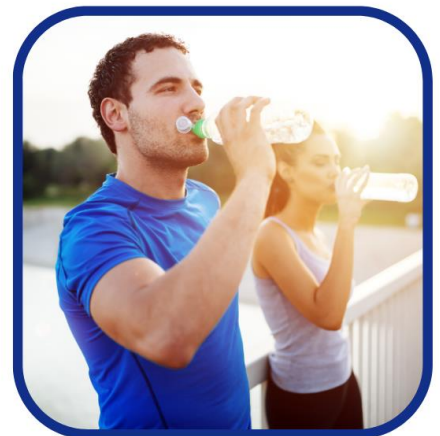




Content Area 2.1: Effects of Health and Fitness Activities on the Body

Teacher Answer Booklet



- 2.1.1 Short-term effects of health and fitness activities (during and/or up to 36 hours after)**
- 2.1.2 Long-term effects of health and fitness activities (over 36 hours and up to months after)**

Topic	Description from Specification	Pupil comments – How confident do you feel on this topic?
Short-Term effects of health and fitness activities (during and/or up to 36 hours after)	Understand the short-term effects that health and fitness activities can have on the body, how to link these to specific health and fitness activities and why each short-term effect occurs: <ul style="list-style-type: none"> • Increased breathing rate/depth of breathing (tidal volume) • Increased heart rate and cardiac output/increased stroke volume • Increased blood pressure • Increased body temperature • Decreased hydration levels • Muscle fatigue • Delayed onset muscle soreness (DOMS) • Light-headedness • Nausea • Tiredness 	
Long-Term effects of health and fitness activities (over 36 hours and up to months after)	Understand the long-term effects that health and fitness activities can have on the body, how to link these to specific health and fitness activities and why each long-term effect occurs: <ul style="list-style-type: none"> • Improved cardiovascular endurance • Improved efficiency to use oxygen • Lower blood pressure • Decreased resting heart rate • Cardiac hypertrophy • Improved muscular endurance • Improved muscular strength • Improved resistance to fatigue • Muscle hypertrophy • Increased volume of red blood cells • Improved flexibility • Body shape change 	

Short-Term Effects of Health and Fitness Activities

Taking part in exercise has a huge effect on our bodies.

Short-term effects on health and fitness activities are the changes that happen to the body **during** exercise and/or up to **36 hours** post-exercise.

Hint:
Use the 'key terms' at the back of the booklet if you are unsure about any of the information given.

Short-term effects can be categorised into effects on:

1. Effects on the muscular system
2. Effects on the cardio-respiratory system
3. Effects on hydration levels
4. Blood redistribution

Short-Term Effects on Muscles

Using the information on the slides, complete the table.



Effect	Muscle Fatigue	Delayed Onset Muscle Soreness
Description	Muscles feel weak and tired.	Aching / pain felt in the muscles starting around 24 hours after exercise
Explanation	There is insufficient oxygen to keep respiring aerobic, so anaerobic respiration is used which produces lactic acid which increases the feelings of fatigue.	Tiny tears in muscles are made during exercise, which need to be repaired. They are made when we exercise at a higher intensity than normal
Consequences	The athlete will not maintain level of performance/ forces athlete to stop working / results in failure.	Reduced range of motion at joints. Pain which may prevent the athlete from being able to exercise at maximum performance.

Short-Term Effects of Exercise on the Cardio-respiratory System

1. What happens to your breathing rate as you begin to exercise?

It increases.

2. What happens to your tidal volume and what consequence do this have on your breathing?

Tidal volume increases so the breathing depth increases.

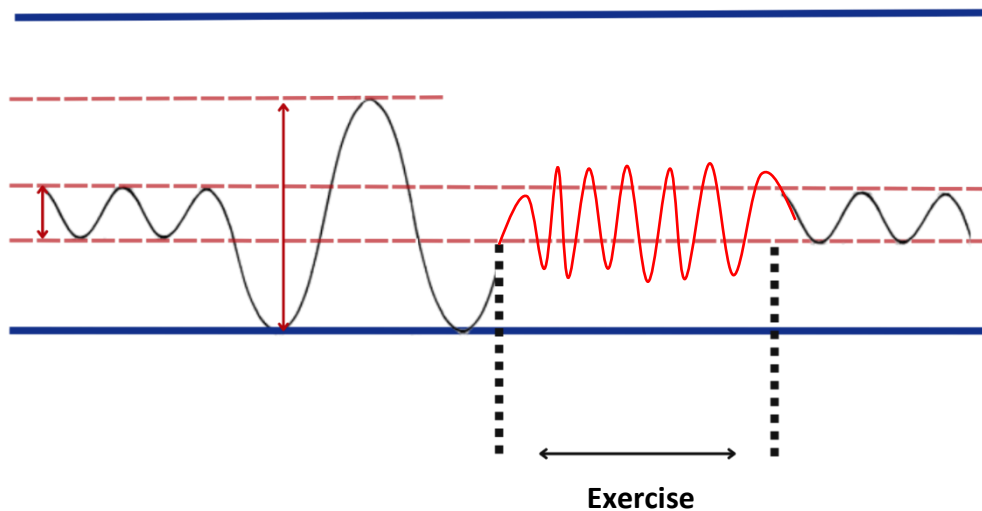
3. How does these changes help you perform in health and fitness activities?

Increased breathing rate means more oxygen diffuses into the bloodstream, therefore more oxygen is delivered into working muscles and there can continue aerobic respiration for longer. This means an individual can work for longer without tiring or fatiguing.

Also, more carbon dioxide can be removed from the body so it can't cause symptoms like shortness of breath.

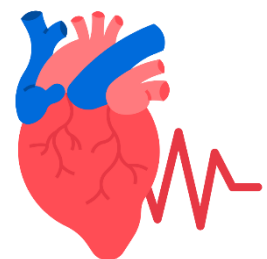
Complete the spirometer trace to show the change to tidal volume in terms of depth and frequency during exercise.

Synoptic Link:
1.3.5 Respiratory
Changes



Identify the short-term effect of the following measurements:

1. Heart rate (beats per minute) – **increases**
2. Stroke volume (amount of blood pumped per beat) – **increases**
3. Cardiac output (amount of blood pumped per minute) – **increases**



How do these changes to the cardiovascular system help you perform health and fitness activities?

The extra oxygen that has diffused into the bloodstream can be pumped to working muscles at a faster rate. This means an individual can work for longer without tiring or fatiguing.

Blood Pressure –

With a partner, discuss what you think happens to blood pressure during exercise and why?

It will increase. Because blood is circulating around the body faster, the pressure inside blood vessels increases thus increasing the resistance to blood flow in vessels (diastolic pressure).

Also, because systolic pressure is increased as the heart needs to contract harder to increase stroke volume.

What impact does this change in blood pressure have on performance?

It allows more blood to be delivered to working muscles, so they can contract and work longer before tiring and fatiguing.

Synoptic Link:
1.4.6 Blood Pressure



Short-Term Effects on Hydration Levels

Water levels in the body **decrease** during exercise because **more** fluids are **lost** through **sweat** than it able to be **taken in**. Also, **electrolytes** are lost in sweat which can negatively affect performance.

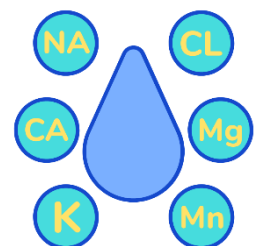
What are the consequences of water is not replaced?

The chances of an athlete **overheating increases**, which can **decrease performance and be harmful to health**.



Following intense exercise, just drinking water may not be enough to rehydrate effectively. What else is needed? Can you provide examples of sources of this?

Electrolytes are needed. They can be found in coconut water, milk, fruit juice, or can be found in tablet or powder form and added to water.



Name one effect of exercise that could be caused by either dehydration or a sudden decrease in blood pressure because of overexertion.

Light-headedness

Describe what this feel like.

It causes a feeling of dizziness.

What are the consequences of this on performance?

There is a decrease in performance





Related to blood redistribution

Define vascular shunting.

Vascular shunting is the function of blood redistribution to the muscles with greater demand, while diverting away from areas of lower demand.

Synoptic Link:
1.4.2 Blood
Redistribution

Complete the table below by describing the short-term effects exercise has on vascular shunting

Effect	Explanation	Which blood vessels are effected? Consequences to performance
<p>Body Temperature Increase</p> 	<p>Muscle cells burn glucoses and fat to create energy. This produces heat so raises body temperature.</p>	<p>Blood vessels near the surface dilate so more blood reaches the skin surface and heat is lost to the environment.</p> <p>Heat is also lost in sweat. This can decrease performance.</p>
<p>Nausea</p> 	<p>Blood flow to the digestive tract and stomach is reduced to redirect blood and oxygen to working muscles.</p>	<p>Blood vessels towards the digestive tract are vasoconstricted. This means digestion is affected, can cause you to feel sick and decreases performance</p>

Tiredness is another short-term effect of exercise. It can be caused by working hard for a long time. Eventually, the individual may feel too tired to continue.



What other factors can contribute to feeling tired during and shortly after exercise?

1. Inappropriate training plan
2. Lack of sleep
3. Lack of proper hydration and nutrition

Summarise the short-term effects of health and fitness activities in the table below.

Effect	Explanation
Muscle fatigue	Insufficient oxygen to meet demand and an increase in lactic acid
Delayed onset muscle soreness (DOMS)	Damage to the muscle fibres due to them working at a high intensity
Increased breathing rate/depth of breathing	More oxygen is required and more carbon dioxide must be expelled
Increased heart rate and cardiac output/increased stroke volume	More blood is being provided to the muscles
Increased blood pressure	Faster circulation of blood leads to a rise in systolic pressure and diastolic pressure
Decrease hydration levels	More fluid is lost than is taken in

Light-headedness	Lack of hydration or sudden drop in blood pressure due to overexertion
Nausea	Blood flowing to the digestive tract and stomach being rerouted to fatigued muscles
Increased body temperature	Heat is a by-product of energy being produced
Tiredness	Working hard for a prolonged period of time, inappropriate training plans, lack of sleep or insufficient hydration and nutrition

Long-Term Effects of Health and Fitness Activities

Long-term effects comprise what happens to the body **over 36** hours and up to **months** after exercise.

When an individual performs health and fitness activities over an extended period of time, the body adapts in ways that reflect the types of activities.

For this section, we are going to categorise the effects into:

1. Effects on the musculoskeletal system
2. Effects on the cardio-respiratory system
3. Body shape changes

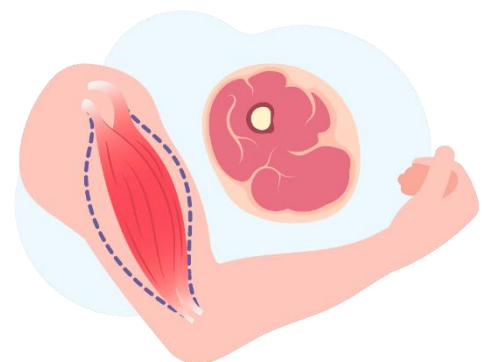
Effects on the Musculoskeletal System

What is muscular hypertrophy?

An increase in muscle mass

Muscular hypertrophy strongly contributes to the improvement of two components of fitness:

1. Muscular **endurance**
2. Muscular **strength**.



Complete the table below:

Effect	Explanation	Consequences to performance
Improved muscular endurance	<p>Muscle mass and the number of capillaries in the muscle increases.</p> <p>This means more oxygen can be transported to the muscles in the blood.</p>	Athletes' muscles can keep working for longer, without tiring.
Improved muscular strength	<p>Muscle fibres are damaged when put against resistance in weight training. When they are repaired there will be more and thicker muscle fibres than before, making the muscle larger and stronger.</p> <p>Tendons and ligaments also increase in strength.</p>	<p>Athletes can exert more force against resistance, thus lift heavier weights.</p> <p>They will also be less likely to sustain an injury.</p>

Explain how muscular hypertrophy develops muscular strength. In your answer, give a specific example of how this affects performance in rugby.

Muscular hypertrophy increases muscle mass as when muscle work against resistance, they sustain damage which when repaired are developed in greater numbers. This increases strength as more muscle fibres work at the same time, generating a greater force. This means that rugby players can exert more force against a resistance in a scrum.



Suggest how there is an improved **resistance to fatigue** in muscles which have undergone health and fitness activities aimed at improving muscular endurance?

The muscle have an increased capacity to use oxygen because increased muscle mass means there are muscle fibres which can individually use oxygen. Therefore, muscles can work for longer before running out of energy stores or fibres to respire.

With a partner, discuss what other long-term effect on the body health and fitness activity participation could cause if it causes the muscles and tendons to become more elastic?

It could improve flexibility (with adequate stretching)

How could this effect performance?

The risk of injury decreases as the joint can safely move through a greater range of motion.

Effects on the Cardiovascular System

Synoptic Link:
1.2.1 Types of Muscles

Based on the changes to the muscular system resulting from muscle hypertrophy, what do you think happens to the heart because of long-term training?


Cardiac hypertrophy

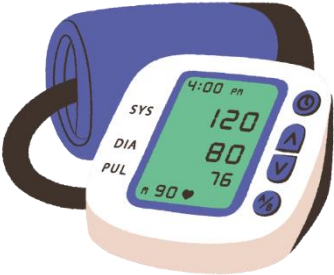

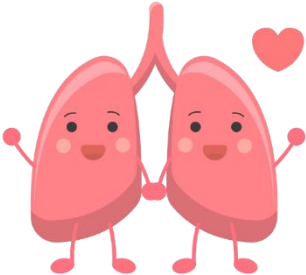



This also happens in **respiratory muscles**. Overall, these changes results in the cardio-respiratory becoming more **efficient at**:

- Getting **oxygen** to working muscles
- Removing **carbon dioxide**

Complete the table below to explain the long-term effects on the cardio-respiratory system:

Effect	Explanation	Consequences to performance
Improved cardiovascular endurance 	The heart – Regular exercise strengthens the heart muscle, which means more blood can be pumped per heat. Respiratory muscles – The respiratory muscles become stronger, so more oxygen is taken in with every breath / increased lung volume. Blood vessels – more capillaries develop, and blood vessels overall improve.	The volume of blood and oxygen which can be delivered per beat is increased which means aerobic respiration can continue during health and fitness activities for longer without the performer tiring.

<p>Lower blood pressure</p> 	<p>Blood pressure decreases because:</p> <ul style="list-style-type: none"> • Walls of arteries become more elastic. • The heart is stronger so pumps blood more easily. 	<p>Athletes can exert themselves at higher intensities more safely.</p> <p>Also lower risk of heart disease and stroke.</p>
<p>Decreased resting heart rate (Bradycardia)</p> 	<p>The heart is stronger, which means more blood is pumped per beat.</p> <p>Therefore, at rest it does not need to pump as many times to deliver the required oxygen.</p> <p>The recovery back to resting heart rate is faster.</p>	<p>The performer can complete specific activities (/day-to-day tasks) at a lower heart rate.</p>
<p>Improved efficiency to use oxygen</p> 	<p>Increased lung capacity and stronger respiratory muscles.</p> <p>This means more oxygen can be transported to the working muscles.</p>	<p>The performer can continue health and fitness activities using aerobic respiration for longer without tiring.</p>
<p>Increased volume of red blood cells</p> 	<p>Training increases the number of red blood cells in the body.</p> <p>This means more oxygen can be delivered to working muscles.</p>	<p>The performer can continue health and fitness activities using aerobic respiration for longer without tiring.</p>

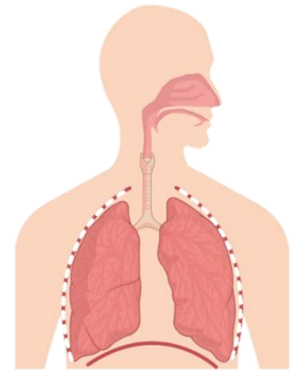
Based on the information you collected in the table, have a go at the following questions:

What is cardiac hypertrophy?

Increase in the size and strength of the heart muscle and a decrease in resting blood pressure.

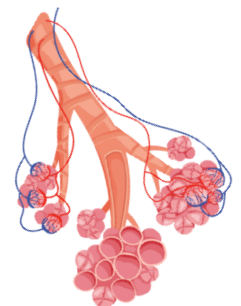
Describe how long-term increased strength of diaphragm and intercostal muscles effects health and fitness activities.

Stronger diaphragm and intercostal muscles means that more oxygen can be forced into the lungs and thus delivered to working muscles. So muscles can aerobically respire for longer without fatiguing/tiring.



Describe how increased number of alveoli and increase capillarisation effects health and fitness activities.

This increases the surface area available for gaseous exchange. This means more oxygen can be taken into the lungs and delivered into working muscles.



Suggest why red blood cell count increases a result of health and fitness activities.

The lower oxygen levels that occur due to exercise results in more red blood cells being produced, to compensate.



Based on the information provided, state the long-term effect of health and fitness activities on the following:

- Resting heart rate – Decreased
- Resting stroke volume – Increased
- Maximum cardiac output – Increased

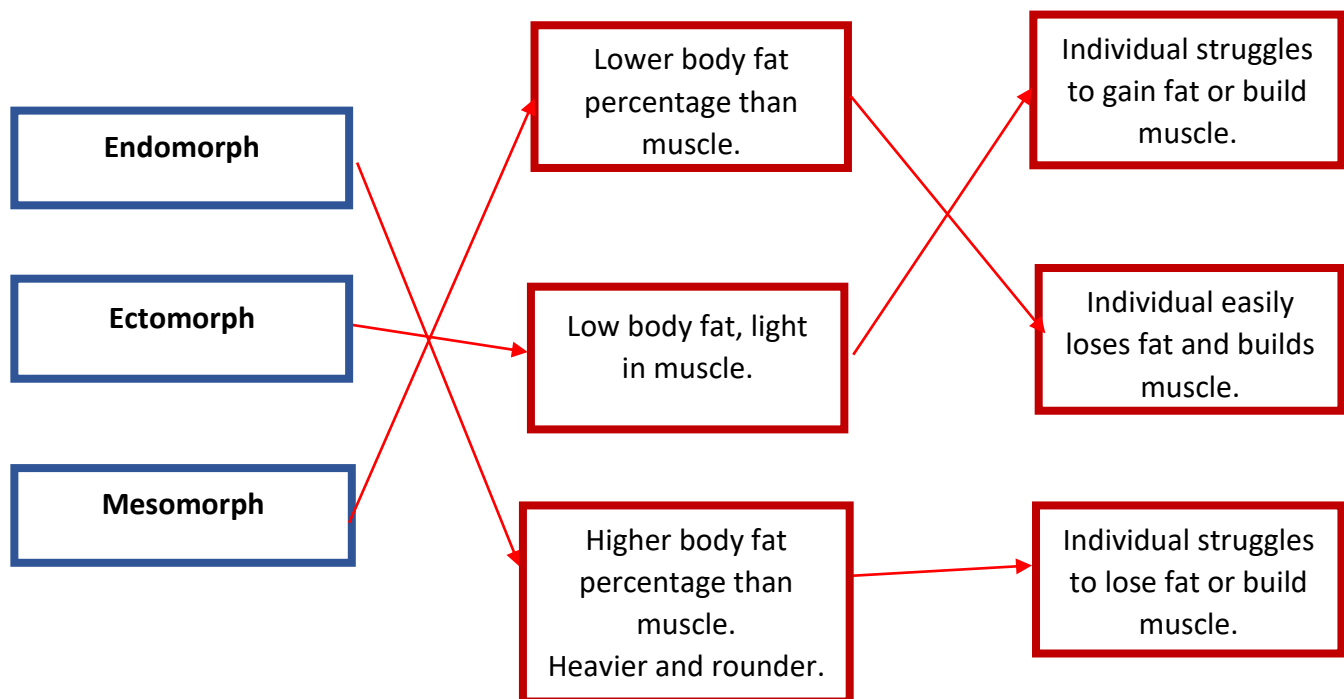
Synoptic Links:
1.3 Respiratory System
1.4 Cardiovascular System

Body Shape Changes

There are three general body shapes:

1. Endomorph
2. Ectomorph
3. Mesomorph

Match the body shape to the description.



Participating in specific health and fitness activities can contribute to an individual's body composition change. The change can depend on what type of body shape they naturally have.

How could an endomorph:

- 1) Increase muscle mass?

Train in a way that increases the load on the muscles.

- 2) Reduce body fat?

Train in a way that uses more calories than they consume.

What could happen if an ectomorph:

- 1) Increased the load on muscles during training?

They could see an increase in muscle mass.

- 2) Train in a way that their consumption cannot meet the calorific needs of?

They could lose further body fat, even if it already quite low.

What could happen if a mesomorph:

- 1) Increased the load on muscles during training?

They could see a further increase in muscle mass.

- 2) Train in a way that their consumption cannot meet the calorific needs of?

They could lose further body fat, even if it already quite low.

Exam Tip: Questions about long-term effects of exercise will often ask you to state or explain the effects on different body systems and suggest how this could improve or impede performance.

Summarise the long-term effects of health and fitness activities in the table below.

Effect	Explanation
Muscular Strength	Increased muscle mass due to working the muscles against a resistance. Increased tendon and ligament strength.
Muscular Endurance	Increased muscle mass due to training that has worked the muscles for a prolonged period.
Muscle Hypertrophy	Increased muscle mass
Cardiovascular Endurance	Regular exercise strengthens the heart muscle. Improves blood vessels health and increases amount of capillaries. Strengthens respiratory muscles.
Blood Pressure	Lowers because a stronger heart that pumps blood more easily.

Resting heart rate	Decreased as fewer beats of the heart are required to pump blood.
Cardiac hypertrophy	A stronger heart and a decrease in resting blood pressure
Resistance to fatigue	Improved due to an increased capacity to use oxygen
Volume of red blood cells	Increased to compensate for low oxygen levels that have been lowered by exercise
Flexibility	Improved because of adequate stretching which increases elasticity of muscles and tendons
Tiredness	Working hard for a prolonged period, inappropriate training plans, lack of sleep or insufficient hydration and nutrition

Key Terms:

DOMS (Delayed Onset Muscle Soreness): The pain that is felt in the muscle around 24 hours after exercise.

Hypertrophy: An increase in the size of muscle cells.

Muscular Endurance: The ability of muscles to undergo repeated contractions for a period.

Muscular Strength: The ability to overcome a resistance.

Heart Rate: The number of times the heart beats per minute.

Stroke Volume: The amount of blood pumped by the heart each beat.

Cardiac Output: Heart rate X Stroke Volume

Short Term effects of exercise: What happens to the body during and/or 36 hours after exercise.

Long term effects of exercise: What happens to the body over 36 hours and up to months after exercise.

Capillarisation: An increase in the number of capillaries.