



Accredited

OCR LEVEL 3 CAMBRIDGE TECHNICAL CERTIFICATE/DIPLOMA IN SPORT

THE PHYSIOLOGY OF FITNESS

R/502/5486

LEVEL 3 UNIT 4

GUIDED LEARNING HOURS: 30

UNIT CREDIT VALUE: 5



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LEVEL 3

AIM OF THE UNIT

Understanding how the body is affected by exercise both in the short term and through long term physical activity, is vital in a number of sport related vocations. This unit builds on the knowledge developed in Unit 1 Anatomy and Physiology, and extends it further to look at the changes that occur in the body as a consequence of long term physical activity. Learners will have the opportunity to not only consider the theory about the effects of exercise on the body, but have the opportunity to conduct tests that measure levels of fitness in different areas and compare the ratings to different population groups. Being able to undertake these tasks is particularly crucial as a gym instructor, coach or teacher.

PURPOSE OF THE UNIT

The purpose of this unit is for learners to further become familiar with the anatomy and physiology of the human body and learn the effects of exercise on the various body systems both in the long term and short term as well as being able to scientifically test and prove the adaptations. Learners could also look at how exercise routines differ as the body adapts over time and how an elite performers exercise routine and body adaptations are significantly different to that of the average learner/performer.

ASSESSMENT AND GRADING CRITERIA

Learning Outcome (LO) The learner will:	Pass The assessment criteria are the pass requirements for this unit. The learner can:	Merit To achieve a merit the evidence must show that, in addition to the pass criteria, the learner is able to:	Distinction To achieve a distinction the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
1 Know the body's response to acute exercise	P1 describe the musculoskeletal and energy systems response to acute exercise		
	P2 describe the cardiovascular and respiratory systems responses to acute exercise		
2 Know the long-term effects of exercise on the body systems	P3 describe the long-term effects of exercise on the musculoskeletal system and energy systems	M1 outline the adaptations to cardiovascular, respiratory, musculoskeletal and energy systems, brought about by regular exercise	D1 compare the effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems for a selected performer against an elite performer
	P4 describe the long-term effects of exercise on the cardiovascular and respiratory systems		
3 Be able to investigate the physiological effects of exercise on the body systems	P5 collect physiological data to investigate the effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems, with tutor support	M2 explain the effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems for a selected performer	
	P6 review physiological data collected, describing the effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems		

TEACHING CONTENT

The unit content describes what has to be taught to ensure that learners are able to access the highest grade.

Anything which follows an i.e. details what must be taught as part of that area of content.

Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples to their work though these do not need to be the same ones specified in the unit content.

LO1 Know the body's response to acute exercise

Musculoskeletal response: (e.g. increase in muscle pliability, increased range of movement)

Energy systems: i.e. phosphocreatine, lactic acid, aerobic, energy continuum, energy requirements of different sport and exercise activities

Cardiovascular response: (e.g. heart rate anticipatory response, activity response, blood pressure changes, vascular shunt mechanism, stroke volume and cardiac output increase)

Respiratory: (e.g. increase in breathing rate and frequency)

LO2 Know the long-term effects of exercise on the body systems

Muscular system: (e.g. hypertrophy and or hyperplasia, increase in tendon strength, increase in myoglobin stores, increased number of mitochondria, increased muscle strength, increased tolerance to lactic acid)

Cardiovascular system: (e.g. cardiac hypertrophy, the link between stroke volume, maximum cardiac output and heart rate, capillarisation, increase in blood volume)

Respiratory system: (e.g. increase in minute ventilation through increased strength of respiratory muscles, increase in oxygen diffusion rate through capillarisation around alveoli)

Energy systems: i.e. changes to energy systems (e.g. threshold changes, enzyme changes, fuel used)

LO3 Be able to investigate the physiological effects of exercise on the body systems

Methods of investigation: i.e. tests that measure physiological levels (e.g. Cooper 12 minute run, one repetition max, goniometer, Illinois agility test), comparison of pre-exercise, exercise and post exercise readings (e.g. heart rate, respiration rate, perceived exertion)

Review: i.e. Usefulness of tests and comparison (e.g. reliability, validity, advantages and disadvantages of tests selected), areas for improvement

DELIVERY GUIDANCE

LO1 This learning outcome should ideally be completed after Unit 1 as the structure and function content contained within and some of the details relating to the effects of exercise are closely related. Learners should consider the effects of exercise in relation to different intensities and durations. A leaflet provides an ideal way in which to give details on fixed changes in body systems and how they relate to exercise. In learning about the effects of exercise practical situations where learners record how their bodies are affected might develop knowledge more readily, this could provide practical examples for them to relay.

LO2 This learning outcome extends on the knowledge developed in LO1. Learners are now looking at how regular exercise impacts on the body. Learners should be clear on the difference between acute or short-term changes and chronic or long-term changes. There are a considerable number of books and DVDs that identify how the body changes. Learners might also be able to share their experiences of the effects of regular exercise. Ideally a period of exercise might be undertaken so that learners could see for themselves what might happen.

LO3 Ideally this learning outcome needs to be as practical as possible and learners should experience as many tests possible through a range of fitness components. The use of the internet, and books has broadened the access to a number of tests. A trip to a local HE institute where more complex tests with specialist equipment are available (such as isokinetic dynamometer, bod pod and Direct VO₂ Max test) can demonstrate the huge range of tests available. Learners should also consider the value of the tests within the context they are conducted and how valid and reliable the results might be not only through how well they are conducted but their relevance to the individual. The most capable learners will be able to contrast their results against those of another individual.

GUIDANCE ON ASSESSING THE SUGGESTED TASKS

The table below shows suggested scenarios that cover the pass, merit and distinction criteria in the assessment and grading grid.

As an assistant fitness instructor it is important that you are able to apply the anatomy and physiology knowledge you have developed into practical situations when working with a client. You should not only know about how exercise affects the body and explain this to your client, you should also be ready to measure their fitness through appropriate tests and understand what this means for the individual.

Criteria	Assignment title	Scenario	Assessment
P1 and P2	Short term effects of exercise.	You have been asked to provide a description of the effects of exercise in the form of a leaflet so that clients new to the gym can know how their body is affected by exercise.	A leaflet that describes the way in which exercise affects each of the body systems (muscular, cardiovascular, respiratory and energy) on a short term basis.
P3 and P4	Long term effects of exercise.	Provide a report that demonstrates to your mentor that you have knowledge of the way body systems are affected long term by exercise.	Provide a report on the long term effects of exercise on the body systems (muscular, cardiovascular, respiratory and energy).
P5 and P6	Effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems.	In your role as an assistant fitness instructor you will be required to select and take clients through a range of tests in order to know how fit they are. You will also need to review the data you have collected.	Simulation of the role between assistant fitness instructor and client. Selecting appropriate tests and reviewing the outcomes.
M1	Adaptations to cardiovascular, respiratory, musculoskeletal and energy systems.	Your mentor has requested that you tell them about the benefits of undertaking exercise for a period of time.	As part of report.
M2	Effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems.	Using the information you have obtained for P5 and P6 explain the results of the test and how this relates to how their body has or might change, through adaptations to exercise.	As part of simulation.
D1	Compare the effects of exercise on the musculoskeletal, cardiovascular, respiratory and energy systems.	Give feedback to a client about the results of their test in comparison to an elite performer in a selected sport.	Could be done as either a simulation or feedback report.

RESOURCES

Books

- Foran, B. (2000) *High-Performance Sports Conditioning* Human Kinetics Europe Ltd
- Noakes, T., Hawley, J., Burke, L (1998) *Peak Performance: Training and Nutritional Strategies for Sport* Allen & Unwin
- Adams G M – *Exercise Physiology Laboratory Manual: Health and Human Performance* (McGraw Hill Higher Education, 2001) ISBN 9780072489125
- Allen M B – *Sports Exercise and Fitness: A Guide to Reference and Information Sources* (Libraries Unlimited Inc, 2005) ISBN 9781563088193
- Davis J – *Fitness for Games Players* (NCF, 1996) ISBN 9780947850104
- Franks B D, Howley E T – *Fitness Leader's Handbook* (Human Kinetics Europe, 1998) ISBN 9780880116541
- Fulcher K, Fox P – *Your Personal Trainer: The Ultimate Guide to Getting Fit for any Sport* (Metro Books, 2002) ISBN 9781843580027
- Hazeldine R – *Fitness for Sport* (The Crowood Press, 2000) ISBN 9781861263360
- Moran G T, McGlynn G – *Cross Training for Sports: Programmes for 26 Sports* (Human Kinetics, 1997) ISBN 9780880114936
- Sharkey B J and Gaskill S E – *Fitness and Health* (Human Kinetics, 2006) ISBN 9780736056144
- Wansworth A – *The Complete Practical Encyclopedia of Fitness Training: Everything You Need to Know About Strength and Fitness Training in the Gym and at Home, from Planning Workouts to Improving Technique* (Lorenz Books, 2010) ISBN-10: 0754818810
- Watson A W S – *Physical Fitness and Athletic Performance: A Guide for Students, Athletes and Coaches* (Longman, 1996) ISBN 9780582091108

DVDs/Videos

- Pushing the Limits in Athletic Performance DVD* (2002). Video Education Australasia (available from Coachwise)
- Recovery from Exercise DVD* (2003). Video Education Australasia (available from Coachwise)

Journals/magazines/booklets/brochures

sports coach UK. *coaching edge Magazine*
 coaching edge is produced quarterly and includes top coaches outlining their innovative coaching methods,

tried and tested theories to improve coaching, how sports science can really make a difference, well presented technical information with something for every coach or sports enthusiast no matter what their level of experience.

UK Sport. *Performance*

UK Sport's regular publication aimed at the elite sport community. The magazine includes news and features on the latest issues impacting on high-performance sport in the UK.

Websites

BBC Sport Academy. news.bbc.co.uk/sportacademy
 Advice on technique for different sports.

English Institute of Sport. www.eis2win.co.uk
 This website has information on applied physiology, biomechanics, medical consultation, medical screening, nutritional advice, performance analysis, psychology, podiatry, strength and conditioning coaching, sports massage and sports vision.

Peak Performance online. www.pponline.co.uk/
 Peak Performance is a subscription-only newsletter for athletes and coaches, featuring the latest research from the sports science world.

scenta (science, engineering and technology).
www.scenta.co.uk/sport.cfm
 This website has an excellent section on sports technology news and features.

Sports Coach. www.brianmac.demon.co.uk
 Provides information on a range of topics related to developing athletic ability and coaching expertise.

sports coach UK. www.sportscoachuk.org
 Links for coaching contact information/fact sheets and resources for coaches..

The Gatorade Sports Science Institute.
www.gssiweb.com/
 GSSI staff scientists study the effects of exercise, the environment and nutrition on the human body using the latest scientific technology and equipment.

Top End Sports. www.topendsports.com
 Lots of information on a range of sports, fitness testing, fitness training, sports nutrition and sport science.

American College of Sports Medicine.
www.acsm.org

Sports Coach UK. www.sportscoachuk.org
Links for coaching contact information/fact sheets and
resources for coaches

St. John Ambulance. www.sja.org.uk

YMCA Fitness Industry Training. www.ymcafit.org.uk

Fitness.com www.fitness.com

Fit for sport www.fitforsport.co.uk

Human Kinetics www.humankinetics.com

Livestrong www.livestrong.com

Teach Pe www.teachpe.com

MAPPING WITHIN THE QUALIFICATION TO OTHER UNITS

Unit 1: Principles of Anatomy and Physiology in Sport

Unit 5: Sports Nutrition

Unit 9: Exercise for Specific Groups

Unit 14: Instructing Physical Activity and Exercise

Unit 15: Sports Injuries

Unit 16: Analysis of Sports Performance

Unit 18: Sport and Exercise Massage

Unit 23: Fitness Training and Programming



CONTACT US

Staff at the OCR Customer Contact Centre are available to take your call between 8am and 5.30pm, Monday to Friday.

We're always delighted to answer questions and give advice.

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