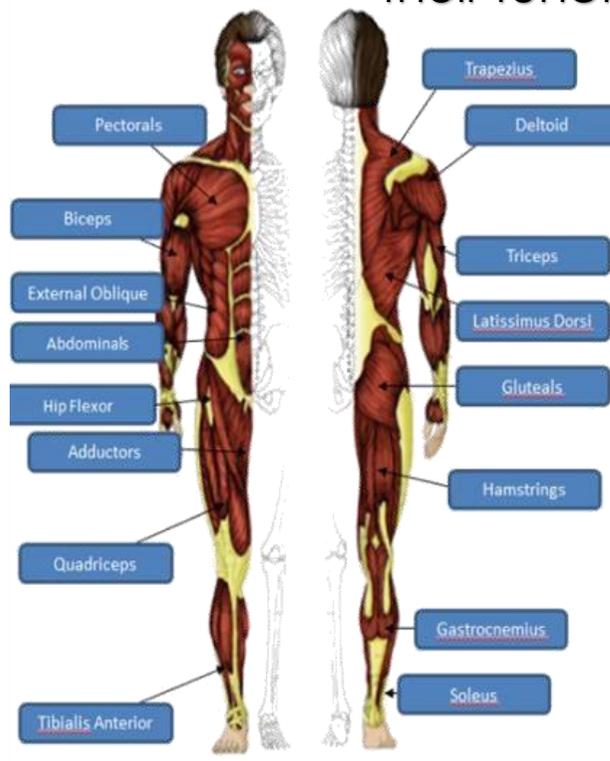
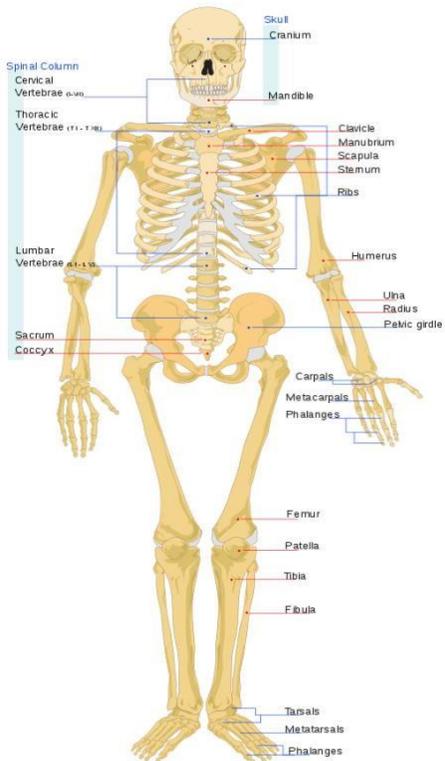


Cycle OCR Sport Science Knowledge Organiser

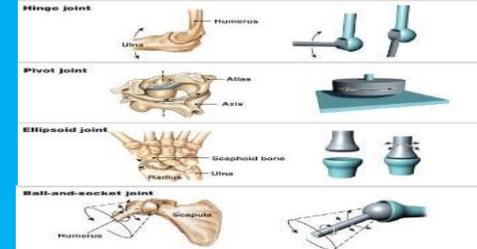
RO43 LO1 Know the key components of the musculo-skeletal and cardiorespiratory systems, their functions and roles



Key components of the musculo-skeletal system and its function

Synovial joints

- Ball and socket (e.g. hip)
- Hinge (e.g. knee)
- Gliding (e.g. carpals)
- Pivot (e.g. neck)
- Saddle (e.g. thumb)
- Condyloid (e.g. wrist)



Connective tissue

- Cartilage**- tough, flexible, found at the end of the bone and cushions the bone.
- Ligaments**- attaches bone to bone, strong and elastic to stabilise joints.
- Tendons**- attaches bone to muscle, sturdy, non-elastic, size changes depending on muscle.

Functions of the musculo-skeletal system

- **Shape**- bones gives us our individual shapes. Our bones are different sizes and shapes. Depending on our shape, will depend on the sport we may excel in.
- **Support**- muscles, ligaments and tendons. If they were not attached to bones then they would not be able to move and play sport.
- **Movement**- Allows movement at the joint.
- **Blood cell production**- some bones in the skeleton produce red blood cells. calcium and phosphorous are stored in bones
- **Protection**- The cranium protects the brain. For example; this helps in a game of football when heading the ball away as a defender from a corner.

The role of the musculo-skeletal system in producing movement

Flexion (elbow/ knee)

- Bending of the joint and the angle of a joint decreases. (upwards phase of bicep curl)

Extension (elbow/knee)

- Straightening of the joint and the angle of a joint increases. (downwards phase of bicep curl)

Abduction (Hip/shoulder)

- Movement away from the midline of the body. (upwards phases of a star jump in gymnastics)

Adduction (Hip/shoulder)

- Movement towards the midline of the body. (downwards phase of a star jump in gymnastics)

Circumduction (Hip/Shoulder)

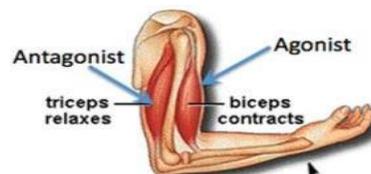
- Movement in a full circle. (arm circles in a dance routine)

Rotation (Hip/Shoulder/Neck)

- limb turns round its long axis, like using a screwdriver (hip movement during a golf swing)

Muscular Contractions

- Isometric (holding a handstand)
- Isotonic (concentric and eccentric movement such as a squat thrust)



Vascular Shunt Mechanism

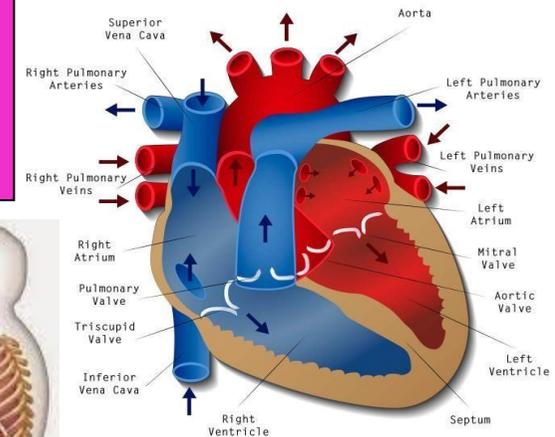
When you start to exercise, muscles need more oxygen to help you move. Your heart beats faster and blood vessels that take blood to non-active areas constrict, which stops as much blood flowing to them. This extra blood is redirected to the working muscles because the blood vessels that lead to the muscles dilate and increase blood flow called vascular shunt.

Function of the cardio-respiratory system

- Transport of oxygen and nutrients to cells via the blood
- Removal of waste products from muscles and other organs
- Fighting Disease
- Transporting hormones
- Regulation of body temperature



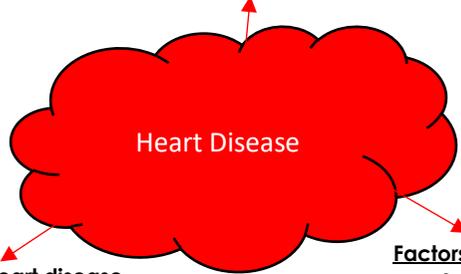
Diagram of human heart



Cycle OCR Sport Science Knowledge Organiser

RO43 LO2 Understand the importance of the musculo-skeletal and cardiorespiratory systems in health and fitness

Heart disease refers to conditions that involve narrow or blocked blood vessels within or around the heart. This causes plaque to build up in the arteries, the inside of the arteries begins to narrow, which lessens or blocks the flow of blood.



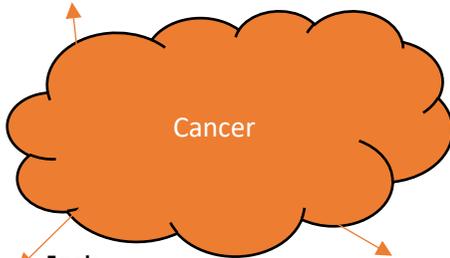
Types of heart disease

- Coronary heart disease
- Coronary artery disease
- Angina
- Atrial fibrillation

Factors that can cause heart disease

- Smoking
- Obesity
- High blood pressure
- Being physically inactive
- There may be other causes for your specific type of heart disease such as caffeine intake and alcohol consumption.

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. These contrast with benign tumours, which do not spread.



Facts

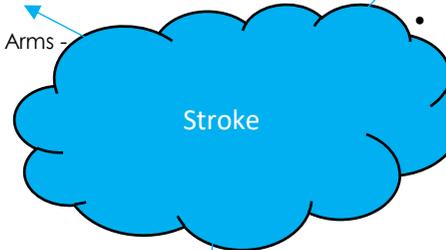
Over 30% of cancers are caused by tobacco use and 10% caused by poor health. Examples of these sorts of cancers are; lung cancer, breast cancer and kidney cancer.

Factors that can cause cancer

- Smoking
- Obesity
- Poor diet
- Being physically inactive
- There may be other causes.

Life threatening condition which happens when the blood supply to a part of the brain is cut off / Brain cells begin to die.

Symptoms - FAST - Face - Arms - Speech - Time



Stroke

Facts

30% of people who have a stroke will go on to experience another stroke. Stroke is a leading cause of death and disability in the UK. Around 32,000 stroke-related deaths in England each year.

Factors that can cause heart disease

- Smoking
- Obesity
- High cholesterol
- High blood pressure
- Being physically inactive

Stress is a physical, mental, or emotional factor that causes bodily or mental tension. Stresses can be external (from the environment, psychological, or social situations) or internal (illness, or from a medical procedure).



Stress

Stress could cause:

- Anxiety
- Eating disorders
- Depression

Facts

85% of adults in the UK experience stress regularly.
39% too stressed in day to day lives.
54% of people stressed worried about health
32% use exercise to relieve stress.

Facts

More than 6 in 10 (59-65%) adults in the UK's constituent countries are overweight or obese by body mass index (BMI).
63-68% of males and 56-62% of females in the UK's constituent countries are overweight or obese.

The term obese describes a person who's very overweight, with a lot of body fat.



Obesity

Factors that can cause obesity

- Poor diet
- Being physically inactive
- There may be other causes.

Benefits of muscular strength

- Increase your ability to do activities like opening door or lifting boxes without getting tired.
- Improves posture
- Prevents joint problems and osteoporosis in later life
- Reduces the risk of injury.
- Help you keep a healthy body weight.
- Improves body confidence

Benefits of flexibility

- Reduces risk of injury
- Improves range of movement at joints
- Improves balance and posture
- Improved sport skill performance.

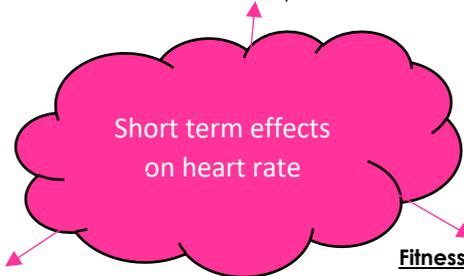
Benefits of muscular endurance

- Increased stamina for work-based tasks
- Improved sport skill performance.
- Reduces the risk of injury.
- Help you keep a healthy body weight.

Cycle OCR Sport Science Knowledge Organiser

RO43 LO3 Be able to assess the short-term effects of physical activity on the musculo-skeletal and cardio-respiratory systems

- Increase in heart rate
- Heart rate increases during exercise because there is an increase in stroke volume
- Heart rate increases during exercise because there is an increase in cardiac output

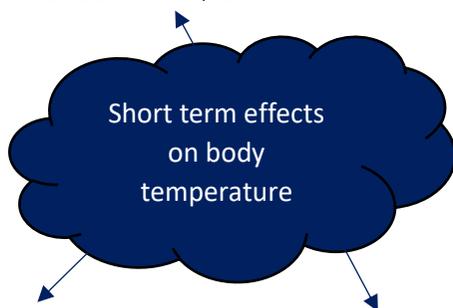


Fitness tests that would measure short term effects on heart rate

- Measured by taking pulse through neck or wrist or using Fitbit/monitor.
- Heart rate is how many times your heart beats per minute.

- Multi stage fitness test
- Cooper Run
- Agility run

- During exercise your metabolic rate increases as heat is produced
- When large muscles groups are used in exercise this increases body temperature
- Sweating tries to cool the body down

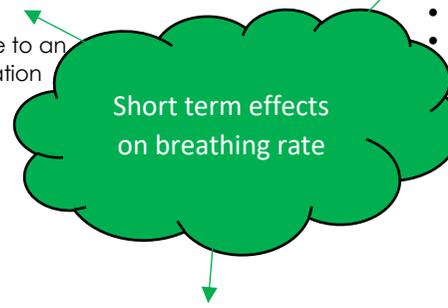


Fitness tests that would measure short term effects on body temperature

- Measured visually as we don't have the equipment to measure properly

- Multi stage fitness test
- Cooper Run

- Increase in breathing rate
- Decreased oxygen levels – this is why we start to breathe fast to cope with the demand of oxygen
- Breathing rate increases due to an increase in inspiration/expiration



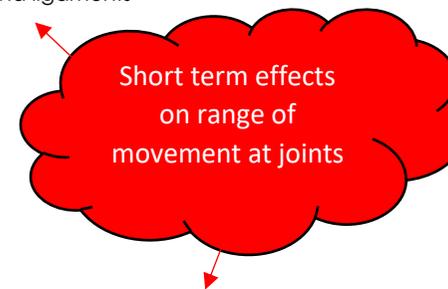
Fitness tests that would measure short term effects on breathing rate

- Multi stage fitness test
- Cooper Run
- Agility run

- Increase in lactic acid
- Increase in muscle soreness
- Delayed onset of muscle soreness (DOMS)
- Not enough time to completely replenish ATP and glycogen stores deplete

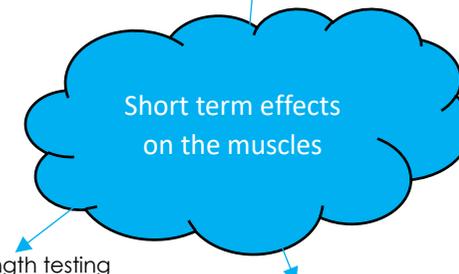
- Measured by counting how many times you breath in/out in a minute

- Increase in range of movement of joints
- Synovial fluid becomes more lubricated.
- Increase in muscle temperature
- Increase in elasticity of tendons and ligaments
- Increase in flexibility
- Increase in blood flow to muscles



Fitness tests that would measure short term effects on range of movements at joints

- Sit and reach test



Measured through strength testing

Fitness tests that would measure short term effects on range of movements at joints

- Sit up test
- Press up test

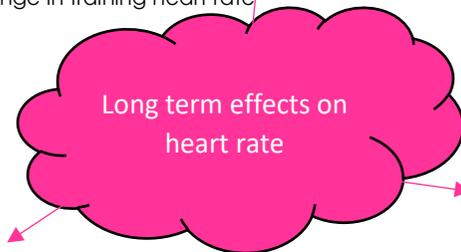
Measured through flexibility testing

Use these tests and results from R042: Applying principles of training – learning objective 3 (Be able to conduct fitness tests). This learning objective draws upon skills, knowledge and understanding from unit R042. Planning and setting up of suitable activities were done independently.

Cycle OCR Sport Science Knowledge Organiser

RO43 LO4 Be able to assess the long-term effects of physical activity on the musculo-skeletal and cardio-respiratory systems

- Change in resting heart rate
- Cardiac hypertrophy
- Increased stroke volume (SV) at rest and during exercise;
- Increase in cardiac output (Q);
- Increase in number of red blood cells.
- Change in recovery rate
- Change in training heart rate

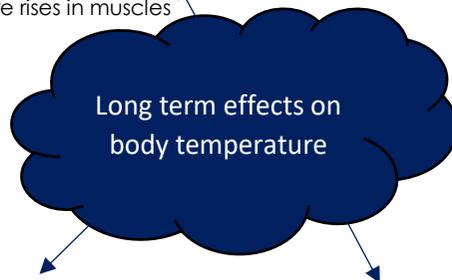


Fitness tests that would measure long term effects on heart rate over 6 week training programme

- Multi stage fitness test
- Cooper Run
- Agility run

- Measured by taking pulse through neck or wrist or using Fitbit/monitor.
- Heart rate is how many times your heart beats per minute.
- Take resting heart rate/training heart rate and resting heart rate

- Increase in range of movement of joints
- Synovial fluid becomes more lubricated.
- Increased bone density.
- Reduced risk of bone diseases such as osteoporosis.
- Increase in flexibility
- Increase in blood flow to muscles.
- Muscle temperature rises in muscles

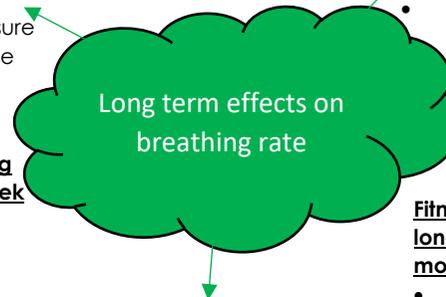


Fitness tests that would measure long term effects on body temperature

- Multi stage fitness test
- Cooper Run

- Measured visually as we don't have the equipment to measure properly

- Measured by counting how many times you breath in/out in a minute. Measure before and after exercise every 2 weeks.

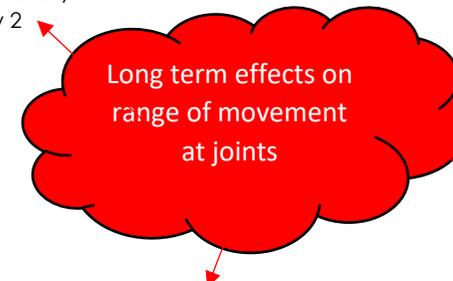


Fitness tests that would measure long term effects on breathing rate

- Multi stage fitness test
- Cooper Run

- Increase in recovery of breathing rate
- Gaseous exchange more efficient
- Increase in lung capacity
- Capillarisation more efficient at the lungs and muscles
- Increased vital capacity; increase in minute ventilation (VE)
- increase in tidal volume (TV)
- increased number of functioning alveoli
- increased strength of the respiratory muscles
- Increase in VO2 max

Measured through flexibility testing. 3 times every 2 weeks.

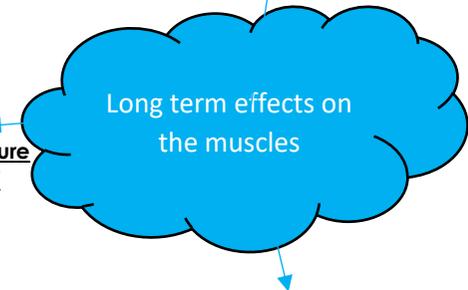


Fitness tests that would measure long term effects on range of movements at joints

- Sit and reach test

- Increase in range of movement of joints
- Synovial fluid becomes more lubricated.
- Increased bone density.
- Reduced risk of bone diseases such as osteoporosis.
- Increase in flexibility
- Increase in blood flow to muscles.
- Muscle temperature rises in muscles

Measured through strength testing. Should see an improvement in the amount of press ups/sit ups that are done in 1 minute



Decrease in muscle fatigue
Decrease in lactic acid/DOMS.
Increased tolerance to lactic acid
Change in muscle recovery size and strength
Muscle hypertrophy; increased strength of tendons and ligaments
Muscles are capable of storing a larger amount of glycogen for energy.
Can exercise for longer as you will have more muscle endurance.

Use these tests and results from R042: Applying principles of training – learning objective 3 (Be able to conduct fitness tests). This learning objective draws upon skills, knowledge and understanding from unit R042. Planning and setting up of suitable activities were done independently.