

**Identify and explain each of the short and long-term effects that regular exercise can have on the main body systems.**

Exercise is defined as an activity that requires physical or mental exertion, especially when performed to develop or maintain fitness. During exercise, the cardiovascular system, the breathing system and the muscles work in conjunction with each other in order to perform their tasks more efficiently. A vital process of exercise is respiration and the production of energy. Principally, respiration is the breaking down of oxygen and glucose into carbon dioxide. There are two types of respiration: aerobic and anaerobic. Aerobic is the most common form of respiration during regular exercise and requires both oxygen and glucose. Anaerobic respiration takes place when there is a lack of oxygen and lactic acid is formed. During anaerobic exercise the body is working in overdrive, for example sprinting, and breathing becomes much faster as we attempt to inhale more oxygen to support the strenuous exercise.

The short-term effects of exercise usually begin before the exercise has even begun. Excitement, anticipation and anxiety all play an important part in preparing the body to cope with the demands of exercise. As a result of these emotions the adrenal gland increases the production of adrenaline hormones, which has a direct effect on the heart by increasing the heart rate and the force with which the heart contracts with each beat.

The cardiovascular system involves the pulsating of the heart and the flow of blood around the body. It works to carry oxygen to the major organs including the muscles and returning the deoxygenated blood to the lungs. The heartbeat, (the rate at which

the heart pumps blood around the body,) changes depending on the amount of physical activity. The average person's resting heart rate is between sixty and seventy beats per minute. However, during exercise the pulse rate increases due to a greater demand for energy in the muscles and therefore a greater rate of respiration and a greater need for oxygen is required. This has an immediate effect on the amount of blood passing through the heart per minute.

One of the short-term effects of exercise on the cardiovascular system is an increased heart rate. This returns to normal after a period of rest. An increase in blood flow around the muscles and rapid heat loss through the skin may continue a short while after exercise. *'The increased heart rate and blood flow has an immediate effect on the lungs as they can receive up to four times as much blood.'*<sup>1</sup>

A long-term effect of exercise on the cardiovascular system is a lower resting heart rate than average. Athletes who train aerobically and run long distances tend to have larger hearts, particularly the left ventricle. This is due to the fact that the blood leaves the left ventricle in order to be pumped round the body. Therefore, *'the left ventricle in particular needs to be stronger in athletes in order to supply the organs with sufficient oxygen at a sufficient rate.'*<sup>2</sup>

The heart size can be increased through regular exercise and, particularly in endurance athletes; this increases the stroke volume resulting in a larger volume of blood leaving the heart to be circulated in the body with each beat and is required to meet the increased demand for nutrients and oxygen that the muscles and other tissue

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<sup>1</sup> Percival, J. et al, (1982), 'The Complete Guide to Total Fitness', p. 144

<sup>2</sup> Williams, A.G, (2005), 'Journal of Strength and Conditioning Research', p.6

require during exercise.

The respiratory system involves the inhalation of oxygen and the exhalation of carbon dioxide. During exercise there is an increased need for oxygen thus inhalation rates during exercise are increased. The tidal volume, (namely the amount of oxygen taken in during each inspiration,) and the rate of breathing, (the number of breaths taken per minute,) increase as a result of this. The increase between these two figures can be as much as twenty times.

Other short-term effects of exercise on the respiratory system can be identified as shortness of breath and rapid breathing. This occurs in order to replace the oxygen in the blood and remove the carbon dioxide, which has built up during exercise, at a more rapid rate than the body is normally used to. Over-exertion during exercise can mean that not enough oxygen is being inspired and a lack of oxygen can cause one to hyperventilate or, as a result of a lack of oxygen reaching the brain, even collapse.

An increase in lung capacity and therefore tidal volume is a long-term effect of exercise on the respiratory system. A larger surface area of the lung means that the amount of oxygen consumed per minute is higher. *'The intercostals muscles and the diaphragm become larger and stronger which lets the person perform larger breathing actions.'*<sup>3</sup> This then allows more oxygen to be taken in and enables the body to dispose of waste products more quickly. Ultimately this improves the persons overall stamina which will then allow them to train for longer and more intensely.

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<sup>3</sup> Percival, J. et al, (1982), 'The Complete Guide to Total Fitness', p. 141

The muscles are also greatly affected by exercise. In fact, it is the muscles that are used more predominantly than any other system during exercise. The cardiac muscles work hard during exercise to pump enough blood around the body and various other muscles work depending on the type of exercise being carried out. Muscles also rely on oxygen to function effectively and respire in order to produce energy. Muscles gain energy for respiration in a number of different ways such as breaking down glycogen into glucose.

One short-term effect of exercise on the muscles is fatigue. This occurs after continual muscle contraction whereby the muscles lose force and it becomes highly difficult or impossible to contract the muscles resulting in muscle exhaustion. This is an especially frequent consequence of anaerobic respiration and is referred to as the body's 'oxygen debt' which can be defined as the '*oxygen needed to oxidise the lactic acid in the muscles.*'<sup>4</sup>

Physical exercise that is directed mainly at working the muscles has, in the long-term, a great effect on the strength of the muscle. The more the muscles are exercised, the greater their strength. Exercising the muscles increases their size and consequently increases their strength. Over a period of training the number and thickness of the muscle fibres increases and the more exercise that muscles do, the greater the blood supply. '*Regular exercise increases the blood vessels in the muscles and consequently increases the supply of energy and oxygen.*'<sup>5</sup>

Regular exercise of the muscles also improves movement and coordination between

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<sup>4</sup> Brady, G.F, (1973) "Muscular Endurance", in '*Encyclopedia of Sport Sciences and Medicine*', p.292

<sup>5</sup> Paish, W, (1991) '*Training for Peak Performance*', p.46

antagonistic muscles. It improves the speed in which muscles are able to relax and contract, as muscles that do not relax quickly enough can be torn. If muscles are under-exercised and then are suddenly put under periods of over-exertion, they can become damaged, sprained or torn.

Strenuous exercise is very good for the bones, this is due to it building bone strength, flexibility, and increasing bone density. Regular exercise also prevents osteoporosis; a disease inside the bone which leads to a sharply increased risk of fractures through a high decrease in bone density.

There are very few, if any at all, short term effects on the skeletal system from exercise because a person's bones are slowly growing all the time, until roughly the age of thirty-five. However, long term effects of exercise on the bones include an improvement in the condition and strength of one's bones.

Regular physical activity benefits our health and fitness wholly and helps us to avoid disease and delay death. Some examples are: risk of osteoporosis and arthritic symptoms. A high blood pressure increases the risk of heart disease, stroke and kidney disease. Regular exercise increases a person's immunity to diseases as more red and white blood cells are produced. It decreases blood pressure, helps keep joints flexible by building muscle to support the joint and delays bone loss. It also widely recognised that regular physical activity increases one's self-esteem and self-confidence.

In conclusion, exercise affects the body systems in many different ways, with some effects coinciding with the effects on other systems, i.e. cardio-respiratory endurance.

It is important to take into account each individual's personal health, fitness and lifestyle when considering the effects of exercise. For example a young, healthy athlete who eats a balanced diet, does not smoke and trains regularly is going to have a more effective cardiovascular and muscular and respiratory system than a sixty year old obese diabetic who has smoked forty cigarettes a day since the age of sixteen.

## Bibliography

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