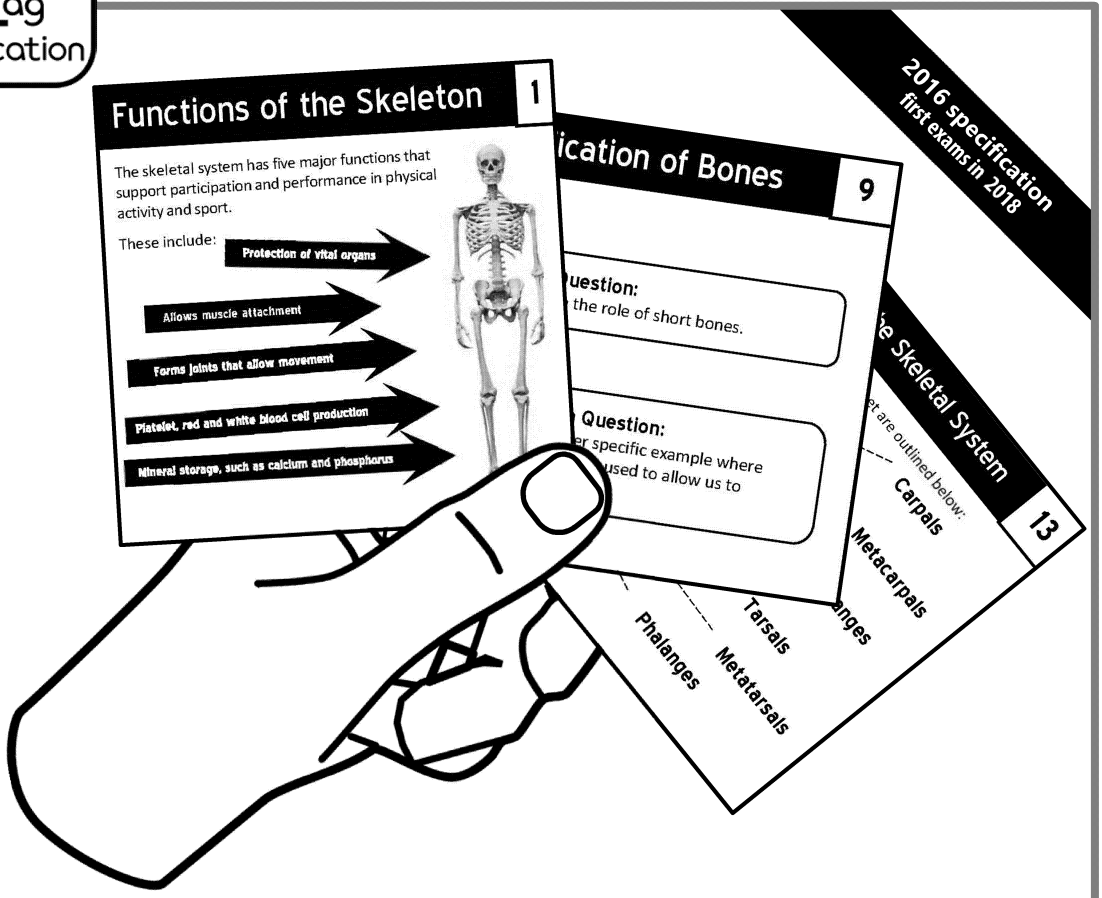
PE

GCSE (9–1) | Edexcel | 1PE0



Revision Cards for Edexcel GCSE PE: Component 1

Fitness and Body Systems

zigzageducation.co.uk

POD 8285

Contents

Teacher's Introduction

How to Use These Cards

These revision cards have been written to support revision of Component 1 of the Ed
cards provide coverage of the whole of Component 1 specification content.

These cards provide many flexible ways to help motivate your students when revising
key topics in class or at home. Using the cards in different ways can help students de
understanding of the examination content.

Flexible ways to use:

- **As a homework** – students to read the relevant cards in preparation for your ne
- **As a starter** – students to read the cards relating to the previous lesson's course
  away, before you quiz them on the content using the extension questions to cha
- As a set of concise notes which students can **use to support the answering of pr**
  practise the technique of converting information into a well-written answer.
- As a **general revision aid** leading up to the exam. Cards can be laminated allowi
  them around when preparing for their exam so that revision can be performed ju
  travelling home from school.
- **In pairs:**
  - As a **student-led quiz** where the students can use the cards to test each oth
    questions on the cards (or, alternatively, by writing their own questions).
  - As summary notes which students can use to **teach the key information** to
- **In groups or as a class:**
  - As a **recall exercise** performed in small groups where one student must tea
    the card. The second student should then memorise the content (without v
    teach it to the third student, and so on. The last student should then write
    how accurate they were in listening to the card's content by answering the
    student should then rotate to swap places in the line.
  - As part of a **hot-seat game**, where students must take it in turns to sit in the
    questions. They can work in groups and see which group is able to answer t
    testing students' confidence on key topics.

The cards are designed to be cut out and folded in half, so that the questions become
given above. There are two types of question provided on the cards:

1. **Card questions** – designed to test knowledge on the card itself
2. **Extension questions** – offer a springboard to inspire further reading and challeng
   information and draw links between different areas of the specification

However, you may wish to cut out the cards without the questions, so that students c
the back of the cards, adding to the flexibility of the resource.

It is suggested that these revision cards are photocopied onto card to make them dur

Specification Cross Reference

Topic 1 – Applied Anatomy and Physiology
1.1.1 Functions of the Skeleton
1.1.2 Classification of Bones
1.1.3 Structure of the Skeletal System
1.1.4 Classification of Joints
1.1.5 Movement Possibilities
1.1.6 Ligaments and Tendons
1.1.7 Classification of Muscles
1.1.8 Location of Muscles
1.1.9 Antagonistic Pairs
1.1.10 Characteristics of Muscle Fibres
1.2.1 Cardiovascular System Functions
1.2.2 Cardiovascular System Structure
1.2.3 Artery, Capillary and Vein Structure
1.2.4 Vascular Shunt
1.2.5 The Role of Blood
1.2.6 Composition of Inhaled/Exhaled Air
1.2.7 Vital Capacity and Tidal Volume
1.2.8 Location of Respiratory System
1.2.9 Structure of the Alveoli
1.2.10 and 1.4.4 Cardiovascular and Respiratory Systems
1.3 Energy
1.4.1–3 and 1.4.6 Short-term Effects of Exercise
Topic 2 – Movement Analysis
2.1.1 Lever Systems
2.1.2 Mechanical Advantage/Disadvantage
2.2 Movement
Topic 3 – Physical Training
3.1.1 Fitness, Health, Exercise and Performance
3.2.1 Fitness Components
3.2.2 and 3.2.4 Fitness Tests
3.2.3 Data Collection and Interpretation
3.3.1–2 Principles of Training
3.3.3 Training Methods
3.4.1–3.4.4 Long-term Effects of Training
3.5.1 PAR-Q
3.5.2 Injury Prevention
3.5.3 Injuries
3.5.4 RICE
3.5.5 Performance-enhancing Drugs
3.6.1–3 Warm-ups and Cool-downs

- 1.1.11 is covered throughout cards 1–27
- 1.4.4 is covered throughout cards 53, 54 and 56
- 1.4.5 is covered on cards 105–109
- 3.2.5 is covered on cards 88–104
- 4.1 is covered where appropriate throughout the cards

Functions of the Skeleton 1

The skeletal system has five major functions that support participation and performance in physical activity and sport.

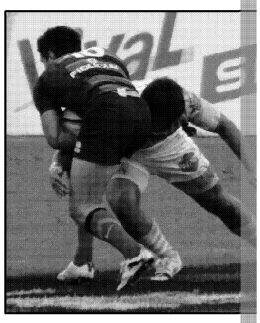
These include:

- Protection of vital organs
- Allows muscle attachment
- Forms joints that allow movement
- Platelet, red and white blood cell production
- Mineral storage, such as calcium and phosphorus

Functions of

The body contains flat bon
internal organs when we p

- The ribs protect interna
- The cranium (skull) pro



Functions of the Skeleton 3

The bones provide a **site for muscles to attach** to via tendons, and the muscles are able to cause movement when they contract by pulling on the bones.

- The biceps are able to move the lower arm by pulling on the **radius** and **ulna**
- The hamstrings are able to move the lower leg by pulling on the **tibia** and **fibula**

Application:

Muscle attachment is important for all sports in order to move the body and perform skills. This allows athletes to evade opponents in sports such as football, and to move body parts in order to perform skills such as a tennis serve.

Functions of

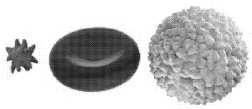
The bones **interact with ea**
moveable and allow sectio
in specific directions, deper

Application:

The radius, ulna and humerus meet at the elbow joint and allow flexion and extension to occur in order to perform sporting movements such as throwing a basketball, performing a biceps curl and performing the ball toss before a tennis serve.

Functions of the Skeleton 5

Platelets, red blood cells and white blood cells are produced within the bone marrow which is found within the central area of the bone.



Application:

Red blood cells are the **oxygen-carrying component** of the blood and are, therefore, especially important in aerobic sports, such as long-distance running, which require a large supply of oxygen.

White blood cells play an important role in **immune functioning** and are, therefore, important as they limit the amount of time an athlete will miss due to illness.

Platelets are important for **forming blood clots** and are, therefore, important when an athlete cuts themselves during sporting activity as they prevent major blood loss.

Functions of

Bones store minerals, such
are important for growth a

Application:

Calcium and **phosphorus** a
of healthy bones as they b
This role is particularly imp
American football, and sports where bones must withstand repetitive loading, such as marathon running. Calcium is also important during muscular contractions.

Functions of the Skeleton 2

Card Question:
Provide specific examples of bones which provide protection.

Extension Question:
Describe another sporting example where protection is important.

Functions of the Skeleton 4

Card Question:
Identify joints in the body and the movements each can perform.

Extension Question:
Assess how different joints in our bodies allow us to perform different movements in sport.

Functions of the Skeleton 6

Card Question:
Describe the importance of calcium and phosphorus for healthy functioning of the body.

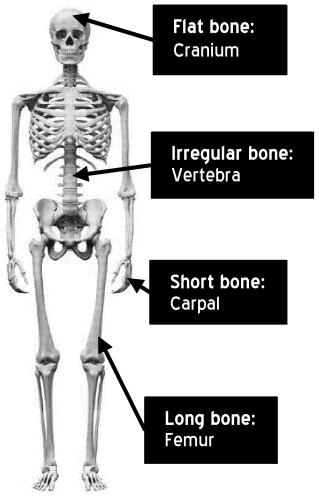
Extension Question:
What dietary sources provide calcium and phosphorus for the body?

Classification of Bones 7

The bones of the body can be classified into four different types, each of which has its own particular function and relevance for physical activity.

The types of bone and their functions are:

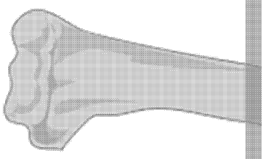
- **Long bones** – for leverage
- **Short bones** – for weight bearing
- **Flat bones** – for protection and muscle attachment
- **Irregular bones** – for protection and muscle attachment



Classificatio

Long bones are important
muscles pull on them in o
force on external objects.

The major long bones in th
fibula in the legs, and the h



Application:

These are important in all
movement and perform sk

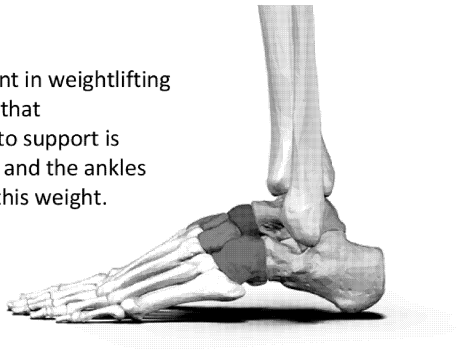
Classification of Bones 9

Short bones are important for providing a **weight-bearing** role which allows the body to support its own weight and also carry external weights without causing damage.

These are small bones which have a similar width and length, such as the tarsals found in the ankles, and the carpals found in the wrist.

Application:

They are important in weightlifting when the weight that the skeleton has to support is greatly increased and the ankles need to support this weight.



Classificatio

Flat bones provide a **site f**
allow movement to occur
also **offer protection of th**

Examples of these bones a
protect the heart and lung
muscles to attach to.

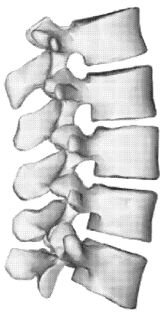
Application:

They are important for contact sports such as kick-boxing as they allow quick movements, such as kicking to occur by anchoring the muscle and also protect vit organs from damage when contact is made with kicks.

Classification of Bones 11

Irregular bones have a similar function to flat bones as they also provide a **site for muscle attachment** and **protect the vital organs**.

Irregular bones have unique structures which are designed for a specific function, such as the vertebrae which are designed for small movements and to protect the spinal column which runs through the vertebrae.

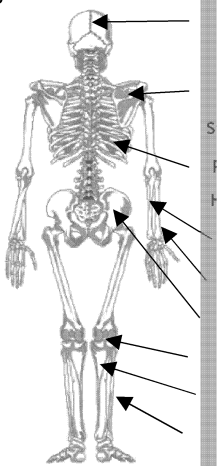


Application:

The vertebrae are important in most sports by offering protection to the spinal cord, e.g. in football, they prevent significant injury occurring when a defender's knee makes contact with the back of an attacking player when challenging for a header.

Classificatio

The major bones of the s
diagram below:



Classification of Bones 8

Card Question:
Describe the role of long bones.

Extension Question:
Assess the value of long bones in allowing performance in a sport of your choice.

Classificatio

Card Questi
Identify the fo

Extension Q
Classify the ma
these four cat

Classification of Bones 10

Card Question:
Describe the role of flat bones.

Extension Question:
Discuss another specific example of where flat bones are used in sport.

Classificatio

Card Questi
Describe the ro

Extension Q
State another
short bones ar
perform in spo

Classification of Bones 12

Card Question:
Identify the location of all the major bones of the body.

Extension Question:
For each bone of the body, state one function that allows you to participate in a sport of your choice.

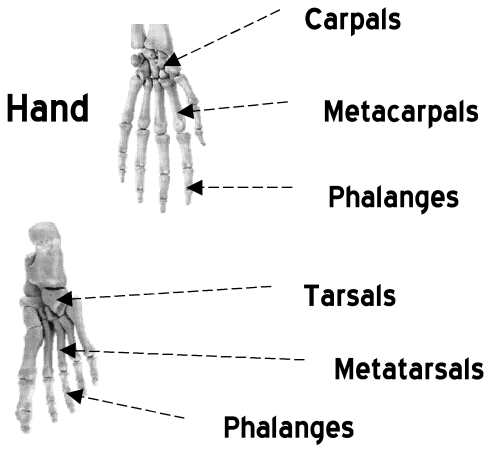
Classificatio

Card Questi
Describe the ro

Extension Q
Explain how th
gymnast to saf

Structure of the Skeletal System 13

The bones of the hands and feet are outlined below:



Structure of the

The regions of the vertebr

Cervical (seven vertebrae
movement for head movem

Thoracic (12 vertebrae) –
provides protection for vital

Lumbar (five vertebrae) – s

Sacrum (five fused vertebr
supports body weight

Coccyx (five fused vertebra
attachment

Classification of Joints 15

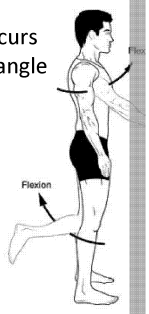
There are four types of joint that you need to know about:

- **Pivot joints** – These joints occur between the ***atlas*** (first cervical vertebra) and ***axis*** (second cervical vertebra) ***joint*** in the neck, and between the **radius and ulna**. They allow **rotation** to occur.
- **Hinge joints** – These joints occur at the ***elbow***, ***knee*** and ***ankle***, and allow **flexion / plantar flexion** and **extension/dorsiflexion** to occur.
- **Ball-and-socket joints** – These joints occur at the ***hip*** and ***shoulder***, and allow **abduction/ adduction**, **flexion/extension**, **rotation** and **circumduction** to occur.
- **Condyloid joints** – These joints are found at the **wrist** and allow **flexion** and **extension** to occur.

Each type of joint is able to perform specific forms of movement as a result of the way that the articulating bones interact with each other.

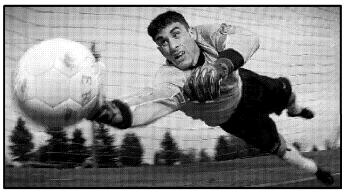
Movement Possi

Flexion occurs when the angle of a joint decreases



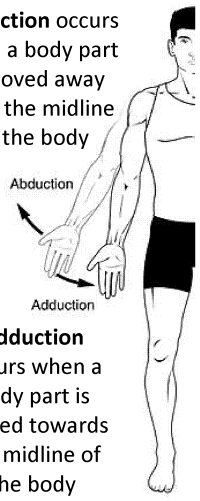
Sporting Example:
The preparation (flexion)
phase (extension) of a bas

Movement Possibilities 17



Sporting Example:
A football goalkeeper lifting their arms away from their body or towards their body in order to save a shot.

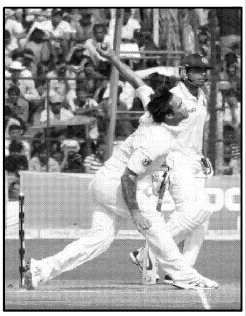
Abduction occurs when a body part is moved away from the midline of the body



Adduction occurs when a body part is moved towards the midline of the body

Movement Possi

Rotation occurs when a
part is moved in a circul
motion around an axis.



Structure of the Skeletal System 14

Card Question:
Describe the location of the five regions of the vertebral column.

Extension Question:
Discuss the movements available at each region of the vertebral column and explain each region's functions in sport participation.

Structure of the

Card Questi
Identify the bo

Extension Q
How does the
feet allow a gy

Movement Possibilities 16

Card Question:
Define 'flexion' and 'extension' and give an example of these movements in sport.

Extension Question:
List as many other sporting examples of flexion and extension as you can for all of the joints that each movement occurs in.

Classification of

Card Questio
Identify the fou
they can be fou

Extension Qu
Assess the type
performed at e

Movement Possibilities 18

Card Question:
Define 'rotation' and give an example of this movement in sport.

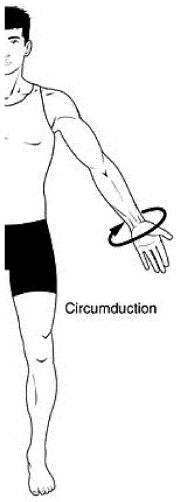
Extension Question:
List as many other sporting examples of rotation as you can for all of the joints that it occurs in.

Movement Possi

Card Questio
Describe adduc

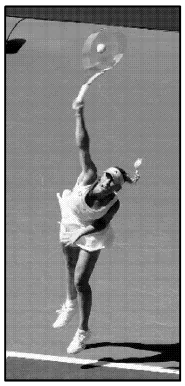
Extension Qu
List as many oth
abduction and
of the joints tha

Movement Possibilities 19

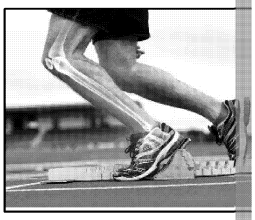


Circumduction occurs when a body part is moved in a conical shape.

Sporting Example:
Circular movement of a tennis player's arm when serving.



Movement Possi

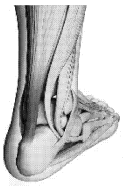


Sporting Example:
Performing a sprint start
the beginning of a 100 m
race requires the athlete
perform plantar flexion i
order to push off the blo

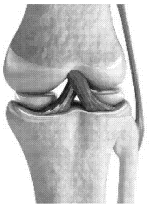
Ligaments and Tendons 21

There are two types of connective tissue which play a role during physical activity:

- **Tendons** – these attach muscles to bone and are responsible for transferring the force created by the muscles in order to move the bone.

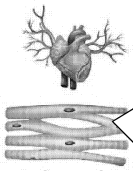


- **Ligaments** – these attach bones to other bones in order to stabilise joints and reduce the risk of injury during movement by restricting the range of movement.



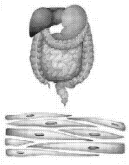
Classification of

There are three types of m



This type o
conscious t
of the hear
supply of bl
during exer

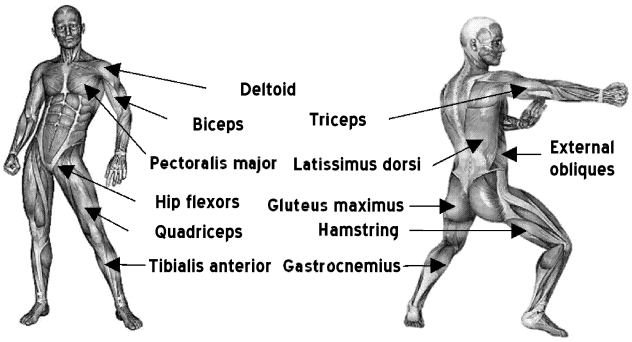
This type of muscle is **und**
control and allows **mover**
parts when required durin
However, it **can become**



This type o
conscious t
processes
It aids **ven**

Location of Muscles 23

The location of the major muscles of the body are identified on the diagram below:



Antagonistic Pai

Muscles work in pairs calle
produce movements. Wit

- **agonist** – this is the **pr**
cause movement
- **antagonist** – this oppo
order to **control the m**

The following is an exampl

Movement Possibilities 20

Card Question:
Define 'plantar flexion' and 'dorsiflexion' and give an example of each of these movements in sport.

Extension Question:
List as many other sporting examples as you can of plantar flexion and dorsiflexion at the ankle.

Movement Possi

Card Questi
Define 'circum
example of th

Extension Q
List as many o
circumduction
joints that it o

Classification of Muscles 22

Card Question:
Describe the three types of muscle that occur within the body.

Extension Question:
What muscle fibre type will each of the muscle types be predominantly made up of?

Ligaments and T

Card Questi
Describe the ro
ligaments.

Extension Qu
What types of j
types of connec

Antagonistic Pairs 24

Card Question:
Describe how antagonistic pairs work.

Extension Question:
Identify as many examples as you can of antagonistic pairs in the body and state what movements they would produce.

Location of Musc

Card Questi
Identify the loc
muscles of the

Extension Qu
For each muscl
movement it a
while acting as

Characteristics of Muscle Fibres 25

Type I Muscle Fibres	
Summary	These muscle fibres are also known as slow-twitch fibres
Characteristics	• Large myoglobin content • Large number of mitochondria • Resistant to fatigue • Work aerobically
Benefits for athletes	They allow athletes to work at low intensities for prolonged periods of time
Suitable sports	Endurance cycling, long-distance running and swimming events

Characteristics

Type
Summary
Characteristics
Benefits for athletes
Suitable sports

Characteristics of Muscle Fibres 27

Type IIx Muscle Fibres	
Summary	These muscle fibres are also known as fast glycolytic fibres
Characteristics	• Small mitochondria supply • Small myoglobin content • Produce very forceful contractions • Produce very rapid contractions • Easily fatigued • Work anaerobically
Benefits for athletes	Allow athletes to produce maximal contractions and work anaerobically
Suitable sports	Weightlifting, sprinting (running, cycling and swimming)

Cardiovascular Sy

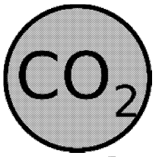
The cardiovascular syst
three main roles:

- **transporting** oxygen,
dioxide and nutrients
the body
- regulating body **tempe**
- **clotting** open wounds

Cardiovascular System Functions 29

Transporting oxygen, carbon dioxide and nutrients around the body is important in order to allow muscular contraction to occur.

Oxygen is required by the muscles in order to produce energy for muscular contractions.



Carbon dioxide is produced during exercise, lowering the pH of the blood (making it more acidic) and leading to fatigue if it is not removed.

Nutrients such as glucose are required in order to fuel muscular contractions for exercise.

Cardiovascular Sy

Regulation of body **temperature** is an important role of the cardiovascular system as it ensures that the core body temperature remains at 37 °C as large deviations from this temperature can disrupt bodily processes.

During exercise, the body

Temperature is regulated
blood vessels supplying bl
allows heat to be lost.

Characteristics of Muscle Fibres 26

Card Question:
Describe the characteristics of type IIa muscle fibres, and explain the benefit of these fibres for athletes.

Extension Question:
How can athletes increase the type IIa fibre content of their muscles?

Cardiovascular System Functions 28

Card Question:
Identify the three main roles of the cardiovascular system.

Extension Question:
Explain how the roles of the cardiovascular system allow us to participate in sport.

Cardiovascular System Functions 30

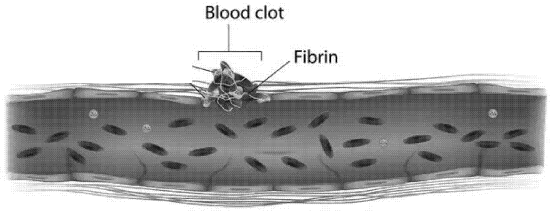
Card Question:
Explain the importance of being able to regulate body temperature during exercise.

Extension Question:
What impact does increased temperature have on an athlete's ability to exercise?

Cardiovascular System Functions 31

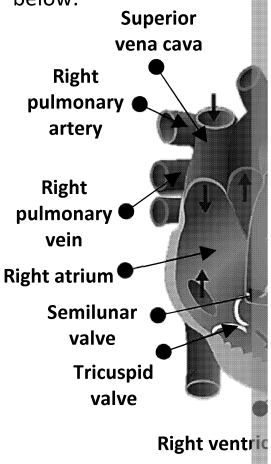
Clotting of open wounds needs to occur in order to avoid excessive blood loss every time the skin is cut. This role is performed by **platelets** which bind to the broken surface of the blood vessel.

This function of the cardiovascular system is particularly important in sports which involve contact, such as rugby, or sports where the skin is exposed to damage, such as cycling, where falls can lead to severe cuts.



Cardiovascular Sy

The main structures of the
below:



Cardiovascular System Functions 33

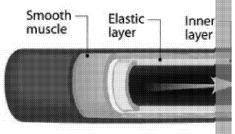
Use Card 32 to help you visualise the following pathway of blood through the cardiovascular system:

1. Deoxygenated blood returns to the right atrium via the vena cava.
2. The tricuspid valve opens, allowing blood to flow into the right ventricle.
3. Blood travels to the lungs via the left pulmonary artery when the ventricles contract and force open the semilunar valve.
4. Oxygen diffuses into the blood at the lungs.
5. Oxygen diffuses into the blood at the lungs.
6. The bicuspid valve opens, allowing blood to flow into the left ventricle.
7. Blood is pumped out of the heart and around the body when the ventricles contract and force open the semilunar valve.

Artery, Capillary a

The **arteries** have the follo

- The diameter of **lume**
- Blood is under **high pr**
- **Thick walls**
- **Vasodilation** and **vaso** blood flow during exe
- **Do not contain valves**
- Aid exercise by **carryi**

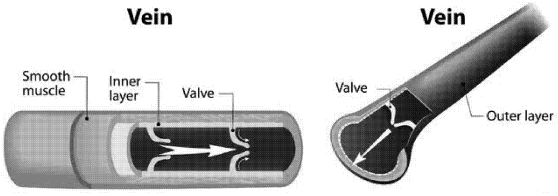


Artery

Artery, Capillary and Vein Structure 35

The **veins** have the following characteristics:

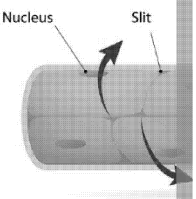
- The diameter of **lumen** is **large**
- Blood is under **low pressure**
- **Thin walls**
- **Contain valves** to prevent backflow under low pressure
- Transport **deoxygenated blood back to the heart** so that it can be pumped to the lungs
- **Transport waste products** of exercise for removal



Artery, Capillary a

The **capillaries** have the foll

- The **surface area** of the
- **Gaseous exchange** occu
- **Small lumen** slows bloo
- **Thin walls** enable gase
- **Do not contain valves**
- Allow **oxygen to diffuse** fuel muscular contracti



Cardiovascular System Functions 32

Card Question:
Describe the location of the main components of the heart.

Extension Question:
Discuss the role of the heart's components in maintaining blood circulation during performance in physical activity and sport.

Cardiovascular Sy

Card Questi
Explain the im
clot open wou

Extension Q
Some individua
in their blood.
describe these
more at risk wh

Artery, Capillary and Vein Structure 34

Card Question:
Describe the characteristics of the arteries.

Extension Question:
How are the arteries able to support the needs of the body during high-intensity exercise?

Cardiovascular Sy

Card Questio
Outline the pat
the cardiovascu

Extension Qu
Describe the imp
gradients in the
the cardiovascul

Artery, Capillary and Vein Structure 36

Card Question:
Describe the characteristics of the capillaries.

Extension Question:
How are the capillaries able to support the needs of the body during high-intensity exercise?

Artery, Capillary a

Card Questio
Describe the ch

Extension Qu
How are the vei
of the body duri

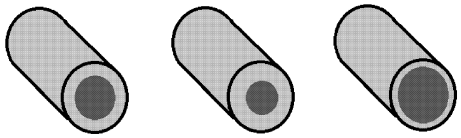
Vascular Shunt

37

Vascular shunt is the process through which blood is redistributed around the body in order to deliver oxygen and nutrients to the areas where they are needed most.

This redistribution is possible due to the vascular system's ability to perform:

- **vasodilation** – an **increase in the size of the lumen** of arteries supplying **working muscles** during exercise
- **vasoconstriction** – a **decrease in the size of the lumen** of arteries supplying **less active regions/organs** during exercise

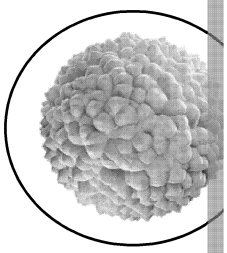


Normal cross section | Vasoconstriction | Vasodilation

The Role of Blo

White blood cells are invo
function of the body by a
breaking down foreign cel
body.

They ensure that athletes
are, therefore, able to trai

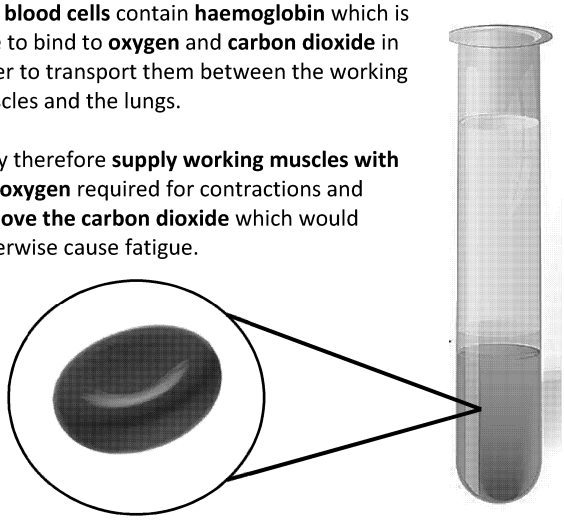


The Role of Blood

39

Red blood cells contain **haemoglobin** which is able to bind to **oxygen** and **carbon dioxide** in order to transport them between the working muscles and the lungs.

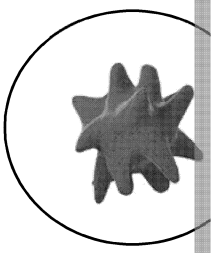
They therefore **supply working muscles with the oxygen** required for contractions and **remove the carbon dioxide** which would otherwise cause fatigue.



The Role of Blo

Platelets are responsible f
blood in order to avoid ex
when blood vessels are ru

They **prevent traumatic in**
when athletes cut themse
competition by quickly clo

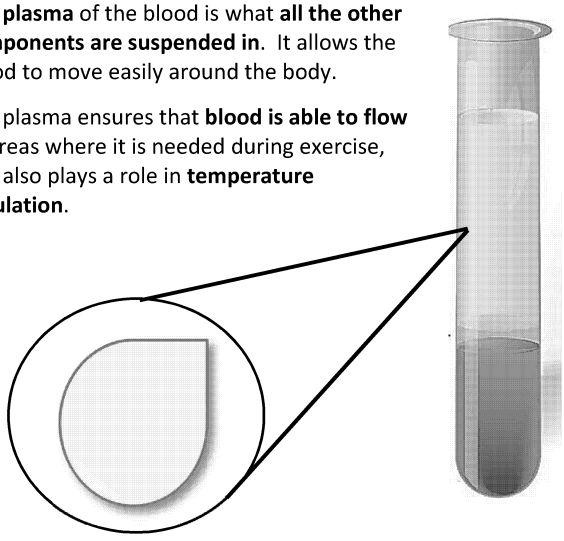


The Role of Blood

41

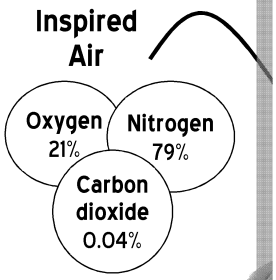
The **plasma** of the blood is what **all the other components are suspended in**. It allows the blood to move easily around the body.

The plasma ensures that **blood is able to flow** to areas where it is needed during exercise, and also plays a role in **temperature regulation**.



Composition of In

The composition of **inspired**
expired (exhaled) air at **rest**



The Role of Blood 38

Card Question:
Describe the function of white blood cells.

Extension Question:
Explain the importance of white blood cells for athletic performance.

Vascular Shunt

Card Questi
Explain what
shunting' duri

Extension Q
How does the
contribute to t

The Role of Blood 40

Card Question:
Describe the function of platelets.

Extension Question:
Explain the importance of platelets for athletic performance.

The Role of Bloo

Card Questio
Describe the fu

Extension Qu
Explain the impo
athletic perform

Composition of Inhaled/Exhaled Air 42

Card Question:
Outline the composition of inhaled air and exhaled air at rest.

Extension Question:
Explain why the composition of inhaled air differs from that of exhaled air.

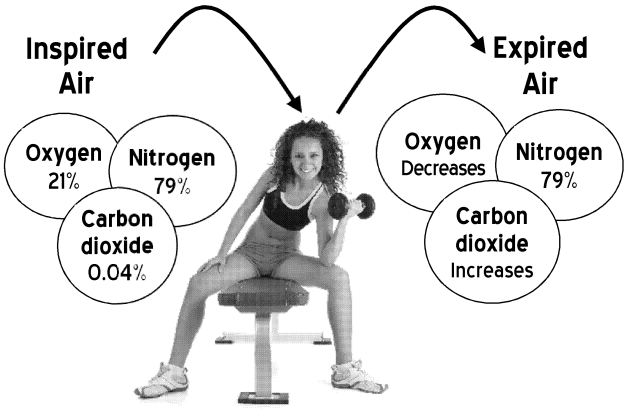
The Role of Bloo

Card Questio
Describe the fu

Extension Qu
Explain the impo
performance.

Composition of Inhaled/Exhaled Air 43

The composition of **inspired (inhaled) air** and the composition of **expired (exhaled) air** during **exercise** are shown below:

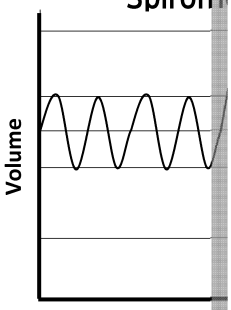


Vital Capacity a 44

Tidal volume is the amou
with each normal breath.

When we exercise, this v
more oxygen to the worki

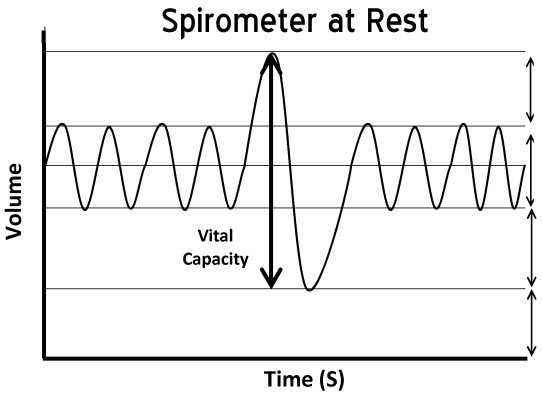
Spirom



Vital Capacity and Tidal Volume 45

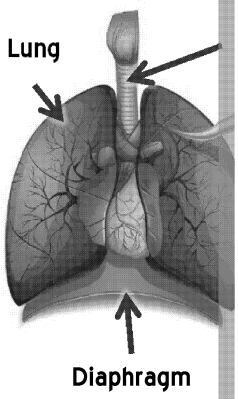
Vital capacity is the maximal volume of air that a person can expire following a maximal inspiration.

The vital capacity **does not change during exercise**.



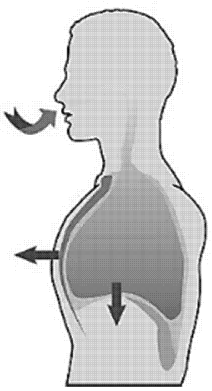
Location of Resp 46

The main structures of the
the diagram below:



Location of Respiratory System 47

Each structure of the respiratory system identified on Card 46 plays an important role in **inspiration**.



1. The intercostal muscles contract, which pulls the ribcage upwards and outwards.
2. The diaphragm contracts and flattens.
3. Movement of the intercostal muscles and diaphragm increases the volume of the lungs.
4. The increased lung volume reduces the air pressure within the lungs.
5. Air is able to move from the area of higher pressure (in the atmosphere) to the area of lower pressure (in the lungs).

Location of Resp 48

Each structure of the respira
plays an important role in **ex**

1. The intercostal muscles
the ribcage to move inw
downwards.
2. The diaphragm relaxes a
to its natural dome shap
3. Movement of the interc
and diaphragm reduces
the lungs.
4. The reduced lung volum
air pressure within the l
5. Air is able to move from
pressure (in the lungs) t
pressure (in the atmosp

As the intensity of exercise i
are recruited to **increase the**

Vital Capacity and Tidal Volume 44

Card Question:
Describe what the tidal volume is a measure of.

Extension Question:
What causes an increase in tidal volume during exercise?

Composition of In

Card Quest
State whethe
carbon dioxid
is greater or l
in inhaled air

Extension Q
Explain how t
would affect t
air and the co

Location of Respiratory System 46

Card Question:
Describe the route air takes to reach the bloodstream for gaseous exchange, identifying the respiratory system features along the way.

Extension Question:
Explain the role the nose and mouth play during respiration.

Vital Capacity a

Card Questi
Describe what
measure of.

Extension Qu
How can an ath
capacity?

Location of Respiratory System 48

Card Question:
Describe the stages of expiration.

Extension Question:
Identify the respiratory muscles which are utilised during exercise.

Location of Resp

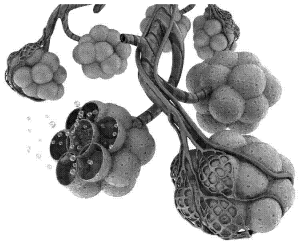
Card Questi
Describe the st

Extension Qu
How does the p
between rest a

Structure of the Alveoli

49

The following features of the alveoli aid their function:



Large surface area – provides a greater area for diffusion

Thin walls – reduce the diffusion distance

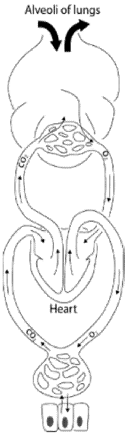
Blood supply – increases diffusion of gases

Capillary network – provides blood and oxygen

Short diffusion distance – increases the rate of diffusion

Cardiovascular and R

It is important to know ho systems are interlinked.



- Air enters passes to t
- Diffusion o and the ca
- Oxygenate is pumped muscles.
- Diffusion o dioxide to
- Carbon diox within the v
- Carbon dio the alveoli during exp

Energy: Aerobic

51

Aerobic energy production allows energy for muscular contractions to be produced when **oxygen can be supplied** to the working muscles. It is therefore utilised during **low-to-moderate-intensity exercise**.

It can be summarised by the following equation:
Glucose + Oxygen → Energy + Carbon dioxide + Water

Sports it is used for: It is an important energy system for long-duration events such as **marathon running** and **road cycling**, as well as for **team sports** where the majority of the event consists of jogging into position.

Food source: Carbohydrates and **fats** can be used as sources of energy for aerobic exercise.

Energy: Anaerob

Anaerobic energy product contractions to be produc is therefore utilised during

It can be summarise **Glucose →**

Sports it is used for: It is a system for short-duration **100 m sprint** and **50 m sw** as for **team sports** where sprints are performed.

Food source: Carbohydrat as a source of energy for a exercise.

Energy: Aerobic/Anaerobic

53

Although most sporting activity can be categorised as being either aerobic or anaerobic, a lot of athletes are required to use both energy systems depending on what actions they are performing.

Team sports such as football, hockey and rugby are good examples of sports which require both aerobic and anaerobic energy production.

For example:
When a defender **sprints back to close down an attacking player** in any of these sports, they will be using the **anaerobic energy system** to support this high-intensity exercise.

When players are **jogging around the pitch in order to maintain a defensive shape**, they will be using the **aerobic energy system** to support this light-to-moderate-intensity exercise.

Short-term Effe

During exercise, and in the experience the following e

- the production of **carb**
- **lactate** accumulation
- **muscle fatigue** due to accumulation
- **delayed onset of mus** (occurs 24–36 hours a

The result of this is a **reduc** lactate levels are reduced. **the intensity** of exercise o

Cardiovascular and Respiratory Systems 50

Card Question:
Explain how the cardiovascular and respiratory systems work together to allow participation in physical activity and sport.

Extension Question:
How do the cardiovascular and respiratory systems adapt to aerobic training?

Structure of the

Card Questi
Describe the f
aid the diffusi

Extension Q
What effect d
capillary netw

Energy: Aerobic 52

Card Question:
Describe what is meant by 'anaerobic activity' and provide an example of a sport it would be associated with.

Extension Question:
Identify different types of training that could be performed in order to improve anaerobic performance.

Energy: Aerobic

Card Questi
Describe what
activity' and pr
it would be ass

Extension Qu
Identify differe
could be perfo
aerobic perfor

Short-term Effects of Exercise 54

Card Question:
Describe the short-term effects of exercise on the muscles.

Extension Question:
How can a cool-down be used to limit the impact of these short-term effects?

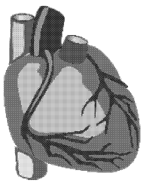
Energy: Aerobic/

Card Questi
Explain why so
of both energy

Extension Qu
Assess how a t
adapted in ord
systems.

Short-term Effects of Exercise 55

During exercise, and in the hours that follow, the **cardiovascular system** will experience the following effects:

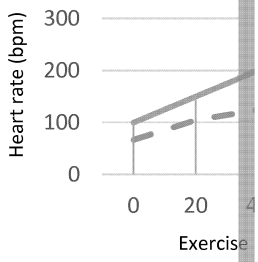


- **heart rate, stroke volume and cardiac output increase** in order to supply the working muscles with oxygen
- **vascular shunting** redirects blood to the working muscles via vasodilation and vasoconstriction
- **blood is redirected to the surface of the skin** in order to lose heat through sweat

These short-term effects ensure that adequate **oxygen is supplied to the muscles**, **carbon dioxide is removed** and heat is lost in order to **maintain the body's core temperature**. The **heart rate also remains elevated** following exercise in order to **repay the oxygen debt**.

Short-term Effec

The graph below shows ho
change during different int



The graph shows that hear
intensity increases, but str
intensity of 60% before pla
that increases in cardiac ou
the result of increasing hea

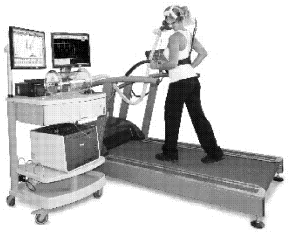
Short-term Effects of Exercise 57

During exercise, and in the minutes that follow, the **respiratory system** will experience the following effects:

- increased breathing rate
- increased depth of breathing

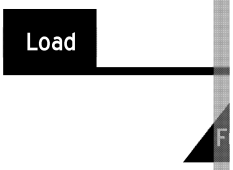
The result of this is the delivery of an adequate supply of oxygen to the working muscles during exercise.

It also repays the **oxygen debt** that occurs when anaerobic exercise occurs at the start of exercise through **excessive post-exercise oxygen consumption (EPOC)**. This ensures oxygen continues to be delivered to the muscles and lactate is removed after exercise stops.



Lever Systems

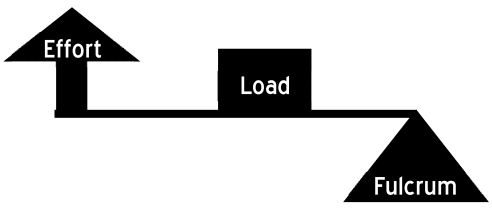
First-class levers have a

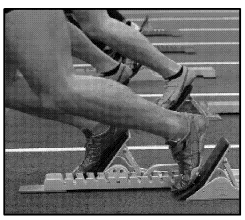


A sporting example of this class of lever is the elbow during a basketball shot, where the elbow is the fulcrum, the ball is the load and the triceps provides the effort.

Lever Systems 59

Second-class levers have an orientation as shown below:





A sporting example of this class of lever is a 100 m start, where the foot acts as the fulcrum, the athlete's body weight is the load and the effort is produced by the gastrocnemius.

Lever Systems

Third-class levers have a

A sporting example of th
class of lever is a biceps
curl where the elbow ac
as the fulcrum, the bice
acts as the effort and th
weight acts as the load.

Short-term Effects of Exercise 56

Card Question:
Explain how heart rate and stroke volume change as the intensity of exercise increases.

Extension Question:
What impact will an athlete's resting heart rate have on their maximal cardiac output?

Short-term Effe

Card Questi
Describe the sh
the cardiovascu

Extension Q
How can a cool
impact of these

Lever Systems 58

Card Question:
Describe the positioning of the fulcrum, load and effort in a first-class lever system.

Extension Question:
Describe another first-class lever system in sport.

Short-term Effe

Card Questi
Describe the sho
the respiratory s

Extension Qu
How are breathi
increased during

Lever Systems 60

Card Question:
Describe the positioning of the fulcrum, load and effort in a third-class lever system.

Extension Question:
Describe another third-class lever system used in sport.

Lever Systems

Card Questi
Describe the pos
and effort in a se

Extension Qu
Describe anothe
used in sport.

Mechanical Advantage/Disadvantage 61

In order to understand mechanical advantage and disadvantage, it is important to understand what the effort arm and load arm of a lever are:

- Effort arm – distance between effort and fulcrum
- Load arm – distance between load and fulcrum

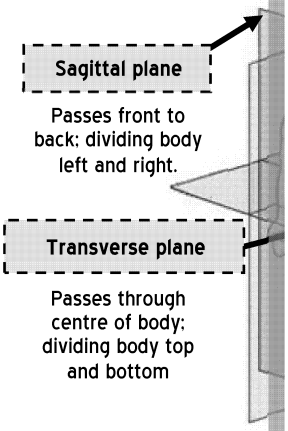
A mechanical **advantage** occurs when the effort arm is longer than the load arm. This allows **large loads to be moved with relatively little effort**.

A mechanical **disadvantage** occurs when the load arm is longer than the effort arm. This allows relatively **small loads to be moved quickly**.

- **First-class** levers –have either **an advantage or a disadvantage**
- **Second-class** levers – have a mechanical **advantage**
- **Third-class** levers – have a mechanical **disadvantage**

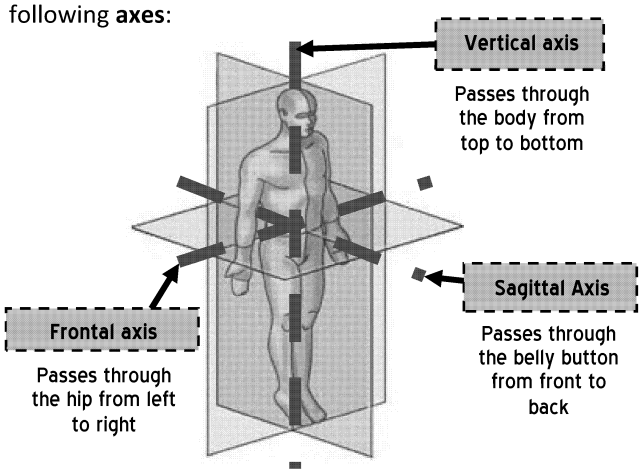
Movement: Plane

Movements can be perfor
planes:



Movement: Axes 63

Movements can be performed **around** one of the three following **axes**:



Movement: Analysis

A front or back somersault
about the **frontal axis**.

Movement: Analysis of Planes and Axes 65

A cartwheel will occur in the **frontal plane** about the **sagittal axis**.

Movement: Analysis o

A 360° twist will occur in th
vertical axis.

Movement: Planes

62

Card Question:
Describe the three planes of movement.

Extension Question:
List as many movements as you can that occur in each of the three planes.

Mechanical Advant

Card Quest
Explain what a
mechanical dis
lever systems h
have a disadva

Extension Q
Assess the use

Movement: Analysis of Planes and Axes

64

Card Question:
Identify the plane and axis that a back somersault occurs in.

Extension Question:
Provide another sporting example of a movement which occurs in the same plane and axis.

Movement: Axes

Card Questi
Describe the thr

Extension Qu
List as many mov
around each of t

Movement: Analysis of Planes and Axes

66

Card Question:
Identify the plane and axis that a 360° twist occurs in.

Extension Question:
Provide another sporting example of a movement which occurs in the same plane and axis.

Movement: Analysis

Card Questi
Identify the plan
occurs in.

Extension Qu
Provide another s
which occurs in th

Fitness, Health, Exercise and Performance 67

Health, fitness, exercise and performance are all *interlinked*.

Exercise will lead to adaptations which improve fitness.

Fitness levels will have a direct effect on performance by determining an individual's exercise capacity.

Fitness is how able you are at performing your everyday tasks.

Exercise is the performance of physical activity in any form.

Exercise improves physical, mental and social health.

Being unable to train due to ill health can reduce fitness levels.

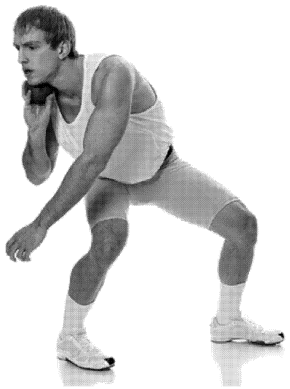
Performance is how well a skill is completed.

Health is your physical, mental and social well-being and not just the absence of disease.

Fitness Components: Strength 69

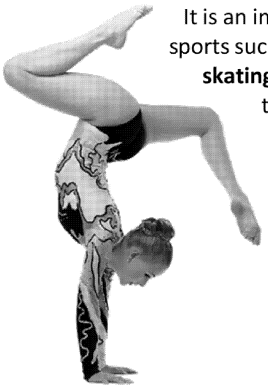
Strength is determined by how much force can be generated by the muscles in order perform an action.

It is an important component of fitness for sports which require large amounts of force to be applied against an external object such as **weightlifting**, **shot-put**, **boxing**, and **long jump**.



Fitness Components: Flexibility 71

Flexibility is determined by the range of movement that can be achieved at a joint. The more pliable an athlete's muscles and connective tissue are, the greater the range of motion that can be achieved.



It is an important component of fitness for sports such as **gymnastics**, **diving** and **figure skating** which require athletes to move their limbs into extended positions.

Fitness Componen

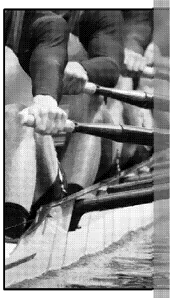
Cardiovascular fitness is determined by how well an athlete's body is able to supply oxygen to the working muscles in order to fuel aerobic exercise.

It is an important component of fitness for **endurance sports** such as open water swimming, and also for **team games** s athletes to work at low to periods of time.

Fitness Components:

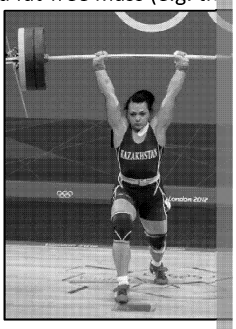
Muscular endurance is de repeatedly contract their m time without experiencing

It is an important compone such as **road cycling**, **mara country skiing**.



Fitness Components:

Body composition is the ra and fat-free mass (e.g. the



The type of body composit on the sport that the athle runner would benefit from very minimal fat mass, wh from having a higher propo

Fitness Components: Cardiovascular 68

Card Question:
Describe what cardiovascular fitness is and suggest a sport that would benefit from this component of fitness.

Extension Question:
What is the best method of training for improving cardiovascular endurance?

Fitness, Health, Exerci

Card Questi
Define the ter
and 'performa
relationships b

Extension Q
What can athl
health and per

Fitness Components: Muscular Endurance 70

Card Question:
Describe what muscular endurance is and suggest a sport that would benefit from this component of fitness.

Extension Question:
What is the best method of training for improving muscular endurance?

Fitness Compone

Card Questi
Describe what st
would benefit fro

Extension Qu
Suggest how str
endurance runn

Fitness Components: Body Composition 72

Card Question:
Describe what body composition is and suggest a sport that would benefit from this component of fitness.

Extension Question:
How would you go about measuring an individual's body composition?

Fitness Compon

Card Questi
Describe what fle
would benefit fro

Extension Qu
What is the best
improving flexib

Fitness Components: Agility 73

Agility is determined by how quickly an athlete can alter their direction of running without losing speed.

It is an important component of fitness in sports such as **American football** where cutting actions are required in order to evade opponents.

Fitness Compone

Balance is determined by a centre of gravity over thei maintain a stable body po

It is an important compone provides a platform from v performed.

Fitness Components: Coordination 75

Coordination is determined by how well an athlete is able to time the movement of different body sections with each other or how well they can time their movement with an external stimulus to which they must respond.

It is an important component of fitness for most sports, but it is especially important for open skills, such as those required in **tennis**, as the athlete must time their movement precisely with external objects.

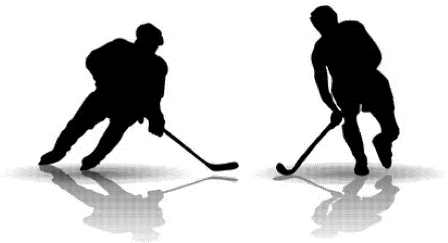
Fitness Compone

Power is determined by ar forceful contraction over a

It is an important compone such as **basketball**, **triple j**

Fitness Components: Reaction Time 77

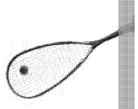
Reaction time is determined by how quickly an athlete can respond to a stimulus.



It is an important component of fitness in open sports such as **ice hockey** where athletes must quickly respond to the movement of the ball and their opponents. It is also important in externally paced skills such as the **100 m sprint** where athletes must respond to a starting signal.

Fitness Compone

Speed is determined by ho a certain distance.



It is an important compone require athletes to move a players have to try to run t themselves time to play a s

Fitness Components: Balance 74

Card Question:
Describe what balance is, and suggest a sport that would benefit from this component of fitness.

Extension Question:
Explain why balance is a fundamental skill to learn when young.

Fitness Compone

Card Questi
Describe what a
would benefit fr

Extension Q
What is the bes
improving agili

Fitness Components: Power 76

Card Question:
Describe what power is, and suggest a sport that would benefit from this component of fitness.

Extension Question:
Explain how power differs from strength.

Fitness Compon

Card Questi
Describe what co
sport that would
of fitness.

Extension Qu
Discuss how two a
differently for two

Fitness Components: Speed 78

Card Question:
Describe what speed is, and suggest a sport that would benefit from this component of fitness.

Extension Question:
Discuss which lever systems allow the most speed when being used, and give an example of this movement.

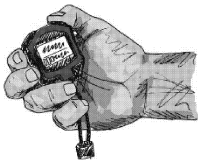
Fitness Componen

Card Questi
Describe what re
sport that would
of fitness.

Extension Qu
What is the best
improving reacti

Fitness Tests: Value of Fitness Tests 79

Fitness tests are conducted in order to determine an athlete's level of fitness in relation to a specific component of fitness.



The **advantages** of doing this include:

- can identify progress
- it can be fun
- can aid goal-setting
- can base a training programme on results
- can identify strengths/ weaknesses

The **disadvantages** of doing this include:

- testers need to be trained to produce valid results
- movements used in tests are often not sport specific
- tests often aren't sport specific
- lab conditions don't represent competitive conditions
- tests often use indirect measures

Fitness Tests: Coop

Test procedures

The Cooper **12-minute ru** can be used to test cardio

Participants have 12 minu swim as far as they can. T measured in metres travel 12 minutes. Scores are th against normative data.

Test evaluation

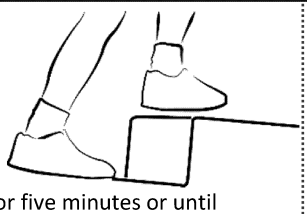
The **advantages**:

- Simple
- Delivered to multiple people at once
- Can run, swim or cycle

Fitness Tests: Harvard Step Test 81

Test procedures

The Harvard step test can be used to test cardiovascular fitness.



Participants should step up and down on a bench in time with a metronome 30 times per minute for five minutes or until exhaustion. Heart rate should be measured for 30 seconds one, two and three minutes into recovery. Scores are then assessed against normative data.

Test evaluation

The **advantages**:

- Simple
- Doesn't require a tester
- Little equipment needed

The **disadvantages**:

- Trip hazard
- Harder for short people
- Dependent on motivation

Fitness Tests: Illinoi

Test procedures

The Illinois agility run can to test agility.

Participants must complet running course (set up as i diagram to the right) as qu possible.

Test evaluation

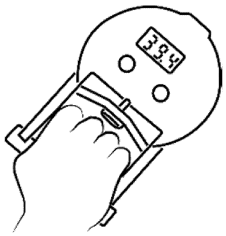
The **advantages**:

- Easy to conduct
- Can be fun

Fitness Tests: Grip Dynamometer 83

Test procedures

A grip dynamometer can be used to test strength.



Participants will have three attempts to record their highest score when gripping the dynamometer as hard as possible. Scores are then assessed against normative data.

Test evaluation:

The **advantages**:

- Simple
- Comprehensive results available for comparison

The **disadvantages**:

- Forearm strength not relevant for most sports
- Large learning effect

Fitness Tests: One-m

Test procedures

One-minute sit-up and pre tests can be used to meas muscular endurance.

Participants will have one repetitions of press-ups or Scores are then assessed a

Test evaluation:

The **advantages**:

- Simple
- Little equipment
- Test multiple people

Fitness Tests: Cooper 12-minute Test 80

Card Questions:

1. Identify the component of fitness that the Cooper 12-minute fitness test measures, and describe its procedures.

2. Explain the advantages and disadvantages of the Cooper 12-minute fitness test.

Extension Question:

Assess the suitability of the Cooper 12-minute fitness test for:

- a rugby player
- a triathlete
- a 100 m sprinter

Fitness Tests: Illinois Agility Run Test 82

Card Questions:

1. Identify which component of fitness can be tested using the Illinois agility run test, and describe the procedures of the test.

2. Explain the advantages and disadvantages of the Illinois agility run test.

Extension Question:

Assess the suitability of the Illinois agility run test for:

- a rugby player
- a triathlete
- a netball player

Fitness Tests: One-minute Sit-up/Press-up 84

Card Questions:

1. Identify which component of fitness can be tested using the one-minute sit-up/press-up test, and describe the procedures of the test.

2. Explain the advantages and disadvantages of the one-minute sit-up/press-up test.

Extension Question:

Assess the suitability of the one-minute sit-up/press-up test for:

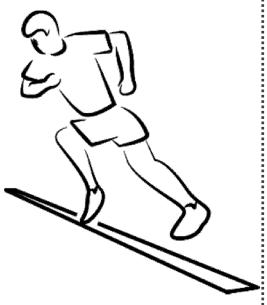
- a football player
- a swimmer
- a 100 m sprinter

Fitness Tests: 30 m Sprint

85

Test procedures

A 30 m sprint test can be used to test speed.



It is a simple test which requires participants to sprint 30 metres in the shortest time possible. Scores are then assessed against normative data.

Test evaluation:

The **advantages**:

- Simple
- Little equipment
- Not time-consuming

The **disadvantages**:

- Affected by surface conditions
- Dependent on accuracy of timing device

Fitness Tests: V

Test procedures

The vertical jump test can
power.

The height of the participa
measured. They then perf
the highest point they rea
difference between the tw
provides a score. Scores a
normative data.

Test evaluation:

The **advantages**:

- Simple
- Not time-consuming

Fitness Tests: Sit-and-reach Test

87

Test procedures

The sit-and-reach test can be used to measure flexibility.

Participants sit with their legs outstretched against a sit-and-reach box. They then lean forwards and extend their hands as far onto the box as possible. The distance from the edge of the box is measured to provide a score of flexibility. Scores are then assessed against normative data.

Test evaluation:

The **advantages**:

- Simple
- Not time-consuming
- Comprehensive results available for comparison

The **disadvantages**:

- Limited application to most sports
- Affected by limb length

Data Collection an

Fitness test scores can be
which are average scores f

The example below shows
and-reach test can be usec
the participant's fitness lev

Participant's gender: Male

Participant's age: 16

Participant's score: 12.3 c

Normative data:

Excellent	Above average
>14	14.0–11.0

Evaluation: The participant
of flexibility.

Principles of Training

89

Individual needs

It is important that athletes and their coaches take their individual needs into consideration when planning a training programme.

Individual needs include:

- age
- gender
- fitness level
- free time
- specific goals
- health

Principles of Tra

S

Training should be made s
participates in. This is bec
demands on the body whic
performing sport-related a

For example, a football pla
training in a manner which
periods of high- and low-in
should also focus on practi
will be required to perform
shooting and tackling.

Fitness Tests: Vertical Jump Test 86

Card Questions:

1. Identify which component of fitness can be tested using the vertical jump test, and describe the procedures of the test.
2. Explain the advantages and disadvantages of the vertical jump test.

Extension Question:

Assess the suitability of the vertical jump test for:

- a rugby player
- a triple jumper
- a shot-putter

Fitness Tests: 30

Card Quest

1. Identify wh
   tested usin
   describe th
2. Explain the
   of the 30 m

Extension

Assess the suita

- a hockey pl
- a 50 m swi
- an 800 m r

Data Collection and Interpretation 88

Card Question:

Explain the use of normative fitness test data.

Extension Question:

Evaluate the usefulness of normative data.

Fitness Tests: Sit-

Card Questi

1. Identify whic
   tested using
   describe the
2. Explain the
   of the sit-an

Extension Qu

Assess the suitabi

- a marathon
- a gymnast
- a diver

Principles of Training 90

Card Question:

Explain the following principle of training: specificity.

Extension Question:

How can a coach ensure that specificity is achieved in their training programme?

Principles of Tra

Card Questi

Describe what is
when planning a

Extension Qu

For each individu
affect an athlete

Principles of Training 91

Progressive Overload

As the athlete's body adapts to the training loads being placed upon it, training loads need to be increased in order to stress the body.

Overload can be achieved by adapting one or more of the following:

Frequency	the number of training sessions performed each week (e.g. how often)
Intensity	the amount of work performed in each training session (e.g. how hard)
Time	the amount of time each training session lasts (e.g. how long)
Type	the form of exercise performed in each training session (e.g. how to train)

Principles of Tra

Ov

Overtraining should be av
an appropriate amount of
amount of time required v
levels, the type of exercise

Rest allows the body to re
bone tissue and muscular
training loads.

If an athlete does not regularly get enough rest, they will increase their chances of suffering an injury.

Principles of Training 93

Reversibility

It is important that athletes maintain a consistent training programme as any prolonged period of inactivity will result in training adaptations being lost.

Taking a holiday in the middle of the season or having time off due to injury or illness are examples of factors which could lead to fitness gains being lost.

Principles of Tra

Th

In order to train a specific component of fitness, the athlete needs to calculate the appropriate training threshold based o their maximum heart rate.

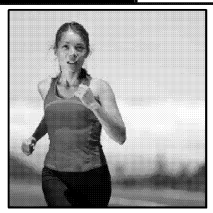
Maximum heart rate can b
220 – Age

Aerobic fitness can be trai
rate max.

Anaerobic fitness can be t
heart rate max.

Training Methods: Continuous 95

Continuous training involves prolonged periods of exercise at a constant intensity which helps **endurance athletes** like you to improve your **cardiovascular and muscular endurance**.



But I've heard the **disadvantages** are:
- it can become boring
- it takes up a lot of time
- it can't improve anaerobic fitness

That's true, but the **advantages** are:
+ it requires little equipment
+ it is easy to perform
+ it can be done individually or in a group

Training Method

Fartlek training involves prolonged exercise at diffe
intensities due to changes
terrain which will help
endurance athletes like yo
improve your **cardiovascul**
and muscular endurance.

But I've heard the **disad**
- it can be boring
- it can be hard to trac
- it can be easier to pu

That's true, but
+ it can be ma
+ changes in
boredom
+ it can be pe

Principles of Training 92

Card Question:
Explain the following principle of training: overtraining.

Extension Question:
How can a coach ensure that overtraining is avoided in their training programme?

Principles of Tra

Card Questi
Explain the follo
progressive ove

Extension Q
How can a coach
overload is achie

Principles of Training 94

Card Question:
How can you work out the aerobic and anaerobic training thresholds?

Extension Question:
Calculate your own aerobic and anaerobic training thresholds.

Principles of Tra

Card Questio
Explain the follow
Reversibility

Extension Qu
How can a coach
avoided in their

Training Methods: Fartlek 96

Card Question:
Describe fartlek training, and explain which components of fitness it can be used to train.

Extension Question:
Identify examples of athletes who would benefit from this form of training.

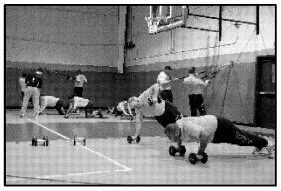
Training Method

Card Questio
Describe continu
components of fi

Extension Qu
Identify example
benefit from this

Training Methods: Circuit 97

Circuit training involves a range of different exercises being performed at different stations, which will help athletes like you who perform a range of sports as it can be used to train **all fitness components**.

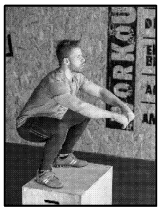


But I've heard the **disadvantages** are:
- it requires a lot of equipment
- set-up is time-consuming

That's true, but the **advantages** are:
+ it can be made specific for a range of sports
+ it is easy to monitor progress
+ it is easy to ensure progressive overload occurs
+ it can train all fitness components

Training Methods: Plyometrics 99

Plyometric training involves the performance of an eccentric contraction followed by a larger concentric contraction. It will help athletes such as **rugby players** develop **power**.



But I've heard the **disadvantages** are:
- it can lead to injury if technique is poor
- must have high levels of strength and muscular endurance

That's true, but the **advantages** are:
+ it requires little equipment
+ it requires little assistance

Training Methods: Body Pump 101

Body pump involves lifting weight in time with music in order to improve **cardiovascular fitness**, **strength** and **muscular endurance**.

The **advantages**:
- It can be fun to perform
- It is easy to perform
- Having an instructor can provide motivation
- Music can be energising

The **disadvantages**:
- It requires an instructor
- It requires access to a fitness studio and a range of equipment such as steps

Training Methods

Interval training involves periods of high-intensity work interspersed with periods of low-intensity work or recovery, which w help **endurance athletes** li you to improve your **cardiovascular and muscu**

But I've heard the **disadv**
- it is not appropriate for
- it requires high levels o

That's true, but
+ it can be pe
+ similar fitne with much

Training Methods:

Weight training involves u lift a weight. It will help at such as **boxers** who are required to perform forceful movements by improving **strength**, **power** and **muscular endurance**.

But I've heard the **disadv**
- it requires specialise
- injury can occur if a p

That's true, bu
+ it is fairly e
+ it is easy to
+ it requires

Training Method

Aerobics involves perform music in order to improve **muscular endurance**.

The **advantages**:
- It can be fun to perfor
- It can be done on lan water
- It requires minimal equipment
- Having an instructor provide motivation
- Music can be energisi

Training Methods: Interval

98

Card Question:
Describe interval training, and explain which components of fitness it can be used to train.

Extension Question:
Identify examples of athletes who would benefit from this form of training.

Training Methods: Weight Resistance

100

Card Question:
Describe weight training, and explain which components of fitness it can be used to train.

Extension Question:
Identify examples of athletes who would benefit from this form of training.

Training Methods: Aerobics

102

Card Question:
Describe aerobics, and explain which components of fitness it can be used to train.

Extension Question:
Identify examples of athletes who would benefit from this form of training.

Training Methods: Pilates 103

Pilates involves performing a range of exercises in a controlled manner in order to improve **strength, balance** and **coordination**.

The **advantages**:

- It improves movement control
- It reduces the risk of injury
- It improves muscular control which is important for all skills

The **disadvantages**:

- It usually requires an instructor
- It can provide a lack of stimulation due to controlled nature

Training Method

Yoga involves performing
improve **flexibility**, balan

The **advantages**:

- It provides psychologi benefits such as reduc stress levels
- It is ideal for participa who don't like maxim physical exertion
- It can improve perfor in all forms of exercise
- It can reduce the risk injury

Training Methods: Spinning 105

Spinning involves performing high-intensity cycling in order to improve cardiovascular **fitness**, **muscular endurance**, **power** and **speed**.

The **advantages**:

- It improves both aerobic and anaerobic fitness
- It can be stimulating

The **disadvantages**:

- It usually requires an instructor
- It requires a lot of motivation
- It is not appropriate for those with health issues

Long-term Effe

Regular aerobic and anaer
adaptations to the **muscul**
respiratory systems.

Improvements to all of the
athlete's potential to train
and for **longer durations**.

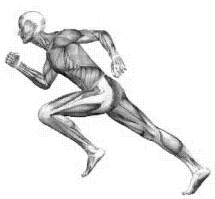
However, in order to achie
important that athletes re
between exercise sessions

When participants first sta
required for recovery will
their recovery times will st

Long-term Effects of Training 107

The long-term training effects on the **muscular system** include:

- **increased strength** – can improve performance in strength-based sports and increase the intensity of work
- **hypertrophy** – can improve sporting performance
- altered **body shape** due to increased muscle mass
- improved **muscular endurance** – can improve ability to train for longer durations
- increased **speed** and **reaction time** – can improve performance in sports such as basketball which require fast movements
- increased **pliability** and **strength** of the muscles and connective tissue – improves performance and reduces risk of soft tissue injuries



Long-term Effec

The long-term training effe
the **skeletal system** includ

- **increased bone densit** reduced risk of fractur
- **increased bone remod** – increases bone stren and reduces risk of fra
- **regular loading reduc risk of osteoporosis** (c that reduces density a quality of bone) – imp quality of life, particul old age

Training Methods: Yoga 104

Card Question:
Describe yoga and explain which components of fitness it can be used to train.

Extension Question:
Identify examples of athletes who would benefit from this form of training.

Training Method

Card Questi
Describe Pilates
of fitness it can

Extension Qu
Identify exampl
benefit from thi

Long-term Effects of Training 106

Card Question:
Explain the impact of adaptations to training and the importance of recovery in order for adaptation to occur.

Extension Question:
How will recovery times be affected by the type and intensity of training performed?

Training Method

Card Questi
Describe spinn
components of

Extension Qu
Identify exampl
benefit from thi

Long-term Effects of Training 108

Card Question:
Identify the long-term effects of training on the skeletal system, and explain how they lead to improved performance.

Extension Question:
What types of activity will lead to the greatest skeletal adaptations?

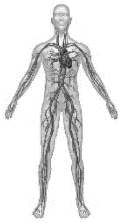
Long-term Effec

Card Questi
Identify the long
the muscular sys
lead to improve

Extension Qu
How can an athl
aid muscular ada

Long-term Effects of Training 109

The long-term training effects on the **cardiovascular system** include:

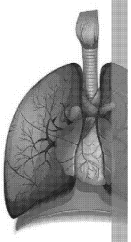


- **cardiac hypertrophy and increased cardiac strength** – increased stroke volume and cardiac output
- **increased stroke volume and bradycardia (reduced heart rate)** – reduces the strain placed on the heart
- greater maximal **cardiac output** – increased aerobic exercise performance
- increased **elasticity of blood vessel walls** – maintains blood pressure and improves oxygen supply to muscles
- **reduced resting blood pressure** – reduces strain on the heart
- **increased red blood cell count** – improves aerobic capacity through increased oxygen supply
- **increased capillarisation** – improves gas exchange

Long-term Effec

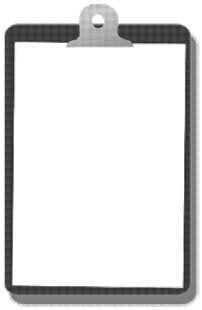
The long-term training eff
includes:

- increased **vital capaci**
- increased strength of
  diaphragm – air can b
- increased **alveoli dens**
- increased **lung volum**
  breathe in oxygen and
  exercising.



PAR-Q 111

A PAR-Q is a form which should be completed prior to taking part in an exercise programme in order to determine whether it is safe to do so.



The form contains questions about:

- personal information, e.g. age, gender and name
- medical history, i.e. previous/current conditions
- current lifestyle, e.g. amount of exercise performed and alcohol consumed

If the participant has experienced any of the medical conditions outlined on the PAR-Q, they will need to seek medical advice and be cleared to participate by a medical professional.

Injury Preventio

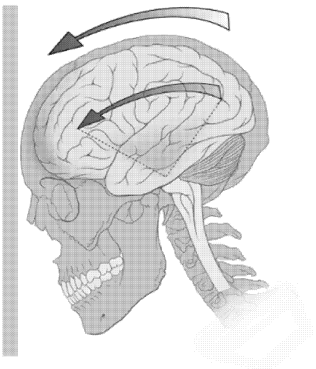
There are a number of me
injury to an athlete:

Method
Use the principles of trai
Play within the rules
Wear protective clothin
Wear bracing
Check facilities and equipment
Perform a warm-up
Perform a cool-down

Injuries: Concussion 113

Concussion is a brief loss of consciousness and confusion caused by contact to the head.

The symptoms usually include **nausea**, **memory loss** and **blurred vision**, but these effects are usually not long-lasting. However, athletes should receive medical attention if they are thought to have a concussion and they should take a rest from sporting involvement until cleared to play by a medical professional.



Injuries: Fractur

Fractures are breaks in the
which can be caused by a
impact, long-term wear or

Fractures can be 'open' or

- An **open fracture** is ch
  by the **bone breaking**
  the surface of the ski
- A **closed fracture doe**
  penetrate the skin.

Medical attention should b
an athlete suspects that th
fractured a bone.

Long-term Effects of Training 110

Card Question:
Identify the long-term effects of training on the respiratory system, and explain how they lead to improved performance.

Extension Question:
What types of activity will lead to the greatest respiratory adaptations?

Long-term Effec

Card Questi
Identify the lon
the cardiovascul
they lead to imp

Extension Qu
How do these ca
the risk of develo

Injury Prevention 112

Card Question:
Identify seven methods that can be used to reduce the risk of injury, and explain how they reduce the risk.

Extension Question:
Provide a sporting example of how each method of injury risk reduction could be implemented.

PAR-Q

Card Questi
What is a PAR-Q
should it contai

Extension Qu
What personal f
having to seek m
part in physical a

Injuries: Fractures 114

Card Question:
Describe the different types of fracture.

Extension Question:
What is the correct procedure for treating a fracture?

Injuries: Concuss

Card Questi
Describe concuss

Extension Qu
What is the corr
concussion?

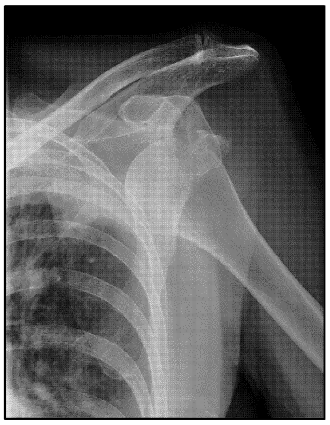
Injuries: Dislocation

115

Dislocation is the movement of a bone from the position within a joint in which it is normally held.

A dislocation usually occurs as a result of a direct impact, e.g. when being tackled by an opponent in rugby.

This type of injury can be extremely painful and medical attention will be required in order to realign the bone with the joint.

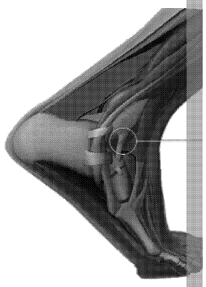


Injuries: Sprain

A **sprain** is a muscle injury
slightly torn.

This type of injury usually
motion, e.g. twisting the a

It will result in swelling an
painful and limits the athl



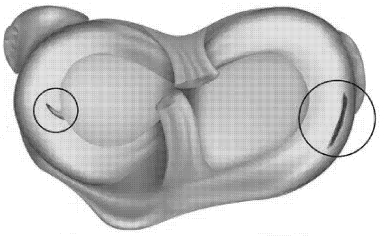
Injuries: Torn Cartilage

117

Torn cartilage occurs when the cartilage surrounding a joint is stretched during movement.

It is often brought about by a sudden twist or as a result of osteoarthritis.

Medical attention is required and sometimes surgery will be needed in order to repair the cartilage and restore stability at the joint.



Injuries: Soft Tis

Soft tissue injuries are tho
ligaments, tendons, cartila
common soft tissue injurie
sporting involvement:

- **Strain** – overstretchin
tendon which results i
movement.
- **Tennis elbow** – an ove
inflammation of the m
the outside of the elbo
- **Golfer's elbow** – an ov
inflammation of the m
the inside of the elbow
- **Abrasion** – damage to
friction when the skin

RICE

119

The following steps are used to treat soft tissue injuries:

R **Rest** is required in order to reduce the load placed on the injured part of the body and ensure no further damage occurs

I **Ice** can be pressed against the injured area in order to reduce swelling

C **Compression** should be used to reduce internal bleeding and swelling by wrapping the injured area

E **Elevation** of the injured area will prevent blood from pooling and, therefore, reduce swelling

PEDs: Anabolic S

Anabolic steroids are som
on strength performance,

Advantages

+ Increased muscle mass
+ Increased strength
+ Improved recovery

– K
– C
– H
– I
c
– R
– A

Injuries: Sprain 116

Card Question:
Describe what a sprain is.

Extension Question:
What is the correct procedure for treating a sprain?

Injuries: Dislocati

Card Questi
Describe what is

Extension Qu
What is the corr
dislocation?

Injuries: Soft Tissue Injuries 118

Card Question:
Identify four types of soft tissue injury and describe each one.

Extension Question:
Describe how the risk of suffering from these soft tissue injuries can be reduced.

Injuries: Torn Ca

Card Questi
Explain what car

Extension Qu
What is the corr
cartilage?

PEDs: Anabolic Steroids 120

Card Question:
Assess the advantages and disadvantages of using anabolic steroids.

Extension Question:
Think of more examples of athletes who would benefit from the use of anabolic steroids.

RICE

Card Questi
Describe the RIC
tissue injuries.

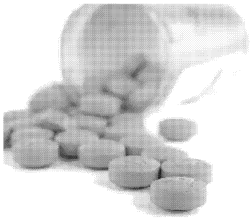
Extension Qu
Explain the effec
cardiovascular sy
treatments of so

PEDs: Beta Blockers

121

Beta blockers are sometimes used by athletes such as snooker players who need to control their movements.

Advantages	Disadvantages
+ Improved fine motor control	– Reduced heart rate can lead to a heart attack
+ Reduced arousal	– Dizziness due to reduced oxygen supply and low blood pressure
+ Reduced anxiety	– Disturbed sleep which can lead to irritability and lack of rest



PEDs: Diuretics

Diuretics are sometimes u
need to weigh-in before a

Advantages

+ Weight loss which allows athletes to make a weight class
+ Helps athletes hide the use of other drugs

PEDs: Narcotic Analgesics

123

Narcotic analgesics are sometimes used by injured athletes who feel the need to keep competing.

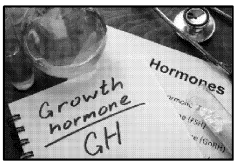
Advantages	Disadvantages
+ Mask pain from injury	– Can lead to addiction
+ Can train when injured	– Can lead to overtraining
+ Can train harder	– Previous injuries can be made worse without the athlete realising
	– Sickness
	– Balance issues

PEDs: Growth H

Growth **hormones** are son
on strength performance,

Advantages

+ Increased muscle mass
+ Increased strength
+ Improved recovery

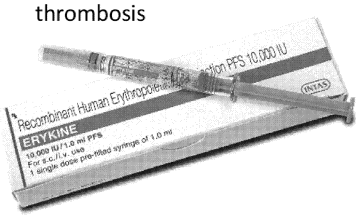


PEDs: Erythropoietin

125

Erythropoietin is sometimes used by endurance athletes such as marathon runners.

Advantages	Disadvantages
+ Increased oxygen-carrying capacity of the blood	– Risk of heart disease
+ Improved aerobic performance	– Risk of stroke
	– Risk of infection
	– Risk of deep-vein thrombosis



PEDs: Stimulant

Stimulants are sometime
focused or have quick reac

Advantages

+ Increased energy for performance
+ Can exercise for a longe duration
+ Can exercise at a higher intensity

PEDs: Diuretics 122

Card Question:
Assess the advantages and disadvantages of using diuretics.

Extension Question:
Think of more examples of athletes who would benefit from the use of diuretics.

PEDs: Beta Bloc

Card Questi
Assess the adva
using beta bloc

Extension Qu
Think of more e
benefit from the

PEDs: Growth Hormone 124

Card Question:
Assess the advantages and disadvantages of using growth hormones.

Extension Question:
Think of more examples of athletes who would benefit from the use of growth hormones.

PEDs: Narcotic A

Card Questi
Assess the adva
using narcotic a

Extension Qu
Think of more e
benefit from the

PEDs: Stimulants 126

Card Question:
Assess the advantages and disadvantages of using stimulants.

Extension Question:
Think of more examples of athletes who would benefit from the use of stimulants.

PEDs: Erythropo

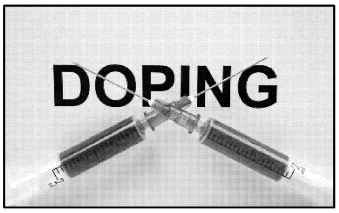
Card Questi
Assess the adva
using erythropoi

Extension Qu
Think of more e
benefit from the

PEDs: Blood Doping 127

Blood doping is a method sometimes used by endurance athletes such as road cyclists.

Advantages	Disadvantages
+ Increased oxygen-carrying capacity of the blood	– Risk of infection
+ Improved aerobic performance	– Risk of heart disease
	– Risk of stroke due to blood pooling or clotting
	– Risk of allergic reaction



Warm-ups

A **warm-up** is perform
activity in order to pr
the risk of injury occu

There are four steps t
warm-up:

1. **Pulse-raising acti**
rate by performin
on a stationary bi
2. **Stretching** – e.g.
will be used in th
mixture of static
3. **Skill practice** – e.
will be required t
4. **Mental preparati**
techniques to red

Cool-downs 129

A cool-down is performed after the main period of physical activity in order to gradually return the body to a resting state and speed up recovery.

There are three steps to performing an effective cool-down:

1. **Maintain heart rate** – e.g. continuing to run for five minutes after a football match
2. **Reduce activity level** – e.g. slowing down activity level to a walk to slowly bring heart rate down
3. **Stretching** – e.g. stretching out the muscles that were used during the activity in order to reduce muscle soreness

Warm-ups

128

Card Question:
Describe the components of an effective warm-up.

Extension Question:
Explain the benefit of warming up for optimal performance in a sport of your choice.

PEDs: Blood

Card Qu
Assess the
blood dopi

Extensi
Think of m
benefit fro

Cool-downs

Card Qu
Describe t
down.

Extensi
Explain hov
reduce som