
heart disease 34
heart rate 212–13
heat exhaustion 281
heatstroke 281
hepatitis B 285
hepatitis C 285
HIV/AIDS
  infection control and protection 284–5
  national strategy 127, 128–9
human papillomavirus (HPV) 48
humerus 140
hyaline cartilage 143
hydrogen ion 217
hyperthermia 366
hypokinetic disease 177
hypothermia 281, 366

illicit drug use 43–5
immovable joints 142
income, as health determinant 72–5
Indigenous Australians
  culture and health 68
  food insecurity 130–1
  health status of young people 28–9
  risk behaviours of young people 68
individual determinants of health
  attitudes 59–60
  genetics 60–1
  knowledge and skills 57–9
indoor cycling 306
inequality 84
infection control and protection 284–5
injuries, in young people 30–1
injury management
  applying bandages, slings and splints 277–9
  injury type, associated symptoms and management 275–6
inspiration 157
intensity 205–7
isokinetic weight training 307
isometric contractions (muscles) 153
isometric exercises 185
isometric training 307
isotonic weight training 307

Jimmy Possum 121–2
joint actions
  involved in movements 146–7
  types 144–5

kayaking skills 369–70
Kids Help Line 82
knee joint 142, 143

lacerations 275
lactate inflection point (LIP) 218
lactate levels 217–18
laminar flow 242
leadership styles 371–2
'leave no trace' camping 354
life expectancy 17
lifestyle approach to health promotion 115–17
lift 240
ligaments 143
light exercise 293
lightning safety guidelines 368
linear momentum 229
linear motion 224–6
line of gravity 234–5
Live Outside the Box program 120
local government, health promotion 112–13
long bones 138
lung function 157–8
lungs 156

magnetic bearing 361–3
magnetic north 361
magnetic variation 361, 363
Magnus effect 245–7, 246
map reading 357–60
mass 229
media, impact on health 21–4, 63–6, 89–90
medical conditions, management of 279–81

Medicare 75
mental health
  definition 7
  young people 52–3
mental health classes 58
mental health status, young people 30
metacarpals 141
metatarsals 141
minute ventilation 213
moderate exercise 293, 294
modifiable health determinants 85–8
momentum (biomechanics) 229–30
morbidity 17
mortality 17
motion
  acceleration 228–9
  in biomechanics 224
  linear motion 224–6
  momentum 229–30
  principles of 231
  speed 226–8
  velocity 226
motor vehicle injuries 50, 51
multistage fitness test 180–1
muscle action 148
muscle contractions 153–4
muscle relationship 152
muscles
  agonists 152
  antagonists 152
  insertion 148
  origin 148
  stabilisers 152
muscular endurance 183–5
muscular hypertrophy 181
muscular power 190–2
muscular strength 181–3
muscular system
  major muscles involved in movement 149–51
  overview 147–8

nasal injuries 276
National Physical Activity Guidelines (NPAG) 294–5
navigation, by the sun or stars 364–5
navigational skills
  check list for navigation 357
  grid bearings 360
  magnetic bearing 361–3
  map reading 357–60
  measuring distance 364
  natural navigation 364–5
neck injuries 273
non-government organisations (NGOs), health promotion 108–9
non-modifiable health determinants 88–9

obesity 38
osteoporosis 32
Ottawa Charter for Health Promotion 100
  actions to improve health 124
  application in Australia 115
  building healthy public policy 126–7
  creating supportive environments 125
  developing personal skills 124–5
  framework for health promotion 123–9
  key points 123
  prerequisites for health 124
  reorienting health services 126
  strengthening community actions 125–6
outdoor fitness groups 319–20
outdoor recreation
  camp site selection 349–52
  conservation skills 352–6
  emergency management skills 365–71
  facilitation skills 374–5
  fitness requirements 336
  leadership styles 371–2
  navigational skills 357–65
  planning skills 336–49
  reasons for participation 332–6
  understanding group dynamics 372–4
  understanding strengths and weaknesses 376–7
overweight 38
ozone depletion 83

participant readiness 376
patella 141
peers, influence on health 24, 63, 90
pelvic girdle 141
perceptions of health
  family influences 25
  implications of different perceptions 15–17
  media influence 21–4
  one's own health 12–13
  others' health 13–15
  peer influence 24
  as social constructs 17–20
personal and social development 124–5
personal trainers 301, 310, 320, 321–3
phalanges 141
physical activity
  adult recommendations 295
  child and youth recommendations 295
  culture and women's participation 67
  effect on respiration 159–60
  exercise as form of 293–5
  young people's participation in 32–4
physical fitness
  agility 193–5
  balance 197–8
  body composition 187–90
  cardiorespiratory endurance 177–81
  changing attitudes towards 298–300
  as a commodity 300–3
  components 201
  coordination 195–7
  flexibility 185–7
  health-related components 176–90
  muscular endurance 183–5
  muscular strength 181–3
  power 190–2
  reaction time 198–200
  relationship to exercise 296–7
  skill-related components 190–204
  speed 192–3
physical fitness profile 201–2, 203
physical health 6–7
physiological responses to training 211–19
Pilates 309
planning for outdoor recreational activities
  emergency management planning 337–40
  environmental planning 336–7
  food and water considerations 341–4
  legal and administrative requirements 344–5
  resources for safe participation 344
plasma 161
platelets 161
poisons 280
power (biomechanics) 250
power walking 304
pregnant women, exercise 316
pressure drag 240
pressure immobilisation bandaging 278
preventative medical approaches (health promotion) 117–18
profile drag 242
protective behaviours 31, 52
public health approach to health promotion 118–23
public policy, improving 126
pulmonary circulation 166
pump classes 312–13

radius 140–1
rating scales 33
reaction forces 248
reaction time 198–200
recovery position 265
redback spider bites 281
red blood cells 161
religious beliefs, influence on health 66
remote areas 76

remote communities, health status of young people 29–30
repetitions (weight training) 308
rescue breathing 267
resilience 48–9
respiration 155
respiratory system
  effect of physical activity 159–60
  exchange of gases 158
  lung function 157–8
  structure and functions 155–6
resting heart rate 212
risk behaviours 31, 52
Royal Flying Doctor Service, remote consultations 82
running 304
rural areas 76

safety
  balancing with challenge 376–7
  behaviours of young people 50–1
scale (maps) 357
scapula (shoulder blade) 140
schools, health promotion 105–7, 118–20
scroggin 341
sedentary behaviour 33
self-efficacy 59, 85, 376
sets (weight training) 308
sexual activity, young people 45–8
sexual assault 45
sexually transmitted infections 31, 45
Shape Up Australia 110–11
shock 272–3
short bones 138
sidespin 246
sit-and-reach test 186
situational analysis, first aid 262–3
sit-up test 184–5
skeletal system
  joint actions 144–7
  major bones involved in movement 140–1
  overview 138–40
  synovial joints 142–4
skinfold test 188–9
skin friction 241
slightly moveable joints 142
slings 277–8
small screen recreation (SSR), hours per day 34
snakebite 280, 366
social constructs
  nature of 18, 93
  and perceptions of health 17–20
social exclusion 75
social health 7
social interaction, in recreation activities 335
social justice principles 129–32
social marketing 116
social networks, establishing 48–9
social norms 91
sociocultural determinants of health
  culture 66–9
  family 61–2
  media 63–6
  nature of 61
  peers 63
  religion 66
socioeconomic determinants of health
  education 70–1
  employment 71
  income 72–5
  nature of 69–70
socioeconomic disadvantage, and health 25
socioeconomic status, and health 18–19
specific density 238
speed
  definition 226
  improving 192–3, 227
speed-dominated power 190
sphygmomanometers 168–9
spider bites 281
spin classes 313
spinal injuries 273
spiritual health 7, 9
sports fashion 301
stabilisers (muscles) 152
State governments, health promotion 111–12
static balance 197
steady state 212
step classes 313
stereotypes 16
STOP regime 270–1
strength-dominated power 190
strengths and weaknesses, understanding 376–7
stress management and relaxation 332–3
stroke 279
stroke volume 214–15
supportive environments
  creating 125
  and social justice 131–2
surface drag 241
swimming 305
synovial fluid 143
synovial joints 142–4
systemic circulation 166
systole action of heart 163
systolic pressure 167

tai chi 308
target heart rate (THR) 294
target heart rate zone 205–7, 294
tarsals 141
team building 373–4
team games 314–15
technology, access to 80–3
teeth injuries 276
telehealth consulting 81–2
tendons 143
thermoregulation 365
time, duration of training 207
tobacco smoke, as environmental pollution 83
tobacco smoking 39
topographical maps 358–60
topspin 245, 246
traffic accidents, rescue and first aid 282–3
training
  best type of exercise 208
  duration 207
  frequency 205
  immediate physiological responses to 211–19
  intensity 205–7
true north 361

ulna 141
unconscious victims
  care of 274–5
  priority with 265
underweight 38
urbanisation 332

vegetable consumption 36
veins 165–6
velocity 226
ventilation rate 213–14
vertical jump test 190–1
vigorous exercise 293, 294

wake 242
water consumption 348
water environments, rescue and first aid 283
weight training programs 307–8
white blood cells 161
wilderness first aid 365–6
working heart rate 212
workplaces, health promotion 121–2
World Health Organization
  definition of health 5
  definition of health promotion 100
  Global Outbreak Alert and Response Network (GOARN) 114
  health promotion 113, 115

yoga 309
young people
  health status 26–31
  physical activity recommendations 295

Index

Chapter 8 Composition and performance

aerobics
  basic skills 22
  criteria for judging 37–8
  purpose and motivating factors 21
  rules and conventions 28–9
  variations 23–4
analysis (appraisal) 33
apparatus and equipment 17–18
appraisal
  achievement of purpose 35
  analysis 33
  arrangement of movement 35
  aspects of 34–5
  creativity and innovation 34–5
  elements of composition 34
  establishing and applying criteria 35–8
  experiencing 33
  methods 31–4
  observation 31–3
  process of 31

composition, and movement mediums 2–3
creativity, appraisal 34–5

dance
  basic skills 22
  criteria for judging 38
  purpose and motivating factors 21
  rules and conventions 27–8
  variations 24
dimension 5–6
direction 3–4
duration 12
dynamics
  definition 7
  flow 9–10
  force 8–9

elements of composition
  appraisal 34
  dynamics 7–10
  overview 2–3
  relationships 16–20
  space 3–7
  time and rhythm 10–15
equipment 17–18
experiencing (appraisal) 33
externally paced movements 14

flow 9–10
force (composition and performance) 8–9
formations 6–7

games
  basic skills 22
  criteria for judging 37
  purpose and motivating factors 21
  rules and conventions 27
  variations 23
general space 3
gymnastics
  basic skills 22
  criteria for judging 36–7
  purpose and motivating factors 21
  rules and conventions 28
  variations 24

improvisation 20, 25–6
innovation, appraisal 34–5

level (in space) 4
locomotor skills 22

momentum (composition and performance) 13
movement
  achievement of purpose 35
  appraisal of arrangement 35
  generation relevant to purpose 22–3
  process of creating 20–6
  purpose or motivating factors 20–2
  spatial elements 3
movement exploration 23–5
movement mediums
  basic skills 22
  nature of 2
  purpose and motivating factors 21
  rules and conventions 26–9
movements, combining and arranging 26–31

nonlocomotor skills 22

observation (appraisal) 31–3

partner work 18–20
patterns 6–7
performance 2
personal space 3
phrases (movement) 26
positional play 18–20

relationships
  apparatus and equipment 17–18
  movement relationships 16
  other people 16–17
  team formations, positional play and partner work 18–20
repetition 30
rhythm 10–11

self-paced movements 14
sequences 26
sequencing 29
space
  definition 3
  dimension 5–6
  direction 3–4
  level 4
  patterns and formations 6–7

team formations 18–20
time and rhythm
  duration 12
  in movement mediums 10
  momentum 13
  musical applications 10–11
  rhythm 10
  self-paced vs externally paced movements 14–15
  timing 15
transitions 30

variation 30–1