

Exercise and physical activity

It is widely proven that individuals who regularly partake in physical activity or exercise are less prone to significant health problems, ranging from obesity to many chronic diseases.

Physical and psychological benefits of exercise



Social and economic benefits

Social:

- encourages social interaction
- improves social skills
- reduces isolation
- enhances self-esteem / confidence.

Economic:

- reduces NHS costs
- creates employment
- supports businesses
- reduces absenteeism in the workplace.

Key definitions

Physical activity is any activity that increases energy expenditure above resting level.

Exercise is physical activity with more structure and is usually undertaken for fitness gains.

Sedentary lifestyle is a type of lifestyle with no or irregular physical activity.

Remember, physical activity has to be current and continued for there to be health benefits.

Examples of physical activity / exercise

- Everyday activities – for example, walking / cycling to work / school, housework, gardening, DIY or any active / manual work as part of a job.
- Active recreational activities – for example, dancing, active play amongst children, or walking or cycling for recreation.
- Sport – for example, exercise and fitness training at a gym or during an exercise class, swimming and competitive sports such as football, rugby and tennis.
- Positive risk-taking activities – for example, activities that promote endorphin release and improved confidence levels, such as rock climbing, sky diving and white water rafting.

Physical activity / exercise: government recommendations

Children and young people (5–18 years)	Adults (19–64 years)	Older adults (65+ years)
<ul style="list-style-type: none"> • Moderate–vigorous physical activity for 60 min per day • Vigorous activities 3 times a week minimum • Activity for strength – 3 times a week 	<ul style="list-style-type: none"> • Moderate activity 30 min – five times per week • Moderate / vigorous activity – 150 min spread across week • Activity for strength – 2 times a week 	<ul style="list-style-type: none"> • Should be active daily • Moderate / vigorous activity – 150 min spread across week • Activity for strength – 2 times a week

Now try this

Jack is a 35-year-old office worker who plays 5-a-side football for two 1-hour sessions per week.

- Compare Jack's current exercise to government recommendations.
- What would you recommend?

A balanced diet

An increasing number of adults and children are classified as overweight or obese. This simply means that many of us are eating more than we actually need.

What is a balanced diet?

- Eating the right amount of food to achieve / maintain a healthy body weight.
- Eating a wide variety of foods in the right proportions.

The Eat Well Plate shows the different types of food that should make up our diet, and the required proportions we should eat them in.



Benefits of a healthy diet

These include:

- improves immune function
- increases energy and vitality
- prevents disease and improves mood
- maintains a healthy weight
- reduced risk of developing chronic diseases.

The NHS key recommendations from the Eat Well Plate

The recommendations are to eat:

- plenty of fruit and vegetables
- plenty of potatoes, bread, rice and pasta
- some milk and dairy foods
- some meat, fish, eggs and beans
- a small amount of food / drink high in fat or sugar.

Fluid intake

Water is essential for life; it is very important to get the right amount of fluid to be healthy.

To maintain **water balance** a sedentary individual requires **2–2.5 litres** of fluid per day (6–8 glasses).

Physical activity, the weather and age determine how much fluid we require.

Moderation of caffeine intake

Caffeine is an addictive mild stimulant, which provides **no nutritional value**, so moderate caffeine consumption of around 400 mg (4–5 average cups) per day is recommended.

Remember we also get water from the food we eat; on average food provides about 20 per cent of our total fluid intake.

Strategies for improving dietary intake

- ✓ **Timing of meals** – eat at appropriate times to aid fat burning, reduce hunger and balance stress hormones. Breakfast is the most important meal of the day. Eating late at night can produce negative effects, such as sleep issues, weight gain, heart burn and acid reflux.
- ✓ **Number of meals** – you should aim to eat at regular intervals (every 3–4 hours).
- ✓ **Food choices** – ensure a balance of food groups; aim to eat five fruits / vegetables a day. Reduce salt intake. Aim to consume recommended calories (2500 men / 2000 women). Check food labels for healthier options, such as those low in salt / sugar.
- ✓ **Drink alcohol in moderation** – as per government guidelines.
- ✓ **Consider portion sizes** – reduce sizes and avoid second helpings.
- ✓ **Food organisation and preparation** – plan meals the night before, consider how meals are cooked, such as grilling rather than frying.
- ✓ **Eat slower** – it takes the brain time to register.

Now try this

- Many clients don't have time for breakfast. Suggest **two** strategies to help them make time.
- Does drinking coffee and tea count towards our fluid intake?

Negative effects of smoking

Smoking increases your risk of developing more than 50 serious health conditions. Some are fatal while others can cause irreversible long-term damage to your health.

Smoking statistics

There are about **10 million adults** who smoke cigarettes in Great Britain: this is about $\frac{1}{6}$ of the total UK population.

In Great Britain, **22 per cent** of adult men and **17 per cent** of adult women are smokers.

Every year, around **100 000** smokers in the UK die from smoking related causes.

Smoking accounts for $\frac{1}{3}$ of respiratory deaths, over $\frac{1}{4}$ of cancer deaths, and about $\frac{1}{7}$ of cardiovascular disease deaths.

Smoking and cancer

Lung cancer is the most common form of cancer associated with smoking. It also causes cancer in many other parts of the body, including the:

- mouth
- lips
- throat
- voice box (larynx)
- oesophagus (the tube between your mouth and stomach)
- bladder
- kidney
- liver
- stomach
- pancreas.



The age at which you start smoking appears to be significant in the risk of developing lung cancer.

Smoking – heart-related conditions

Smoking damages your heart and your blood circulation, increasing your risk of developing conditions such as coronary heart disease, heart attack, stroke, peripheral vascular disease (damaged blood vessels) or cerebrovascular disease (damaged arteries that supply blood to your brain).

Smoking – lung-related conditions

Smoking also damages your lungs, leading to conditions such as chronic obstructive pulmonary disease (COPD), which incorporates bronchitis and emphysema / pneumonia.

Other health-related problems

Smoking can also:

- worsen / prolong the symptoms of respiratory conditions such as asthma, or respiratory tract infections such as the common cold
- cause infertility – male and female smokers are likely to have more fertility problems than non smokers.

Ten health benefits of stopping smoking

Stopping smoking provides the following benefits:

- ✓ breath more easily
- ✓ gives you more energy
- ✓ less stressed
- ✓ better sex life
- ✓ improves fertility
- ✓ improves smell and taste
- ✓ younger looking skin
- ✓ whiter teeth and fresher breath
- ✓ live longer
- ✓ protects your loved ones from second-hand smoke inhalation.

Now try this

Recall **three** of the negative effects of smoking.

Had a look

Nearly there

Nailed it!

Negative effects of alcohol

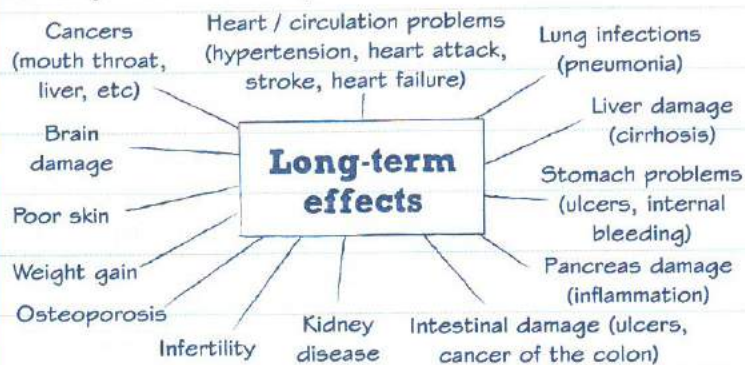
Drinking too much on a single occasion or over time can seriously affect health.

Key points

- 1 Alcohol is legal for those aged 18 and over. This doesn't mean it's any less powerful than other drugs.
- 2 Alcohol is a depressant, which means it slows down your body's responses in all kinds of ways.
- 3 Moderate consumption can make you feel sociable; too much and you'll have a hangover the next day.
- 4 Excessive consumption of alcohol in a single session could put you in a coma or even kill you.

Effects of alcohol on the body

Short-term effects include nausea, vomiting, blackouts, memory loss and anxiety.



Mental health problems

Alcohol is sometimes used to help cope with difficult situations / emotions or reduce stress and anxiety, but, in fact, alcohol can be associated with a range of mental health problems, including:



Empty calories

Alcohol is high in sugar, equalling calories.

These are 'empty calories' and have no nutritional value. The calories in alcohol are metabolised first by the body, ahead of burning fat, which is not desirable if on a weight loss programme.

Key term

Metabolism – the chemical processes that happen in the body to keep us alive and allow our organs to function normally, such as breathing, repairing cells and digesting food.

Government recommendations and guidelines

- ✓ Men and women are advised not to regularly drink more than 14 units a week.
- ✓ Spread your drinking over three days or more if you drink as much as 14 units a week.

Examples of units in common drinks



The number of units in a drink is based on the size of the drink as well as its alcohol strength.

Now try this

Sam meets his friends four nights a week in his local pub, consuming approximately three pints of lager on each occasion. Compare Sam's alcohol intake to government recommendations.

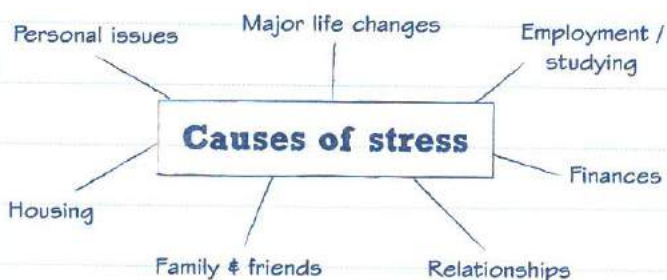
Stress and sleep

Stress and a poor sleep pattern can interlink – affecting how we feel, think, behave and how our body works.

What is stress?

Stress is the feeling of being under too much mental or emotional pressure.

Pressure turns into stress when you feel unable to cope. People have different ways of reacting to stress, so a situation that feels stressful to one person may be motivating to someone else.



Some of the effects of stress

How you might feel	How you might behave	How you might be physically affected
Irritable	Find it hard to make decisions	Problems sleeping / staying asleep
Anxious / nervous	Poor concentration	Tired all the time
Depressed	Eating too much / too little	Headaches
Lonely	Tearful / crying	Constipation / diarrhoea
Can't switch off	Smoking / drinking more than usual	Feeling sick / dizzy / faint

Long-term effects of stress

These include:

- poor immune system
- skin conditions
- heart disease / heart attack
- stroke
- hypertension
- angina
- stomach ulcers
- depression.

Role of sleep

Sleep is a restorative state which plays a vital role in our health. If sleep is cut short, the body doesn't have time to complete all the phases needed for:

- muscle repair
- memory consolidation
- release of hormones regulating growth and appetite.

Effects of poor sleep



Recommendations

The NHS recommends that we need approximately **8 hours** of good-quality sleep a night to function properly. Some individuals need more or less.

Sleep requirements vary with age.

Now try this

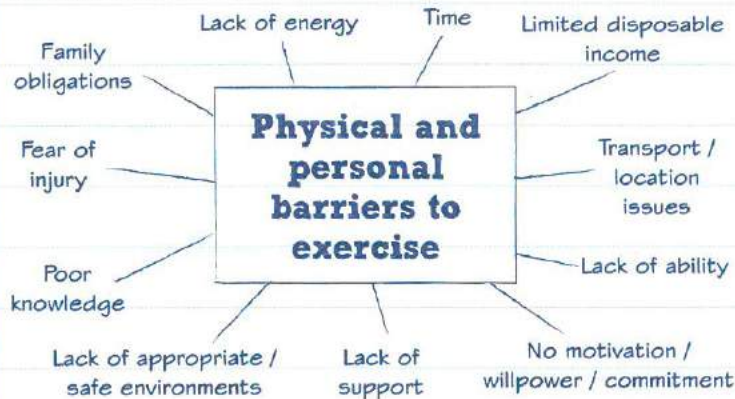
Paul is stressed on a daily basis because he has a demanding workload; he only allows himself an average of 6 hours sleep per night.

- Compare this to the NHS recommendations for sleep.
- How might his sleep pattern cause him additional stress?

Barriers to change

Different barriers may present themselves in tackling health behaviours; particularly individuals embarking on physical activity. Strategies are essential to overcome these barriers.

Barriers to exercise



It is important to understand some of the most common barriers to physical activity and create strategies to overcome them, so that physical activity can be part of daily life.

Overcoming the time barrier

'I don't have **time** to exercise'.

- Prioritise and manage your daily routine / schedule; identify available time slots.
- Incorporate exercise into your daily routine, such as when travelling to and from work.
- Adapt what you do at work; for example, exercise in your lunch hour, use the stairs instead of the lift, stand up while making phone calls, have walking meetings.
- Adapt leisure time activities; undertake a new activity.
- Select activities that require minimal time.

Overcoming the cost barrier

'I can't **afford** a gym membership.'

- Walking to work or increasing activity at home (gardening, housework) is free.
- Walking and jogging are low in cost.
- Exercise at home – press ups, squats, workout DVDs.

Overcoming the transport / location barrier

'The gym is **too far** from my house.'

- Less reliance on the car increases activity levels.
- Consider your location and how it can be used to maximum benefit. If it's local, walk.
- When commuting, get off one stop earlier and walk the remaining distance.
- Park your car further away and walk.

Overcoming lack of energy / motivation

'I don't have the **energy**, I can't be **bothered**.'

- Schedule exercise when you have most energy or plan ahead.
- Think positively: exercise will increase your energy levels.
- Invite a friend.
- Exercise in the morning to avoid excuses.
- Ensure a variety of activities.
- Set achievable goals.

Overcoming family obligations as a barrier

'I don't have time to exercise because of the **children**.'

- Trade babysitting with a friend, neighbour or family member.
- Exercise with the kids or when they are not around.
- Get a bike or use home gymnasium equipment.

Now try this

Consider **two** strategies you would employ if your client says 'Exercise is boring'.

Smoking cessation strategies

Giving up smoking is probably the biggest single step we can take to improve our health. However, this can prove to be challenging, as nicotine is a powerful and addictive substance.

Ten self-help tips

Making small lifestyle changes may help when quitting smoking:

1. thinking positively
2. making a plan to quit
3. dietary changes
4. drinking changes
5. identifying the times when we crave cigarettes
6. getting some support to stop smoking
7. getting moving
8. making non-smoking friends
9. keeping the hands and mouth busy
10. making a list of reasons to quit.

Advantages and disadvantages of acupuncture

Acupuncture is a treatment derived from ancient Chinese medicine in which fine needles are inserted at certain sites in the body for therapeutic or preventative purposes.

- 👍 Stimulates the release of natural painkilling substances: endorphins
- 👍 Effective for some individuals
- 👎 Limited scientific evidence to support effectiveness
- 👎 Costly.

Smoking helplines

Smoking helplines such as the NHS Smoking Helpline may be available for free.

Links Go to page 46 to revise the effects of smoking.

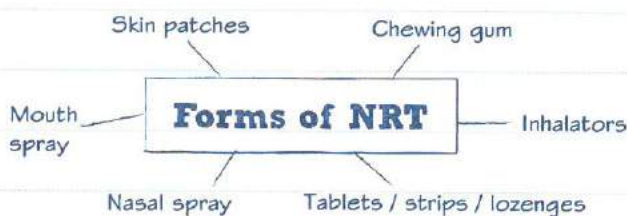
Other services

Stop-smoking services, such as the NHS Smoking Services may also be available for free. It is worthwhile speaking with a GP to find out the services available.

Quit kit support packs – these contain free useful tools to help support quitting smoking.

Nicotine replacement therapy (NRT)

NRT works by steadily releasing nicotine into the bloodstream at lower levels than in a cigarette, without the tar, carbon monoxide and other poisonous chemicals present in tobacco smoke, helping to control cravings.



There is no evidence that one type of NRT is more effective. Choice is down to personal preference.

Side effects of NRT

Side effects can include skin irritation (patches), irritation of nose, throat or eyes (nasal spray), disturbed sleep, vivid dreams, upset stomach, dizziness or headaches.

Which form of NRT?

For example:

- ✓ heavy smokers may use 24-hour patches
- ✓ nasal / mouth sprays are the fastest acting form of NRT
- ✓ some find it useful to combine NRT products.

NRT usually lasts 8–12 weeks before reduction of the dose and eventually stopping.

Now try this

Quitting smoking and weight gain are often linked. What advice would you give to a client who shows concern over this?

Reducing alcohol consumption

To cut down on alcohol successfully, easy-to-adopt steps can be put into practice.

Aiming to drink less

- ✓ Break habits and do something different at the time of day when drinking occurs.
- ✓ Have at least two days a week without drinking.
- ✓ Pace drinking; sipping slowly and enjoying the taste.
- ✓ Space out drinks; have a soft drink / water in between.
- ✓ Have a smaller drink; a single instead of a double.
- ✓ Choose a drink with less alcohol.

Reducing alcohol consumption at home



Reducing drinking while out

- Meet somewhere that doesn't serve alcohol.
- Set a limit, or opt out of rounds.
- Budget: take out a fixed amount of money to spend on alcohol.
- Go out later.
- Sit down – we drink more slowly when sitting down compared to standing.

Self-help groups

- **Drinkline** is the national alcohol helpline.
- **Alcoholics Anonymous (AA)** is a free self-help group. Its 12-step programme involves getting sober with the help of regular support groups.
- **Al-Anon Family Groups** offer support and understanding to the families / friends of problem drinkers.



Links

Go to page 47 to revise the effects of alcohol.

Counselling

Specially trained therapists may offer counselling to individuals / groups. **Cognitive behavioural therapy (CBT)** is one of the most effective forms.

- It tackles patterns of thinking / behaviour, to break certain emotional / psychological ties to habits.
- It addresses the underlying feelings and thought processes causing addiction.
- It helps find ways to address problems / insecurities, without turning to alcohol.

Alternative treatments

Individuals trying to overcome alcohol problems may choose other treatments to boost chances for success.



There are mixed views on the effectiveness of alternative treatments.

Now try this

Suggest **two** strategies / tips you would give a client who drinks more than the recommended units of alcohol per week.

Managing stress

Some people cope with stress more effectively or recover from stressful events quicker than others. Stress management techniques are helpful for all.



Good time management and prioritisation of workload and commitments are key to managing stress.

Assertiveness and goal-setting

- **Assertiveness** – means being confident enough to clearly and effectively express your feelings / opinions, while still valuing those of others. It impacts directly on the way that you communicate and interact with other people and helps build your self-esteem. Training in body language, communication, or receiving counselling or psychotherapy can develop assertiveness.
- **Goal setting** – setting achievable goals can motivate and reward, thus building self-confidence and reducing stress.

Physical activity and positive self-talk

- **Physical activity** – is effective in improving anxiety, depression, self-esteem and mood. It releases 'feel good hormones': endorphins. It also acts as a distractor from the stressor.
- **Positive self-talk** – is the inner dialogue you have with yourself. It involves taking an optimistic view of life and situations, such as challenges / difficulties / deadlines. Having a positive attitude and ways to deal with stress will help with managing and reducing stress.

Relaxation techniques

Relaxation ensures the body is relaxed and calm, resulting in decreasing heart rate, breathing rate, blood pressure and relaxing the muscles. Different techniques work for different individuals.

Two popular techniques are:

- 1 **meditation**
- 2 **breathing techniques** – focusing on controlling inhalation and exhalation, usually in quiet surroundings.

Alternative therapies and work-life balance

- **Alternative therapies** – these include acupuncture, herbal remedies and yoga. They often work well alongside other techniques.
- **Changes to work-life balance** – incorporating strategies at work to help alleviate stress such as regular breaks, not taking work home, informing employers if stressed, using relaxation techniques after work or engaging in leisure activities.

Tips to improve sleep

- ✓ Follow a regular bedtime routine.
- ✓ Avoid drinking coffee and tea.
- ✓ Take exercise during the day / avoid exercise two hours before bed.
- ✓ Ensure sleeping environment is comfortable.
- ✓ Avoid a heavy meal two hours before bed.
- ✓ Avoid using alcohol to help you sleep.
- ✓ Keep a to-do list beside the bed.
- ✓ Have a warm bath.
- ✓ Listen to relaxing music.
- ✓ Try breathing techniques.

 **Links** Go to page 48 to revise the effects of stress on sleep.



Now try this

Joanne has a demanding workload and is stressed on a daily basis. She has never utilised stress management techniques before.

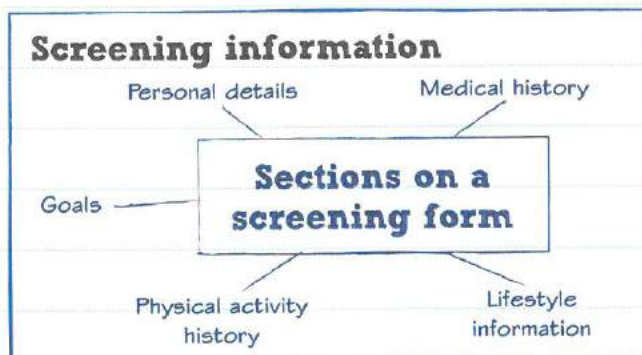
Justify how physical activity can be used to help Joanne alleviate her stress.

Screening processes

In a sport or fitness setting, it is imperative that you collect individual information from clients to provide the most appropriate advice and effectively tailor training programmes.

Screening consultations

You are likely to gather information to assess the lifestyle of an individual through a one-to-one consultation. During this, documentation will be completed, such as a questionnaire which assesses lifestyle behaviours. Accurate screening can lead to overall production of a more effective training programme.



Lifestyle questionnaires

Assessing a client's health status prior to embarking on a physical activity programme is an essential process. It provides an evaluation of the individual's current exercise, health and lifestyle; establishing their strengths and areas of improvement. It allows for the planning of realistic goals and injury avoidance.



PAR-Q (Physical Activity Readiness Questionnaire)

A PAR-Q is a questionnaire used to assess a client's medical history. It determines the safety or possible risks based upon the individual answers given. There are about between 8 and 12 questions, which require a simple yes or no response.

For example:

Do you ever feel pain in your chest when doing physical activity?
Yes No

If a client answers yes to a PAR-Q question, it is sensible to encourage them to seek clearance from their GP before beginning exercise.

Legal considerations

Screening clients accurately is important for insurance purposes; especially if you are a self-employed fitness instructor / personal trainer.

Key points to remember – client confidentiality

Information belongs to the client. It is privileged and subject to the Data Protection Act. This means that personal information should be stored securely and should be inaccessible by other people. Information should not be shared with a third party without the client's consent.

Data Protection Act – controls how personal information is used by an organisation, business or the government.

Informed consent – documented legal evidence that shows that participants have been provided with all the necessary information to undertake the exercise / fitness testing.

Now try this

- Give **two** advantages of the screening process.
- Give **two** disadvantages of the screening process.

Blood pressure

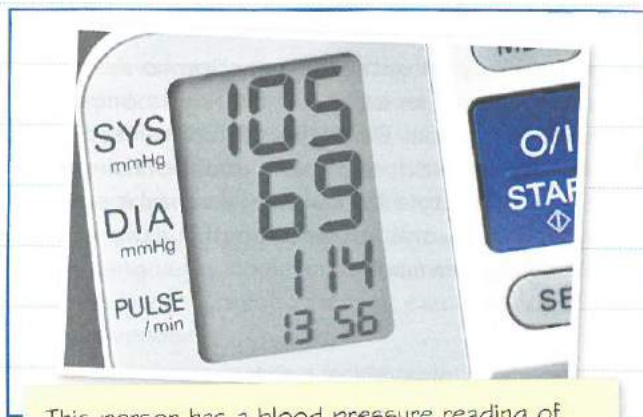
Blood pressure (BP) measures the strain on the arteries and heart caused by the blood pushing against the sides of the blood vessels. It is a key indicator of an individual's current health status.

Blood pressure readings

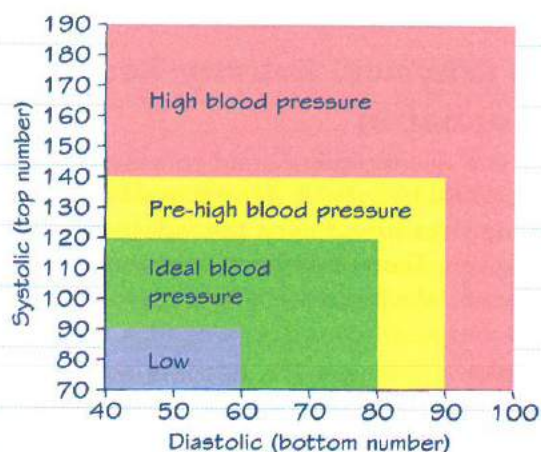
Blood pressure is measured in 'millimetres of mercury' (mmHg) and is written as **two numbers**.

The first (or top) number is your **systolic** blood pressure. It is the highest level your blood pressure reaches when your heart beats.

The second (or bottom) number is your **diastolic** blood pressure. It is the lowest level your blood pressure reaches as your heart relaxes between beats.



This person has a blood pressure reading of 105/69 mmHg, described as '105 over 69'.



Normative data for BP

Interpreting blood pressure readings

Only one of the numbers has to be higher or lower to constitute as high / low blood pressure.

- ✓ If the **top number is 140 or more** – this may indicate high blood pressure, regardless of the bottom number.
- ✓ If the **bottom number is 90 or more** – this may indicate high blood pressure, regardless of the top number.
- ✓ If the **top number is 90 or less** – this may indicate low blood pressure, regardless of the bottom number.
- ✓ If the **bottom number is 60 or less** – this may indicate low blood pressure, regardless of the top number.

High blood pressure

High blood pressure is a significant health risk. It can cause:

- strain on heart and blood vessels
- increased risk of a heart attack
- increased risk of stroke
- kidney disease
- vascular dementia.

Treatment and prevention

Here are some ways to reduce high blood pressure:

- ✓ Eat less salt
- ✓ Eat more fruit and vegetables
- ✓ Maintain a healthy weight
- ✓ Drink less alcohol and stop smoking
- ✓ Get more active
- ✓ Reduce intake of coffee, tea, other caffeine-rich drinks.

Now try this

Your next client's blood pressure measures $\frac{138}{86}$ mmHg.

- (a) Interpret this reading against normative data.
- (b) Identify the areas on the screening form you would refer to to make initial recommendations.

Resting heart rate (RHR)

Resting heart rate can vary with fitness level and age – the fitter you are, generally the lower the resting heart rate.

Heart rate (HR)

Your heart rate is the number of times your heart **beats per minute**. The heart, like any other muscle, needs physical activity to keep it in good condition.

An adult's **normal resting heart rate** can range anywhere from 60 to 100 beats per minute (bpm), whilst resting. It will vary depending on: **when** it is measured and the **level of activity immediately before the reading**.

Factors affecting heart rate

- **Caffeine and alcohol** – increases the strength and frequency of the heartbeat.
- **Exercise** increases the HR, but someone who exercises regularly may have a lower resting rate.
- **Disease** affects the HR, for instance, thyroid disease can either make the rate faster or slower.
- **Drugs** (medical and recreational), such as beta blockers, slow the HR. Recreational drugs tend to increase HR.

Normative data for resting heart rate (RHR) men

Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	49-55	49-54	50-56	50-57	51-56	50-55
Excellent	56-61	55-61	57-62	58-63	57-61	56-61
Good	62-65	62-65	63-66	64-67	62-67	62-65
Above average	66-69	66-70	67-70	68-71	68-71	66-69
Average	70-73	71-74	71-75	72-76	72-75	70-73
Below average	74-81	75-81	76-82	77-83	76-81	74-79
Poor	82+	82+	83+	84+	82+	80+

Normative data for resting heart rate (RHR) women

Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	54-60	54-59	54-59	54-60	54-59	54-59
Excellent	61-65	60-64	60-64	61-65	60-64	60-64
Good	66-69	65-68	65-69	66-69	65-68	65-68
Above average	70-73	69-72	70-73	70-73	69-73	69-72
Average	74-78	73-76	74-78	74-77	74-77	73-76
Below average	79-84	77-82	79-84	78-83	78-83	77-84
Poor	85+	83+	85+	84+	84+	84+

Now try this

Your client, Chris, is 31 years old and his resting heart rate is 85 bpm.

- Interpret this reading against normative data.
- Identify the areas on the screening form you would refer to, to make initial recommendations to improve your client's resting heart rate.

Body mass index (BMI)

BMI is a measure that adults can use to see if they are a healthy weight for their height. Research shows a significant relationship between high BMI and cardiovascular disease and diabetes.

How to calculate BMI

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height (m)}^2} = \frac{\text{Total}}{\text{Height (m)}^2}$$

Worked example

Gina measures 1.6 metres tall and weighs 70 kilograms.

$$\text{BMI} = \frac{70}{1.6^2} = \frac{43.75}{1.6} = 27.34 = 27 \text{ kg/m}^2$$

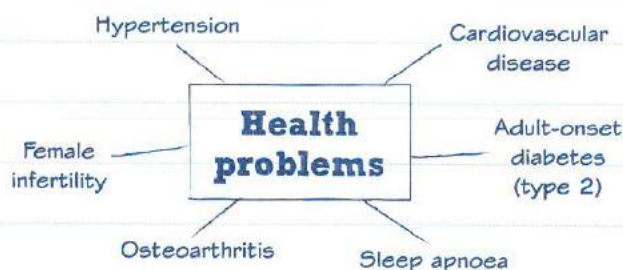
Acceptable BMI

- Less than 18.5 = underweight
- Between 18.5 to 24.9 = healthy weight
- 25–29.9 = overweight
- 30–39.9 = obese
- 40 or more is very obese

These ranges are only for adults. BMI is interpreted differently for children.

High BMI / Overweight

If BMI is 25 or above, you weigh more than is ideal for your height.



BMI can mean an increased risk of developing some of the above health problems.

Low BMI / Underweight

If BMI is less than 18.5, you weigh less than is ideal for your height.

Low BMI can mean an increased risk of developing health problems, such as:

- brittle bones (osteoporosis)
- absent periods in women (amenorrhoea)
- iron deficiency (anaemia).

Accuracy of BMI

As BMI is based on the height and weight of a person, it is an **inaccurate** measure of body fat content.

It does not take into account muscle mass, bone density, or overall body composition. It doesn't take into account where a person carries his / her body fat, or racial and gender differences.

Strategies to lower BMI

These include:

- healthy eating / balanced diet
- increasing activity
- drinking more fluids.

Muscle is much denser than fat so very muscular people, such as heavyweight boxers, may be a healthy weight even though their BMI is classed as obese.

Now try this

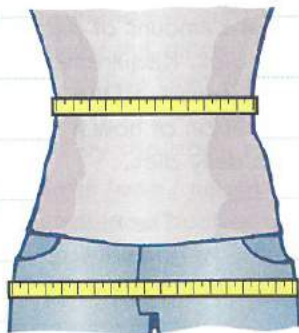
James measures 1.75 m tall and weighs 85 kg.

- Calculate his BMI.
- Give **two** considerations you would need to take into account about James' BMI before making any recommendations.

Waist-to-hip ratio

Fat distribution, as measured by the waist-to-hip ratio (WHR), has been found to identify those at risk of health complications.

Measuring the waist-to-hip ratio



$$\text{Ratio} = \frac{\text{Waist}}{\text{Hips}}$$

Conducting the test

To calculate waist-to-hip ratio:

- 1 Measure the hips – maximum circumference of buttocks.
- 2 Measure the waist – narrowest part of the torso.
- 3 Divide the waist number by the hip number.

Obesity definitions

There are three forms of obesity.

- 1 **Peripheral obesity** is the accumulation of excess fat in the buttocks, hips and thighs.
- 2 **Central obesity** is an excess accumulation of fat in the abdominal area.
- 3 A combination of peripheral and central obesity.

Normative data for the waist-to-hip ratio

hip ratio Male	Female	Related health risks
0.95 or below	0.80 or below	Low risk
0.96 to 1.0	0.81 to 0.85	Moderate risk
1.0+	0.85+	High risk

Acceptable waist-to-hip readings

A ratio of 1.0 or more in men or 0.85 or more in women indicates carrying too much weight around the middle. **Excessive weight around the waist increases the risk for certain diseases, compared to carrying more weight around the hips.**

Advantages and disadvantages of the waist-to-hip ratio

- 👍 Quick risk factor assessment
- 👍 Can be completed at home
- 👍 Only requires a tape measure
- 👍 Can be used to determine changes in body composition over time.
- 👎 Does not take into account lean body mass
- 👎 Does not take into account fat mass
- 👎 Open to human error when measuring

Now try this

Rob's waist measures 39 inches and his hips measure 37 inches.

- (a) Calculate his waist-to-hip measurement.
- (b) Interpret the measurement against normative data.
- (c) Based on his WHR measurements only, provide **two** recommendations for Rob.

Nutritional terminology

Nutrition is about eating a healthy and balanced diet. Understanding nutritional terminology may make it easier to make better food choices.

Food labelling

Nutritional labels include information on:

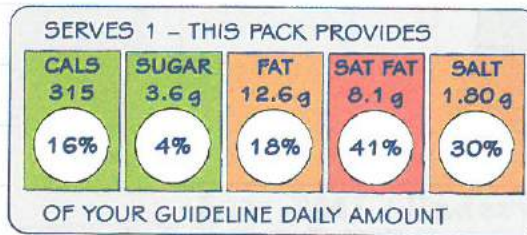
1. Energy: **8400 kJ / 2000 kcal**
2. Total fat: **70 g**
3. Saturates: **20 g**
4. Carbohydrate: **260 g**
5. Total sugars: **90 g**
6. Protein: **50 g**
7. Salt: **6 g**

The bold figures above represent an adult's reference intake (RI) for a day.

Key point: Nutrition information is provided per 100g and sometimes per portion of the food.

Recommended daily allowance (RDAs) or Daily reference intakes (RIs)

These are guidelines about the approximate amount of particular nutrients / calories required for a healthy diet. Requirements for calories / nutrients are different for all individuals. **RDAs are not intended as targets** but as a useful indication of how a particular nutrient or amount of energy fits into the daily diet.



The RDAs are shown as a percentage

Other food measures include **calories and joules (international system)** which are a measure of the amount of energy in food:

- ✓ 1000 calories = 1 kilocalorie = 1 kcal
- ✓ 1000 joules = 1 kilojoule = 1 kJ.

Estimated average requirements (EAR)

Energy intake is compared against the estimated average requirement (EAR) for a group. Estimates of energy requirements for different populations are defined as the energy intake estimated to meet the average (median) requirements of the group. About half the people in the group will need more energy than the EAR and half the people in the group will need less.

Colour coding

The colour coding used on some nutritional labels, at a glance, tells us if the food is high, medium or low in calories, sugar, fat, saturated fat and salt.

- RED** = high in this nutrient, these foods need to be eaten less often and in small amounts.
- AMBER** = medium in this nutrient, these foods / drinks can be eaten most of the time.
- GREEN** = low in this nutrient, the healthier choice.

Lower reference nutrient intake (LRNI)

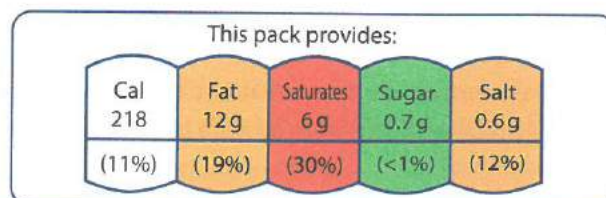
This is the amount of a nutrient that is sufficient for only a few members of the group who have exceptionally low requirements. Intakes below the LRNI by most individuals within the group will almost certainly be inadequate.

Safe intake (SI)

This is the range used where there is insufficient evidence to set an EAR, RNI or LRNI. The safe intake is the amount judged to be enough for almost everyone, but below a level that could have undesirable effects. The amount of each nutrient needed differs. Individual requirements of each nutrient are related to a person's age, gender, level of physical activity and health status.

Now try this

- (a) Compare this product against RDAs.
- (b) Using the colour coding, is this product a healthy choice?



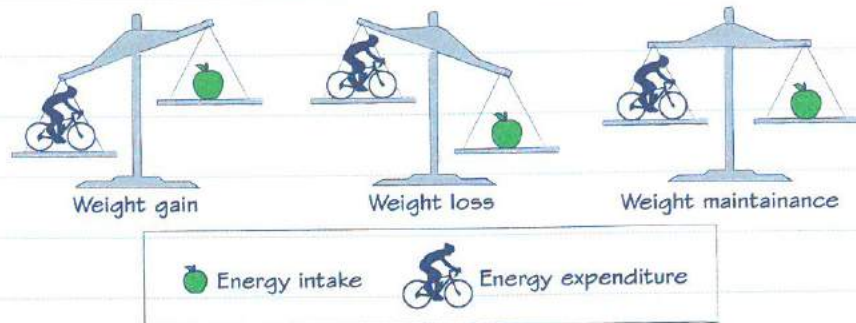
Energy balance

Understanding how many calories are in our food can help us to balance the energy we put into our bodies with the energy we use. This is key to maintaining a healthy weight.

What is energy balance?

✓ **Weight gain / positive energy balance** occurs when we regularly put more energy into our bodies than we use. Over time, that excess energy is stored by the body as fat.

✓ **Weight loss / negative energy balance** occurs when we don't put enough energy into the body for what we use.



Energy balance = no weight gain and no weight loss

Components of energy output

1 Resting metabolic rate (RMR)

The number of calories your body burns if you do nothing. The energy used to keep the essential body functions going. It accounts for 60–75 per cent of total energy expenditure.

2 Dietary thermogenesis (DT)

Refers to the energy expended above that of RMR for the processes of digestion, absorption, transport and storage of food. It is influenced by calories content and composition of diet along with individual nutritional status.

3 Physical activity (PA)

Represents the most variable component of your total energy expenditure (energy above RMR and DT). Exactly how much it varies depends on how active your lifestyle is (frequency, intensity, time and type).

4 Adaptive thermogenesis

This is energy expenditure that occurs as a result of environmental or physiological stresses placed on your body, such as a change in temperature which requires a response of shivering or stress that causes anxiety and fidgeting.

Basal metabolic rate (BMR)

This is the number of calories expended to maintain essential processes, such as breathing and organ function during sleep.

BMR is affected by a number of factors:

- **Age** – BMR **decreases** with increasing age.
- **Gender** – males generally have a **higher** BMR due to greater muscle mass.
- **Climate** – exposure to hot / cold climates causes an **increase** in BMR.
- **Physical activity** – affects the energy requirements needed.
- **Moderate-intensity activities:** walking, golfing and yoga – between 150 and 300 calories per hour.
- **High-intensity activities:** basketball, running and swimming – approximately 500 calories plus per hour.

Now try this

- Explain how weight gain occurs.
- Explain how weight loss occurs.

Macronutrients

Carbohydrates, protein and fats are classed as macronutrients as they are required in large amounts on a daily basis. These are the nutrients that provide energy within our diet.

Carbohydrates

Carbohydrates:

- are the body's main sources of fuel
- are easily used by the body for energy
- all carbohydrates consumed end up as glucose to provide energy
- are needed for the central nervous system, the kidneys, the brain and the muscles (including the heart) to function properly
- can be stored in the muscles and liver and later used for energy
- are important in intestinal health and waste elimination.

Types of carbohydrates

Simple	Complex
'Quick release energy'	'Slow release energy'
Sugar, jam, fizzy drinks	Bread, bagels, rice, pasta, cereals

Complex carbohydrates should comprise **50–60 per cent** of total calories consumed. More active individuals will need 70 per cent to replace depleted glycogen store.

Protein

Protein should comprise **12–20** per cent of our total calories. We need this protein for:

- growth (important for children / teens / pregnant women)
- building and repairing tissue
- immunity function
- making essential hormones / enzymes
- energy when carbohydrates are not available
- preserving lean muscle mass.

Types of protein

Complete proteins	Incomplete proteins
Meat, poultry, fish, milk, cheese	Cereals, bread, rice, pasta, beans

On average:

- men should consume no more than **55 g** a day
- women should consume no more than **45 g** per day.

Fats

Fats should comprise **20–35** per cent of our total calories. We need fat for:

- normal growth and development
- energy (fat is the most concentrated source of energy)
- absorbing certain vitamins (like vitamins A, D, E, K)
- providing heat insulation, cushioning and buoyancy for the organs
- maintaining cell membranes
- providing taste, consistency, and stability to foods.

Types of fats

Saturated	Monosaturated	Polyunsaturated
Butter, meat, lard, cream	Olive oil, rapeseed oil, peanut butter	Soft margarine, low-fat spreads, soya oil

Too much saturated fat within our diet causes significant health problems. The government recommends that:

- men should consume no more than **30 g** a day
- women should consume no more than **20 g** per day.

Now try this

Explain the reasoning behind endurance athletes reducing their proportion of fat intake and consuming more carbohydrates.

Vitamins A, B and C

Micronutrients are dietary components, often referred to as vitamins and minerals, which although only required by the body in small amounts, are vital to development, disease prevention, and well-being.

Vitamin A

Vitamin A:

- is a fat-soluble vitamin
- is needed for the normal functioning of the eyes and respiratory tract
- keeps the immune system healthy
- has two forms:

Retinol (animal sources)	Carotenoids (plant sources)
Liver, whole milk	Green leafy vegetables, carrots and orange coloured fruits

Too much or too little vitamin A?

Adults need: **0.7 mg a day for men / 0.6 mg a day for women.**

Too much vitamin A causes an increased risk of fractures.

Consuming too much whilst pregnant has also been linked to birth defects.

Deficiency leads to poor vision / blindness.



A good source of vitamin A

Vitamin B

All B vitamins have important functions.

- They support the breakdown and release of energy from food.
- They keep the eyes, skin and nervous system healthy.
- Examples of sources are: lean meats, eggs, cereal and wholegrain breads.

Too much or too little vitamin B?

There is limited evidence of the issues caused by too much vitamin B.

Most vitamins cannot be produced by your body and must be supplied by a balanced diet.



A good source of vitamin B

Vitamin C

Vitamin C:

- is also known as ascorbic acid
- helps to protect cells, keeps them healthy
- is needed in maintenance of healthy connective tissue
- helps wound healing
- acts as an antioxidant that protects the body from damage by free radicals.

Vitamin C

Fresh citrus fruits and berries, green vegetables, peppers and tomatoes

Too much or too little vitamin C?

Adults need **40mg of vitamin C a day.**

- Scurvy can result from lack of ascorbic acid. Scurvy leads to spots on the skin, bleeding gums and loose or loss of teeth.
- Overnutrition of ascorbic acid is rare.



A good source of vitamin C

Now try this

Give **two** examples of food sources for the following vitamins:

- Vitamin A
- Vitamin B
- Vitamin C.

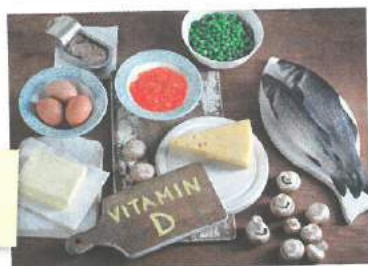
Vitamin D, calcium and iron

Micronutrients are essential food factors required in only small quantities.

Vitamin D

Vitamin D:

- is needed for the absorption of calcium and phosphorous from foods, keeping bones healthy
- enhances immune function and improves muscle strength
- found in our diet, but most is gained from sunlight.



Good sources of vitamin D

Too much or too little vitamin D?

- Too much can lead to excess levels of calcium in the blood.
- Deficiency of vitamin D leads to rickets and the formation of soft bones.
- Deficiency in adults can cause pain and muscular weakness.

Young children, housebound older adults and people practising certain religions where their skin must be covered are at risk of deficiency through lack of exposure of their skin to sunlight.

Calcium

Calcium is used for:

- helping to build strong bones and teeth
- regulating muscle contractions, including heartbeat
- ensuring that blood clots normally
- sources include milk, cheese and other dairy foods, and green leafy vegetables.



Good sources of calcium

Too much or too little calcium?

Adults need 700mg of calcium a day.

- Taking high doses of calcium supplements can cause stomach pains and diarrhoea.
- Poor intakes of calcium can result in poor bone health, which can increase the risk of diseases such as osteoporosis later in life.

Iron

Iron:

- is needed for the formation of haemoglobin in red blood cells, which transport oxygen around the body
- is also required for energy metabolism and has an important role in the immune system
- sources include liver, meat, beans, nuts and dried fruit such as dried apricots.



A good source of iron

Too much or too little iron?

Adults need: 8.7mg a day for men / 14.8mg a day for women.

- Too much iron in the diet can result in constipation, nausea and vomiting.
- A lack of iron will lead to anaemia.

Now try this

Do athletes need to take extra supplements of vitamins and minerals?

Hydration and dehydration

Understanding the relationship between hydration and sports performance is vital for achieving optimal performance in training and competition.

Hydration

- Vital for transporting nutrients, waste products and internal secretions.
- Vital for temperature regulation.
- Aids the passage of food through the digestive system.
- Water makes up 45–65 per cent of total body weight.
- Muscle has a higher water content than fat tissue.
- Water is lost through several routes: urine / faeces / evaporation (skin) and expired breath.

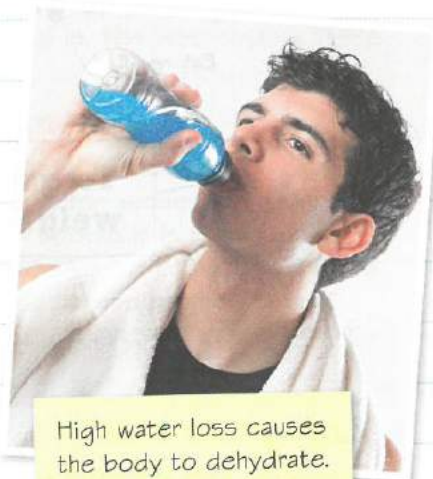
Effects on fluid amounts

Climate – a hot / humid climate will require an increase in fluid intake.

Levels of exercise – athletes need to ensure they are fully hydrated before exercise, during and after.

Programme type – the more intense the activity, the more absorption is slowed down.

Time of year – more care to maintain hydration levels is needed in the summer months.



High water loss causes the body to dehydrate. Adequate fluid intake is crucial for an athlete.

Dehydration

Dehydration can impair athletes' **strength, power and aerobic capacity**. Severe dehydration can be fatal.

Just a 2 per cent loss of water can affect ability.

Signs and symptoms of dehydration include: lack of energy, early fatigue in exercise, feeling hot, clammy / flushed skin, nausea, not needing to go to the toilet, **headache, disorientation or shortness of breath**.

Those in bold are signs of advanced dehydration.

Hyperhydration

Hyperhydration is a state of excessive hydration, producing greater than normal body water content.

Starting exercise in this state can improve:

- thermoregulation
- heat dissipation
- exercise performance.

The symptoms of hyperhydration often mimic those of dehydration.

Fluid intake when exercising

- **Pre-event:** 300–500ml of fluid 10–15 minutes before exercise.
- **Inter-event:** 150–200ml every 15–20 minutes during exercise, especially if the exercise lasts longer than an hour.
- **Post event:** after exercise fluid losses should be replaced 1.5 times within the first 2 hours of recovery.

Training should be used to practise fluid replacement strategies.

Sedentary individual: 2–2.5 litres per day / 6–8 cups of fluid

Fluid sources / requirements

Water – is adequate and suitable for most exercise. **Sports drinks** – are useful if exercising at higher intensities and for longer durations.

Ten per cent of daily requirements come from metabolic processes which release water from the body. **Ninety per cent is taken from the diet.**

Now try this

Why is it important for athletes to practise their fluid replacement strategies during training?

Nutritional strategies

The purpose of nutritional strategies in sport is to enhance training and performance.

Adapting diet to gain weight



Adapting diet to lose weight



Ergogenic aids

Ergogenic aids are used to improve performance during high-intensity physical exercise. They give you a mental or physical edge while exercising or competing.

Energy gels / bars:

- help replenish carbohydrates
- help replenish glycogen / calories
- deliver a quick supply of energy to your muscles when you need it most – on the go
- are light and easily digestible
- can be consumed on the move.

The timing and frequency of using energy gels / bars is crucial for effectiveness.

Protein supplements

Powders are the most popular and are generally consumed immediately before and after exercising, or in place of a meal. They are used to:

- 👍 increase muscle size and strength
- 👍 reduce muscle soreness post-training
- 👍 accelerate gains in aerobic strength
- 👍 accelerate gains in anaerobic strength
- 👍 increase fat loss
- 👍 reduce hunger.

Problems with protein supplements:

- 👎 excess calories and protein intake
- 👎 taste
- 👎 cost

Carbohydrate loading

- A strategy to increase the amount of fuel stored in your muscles to improve athletic performance for endurance events
- Involves continuing to eat a high-carbohydrate 'training diet' while scaling back your activity level
- Carb-loading is most beneficial for endurance athletes, such as marathon runners, swimmers or cyclists
- Carb-loading is completed the week prior to high-endurance activity.

Sports drinks

Sports drinks aim to provide three nutrients:

carbohydrates – replace energy

water – replace fluid

electrolytes – replace minerals lost sweating.

Three types of sports drinks

	Hypotonic	Isotonic	Hypertonic
Carb content	1-3%	6-8%	10%+
Purpose	Quickly replace fluid lost	Quickly replace fluid lost & boost carbs	To supplement carb intake
Used by	Gymnasts, jockeys	Athletes, footballers	Athletes needing high energy, marathon runners

Now try this

Do power athletes need more protein in their diet than an endurance athlete?

Aerobic strength and muscular endurance

Physical fitness is related to overall health. The more physically fit an individual is, the less chance there is of developing health issues.

Aerobic endurance

This is the ability of the heart (cardiovascular system) and lungs (respiratory system) to supply the exercising muscles with oxygen to maintain the exercise for a long period of time.

Can also be known as cardiorespiratory endurance.



By maintaining the flow of oxygen, an individual is able to exercise continuously for longer periods of time without tiring.

Strength

This is the ability of a specific muscle or muscle group to exert a force in a single maximal contraction against a resistance.



The Olympic rings is predominantly performed by male gymnasts due to its extreme upper body strength requirements.

Muscular endurance

This is the ability of a specific muscle or muscle group to sustain repeated contractions over an extended period of time.

Sporting relevance

Aerobic endurance is one of the **main fitness components**, important for success in many sports. Within certain sports it is the most important attribute, whereas in other sports it is only part of the overall fitness profile.

Key attribute	Part of the overall profile
Distance running, cycling, swimming or rowing	Racket sports
Triathlon	Team sports: football, netball, basketball or rugby

Sporting relevance

Key attribute	Part of the overall profile
Weight lifting	Rugby
Wrestling	Gymnastics

Sporting relevance

Key attribute	Part of the overall profile
Distance running, cycling, swimming or rowing	Racket sports
Triathlon	Team sports: football, netball, basketball or rugby

Now try this

Justify how the component 'muscular endurance' is one of the main attributes required by a triathlete.

Flexibility, speed and body composition

Physical fitness is made up of a number of different components, each contributing to an individual's overall fitness.

Flexibility

This is the ability of a joint or muscle to move through its full range of motion.

Static flexibility – involves holding part of the body still, at its full range of movement, such as holding a balance (gymnastics).

Dynamic flexibility – uses the full range of movement across a joint, where a fast action is used but not held, such as arching the back (high jump).

Sporting relevance

Flexibility is one of the main fitness components, important for success in many sports.

Key attribute	Part of the overall profile
Gymnastics	Racket sports
Diving	Team sports

Speed

This is the ability to move a distance in the shortest time.

Remember: speed is not just how fast someone can run, cycle or swim, but is dependent on acceleration (how quickly they can **accelerate from a stationary position**), maximal speed of movement, and **speed maintenance** (minimising deceleration).

Sporting relevance

Key attribute	Part of the overall profile
Track and field, sprints (100m sprint / long jump)	Racket sports
Speed skating	Team sports



The athlete must accelerate from the starting block to maximum velocity in as short a time as possible.

Body composition

This is the amount of body fat and lean tissue the athlete has.

Body composition is exactly what the name states: what our bodies are composed of. In general, we are all made up of the same parts – muscle, bone, organs, tissue, and fat. However, fat in particular varies immensely from person to person. This is the primary focus of body composition: the percentage of stored fat in a body versus lean mass.

Sporting relevance

Key attribute		Part of the overall profile
Low body composition and low body fat	High body composition and high body fat	
Horse racing	Sumo wrestling	Racket sports
Gymnastics	Heavyweight boxing	Team sports

Now try this

Justify how the component 'speed' is only part of the overall profile required for a tennis player.

Skill-related fitness

This is important for performing the more technical aspects of many sports.

What is skill-related fitness?

Skill-, performance- or motor-related fitness involves skills that will enhance one's performance in athletic or sports events.

Skilled athletes typically excel in all areas.

Agility

This is the ability of the athlete to change direction quickly and accurately during sport while maintaining control of the movement.

Sporting relevance

Key attribute

Team sports – football

Racket sports – squash

Balance

This involves being able to maintain stability or equilibrium while stationary.

Static balance – where the athlete is stationary, such as a handstand in gymnastics.

Dynamic balance – where the athlete is moving, such as a gymnast performing a cartwheel.

Sporting relevance

Key attribute

Gymnastics

Surfing

Coordination

This is the ability to move two or more body parts under control, smoothly and efficiently, to perform a task.

Sporting relevance

Key attribute

Badminton, squash

Baseball, softball

Reaction time

This is the time taken for a sport performer to respond to a stimulus and initiate their response, such as the starting pistol (stimulus) and the sprint start (the movement) in sprint events.

Sporting relevance

Key attribute

Motorsports

Fencing

Power

This is the ability to generate and use muscular strength quickly over a short period of time, such as in accelerating, jumping and throwing implements.

Sporting relevance

Key attribute

Weightlifting

Boxing

Power = strength × speed

Now try this

Explain the importance of 'agility' for a footballer.

Aerobic training principles

Aerobic exercise strengthens the heart and lungs and trains the cardiovascular system to manage and deliver oxygen more quickly and efficiently throughout the body.

Frequency (F)

Ideally, two workouts a week will maintain fitness levels, but for nearly everyone three to five sessions a week would be better.

If fat loss is the goal, then six to seven low-impact workouts a week is optimal.

Intensity (I)

Heart rate is the primary measure of intensity in aerobic training. Before a training programme, a target heart rate zone should be determined.

These factors can be manipulated within aerobic training: time, distance, terrain, pace. There must be a balance between overloading the body (so it can adapt) but not so much that it causes overtraining.

Time (T)

How long someone performs aerobic exercise will depend on their goals, schedule, and physical condition.

In general, 20–60 minutes is acceptable.

If the goal is body fat loss and the athlete is appropriately conditioned, then longer is better: at least 30 minutes and ideally 40–60 minutes.

Type (T)

Selection of aerobic exercise depends on goals, physical condition, injury and illness history.

It is a good idea to 'cross train' – alternate between and among several appropriate exercises. This reduces the chances of overuse injuries, imposes more balanced conditioning and enhances enjoyment.

Maximum heart rate (MHR) and training zones

MHR is used to calculate how hard you should work your heart to develop either aerobic or anaerobic fitness. (MHR) can be calculated as follows: $220 - \text{age} = \text{MHR}$.

✓ **Warm-up or cool-down zone** = 50 per cent of MHR (mainly for sedentary / unfit individuals new to training).

✓ **Activity recovery zone** = 60 per cent of MHR (useful for aiding recovery, removing waste products; the next step for those new to training).

✓ **Fat burning zone** = 60–70 per cent of MHR (required for fat burning management and for athletes training for long distances).

✓ **Aerobic fitness zone** = 70–80 per cent of MHR (where you develop aerobic endurance; it is suitable for active / trained individuals).

✓ **Target heart rate** = 60–75 per cent of MHR (this has the greatest benefit for cardiovascular health).

✓ **Peak performance zone** = 80–90 per cent of MHR (highest zone of cardiovascular training, which is geared towards competitive sport and will help develop speed).

✓ **Anaerobic threshold** = 90–100 per cent of MHR (this is the point where you can no longer meet your aerobic requirements, so the body uses your anaerobic systems. Training at this level is only suitable for advanced athletes).

Now try this

Your client, Julie, is 52 years old and she has decided to begin exercising.

- Calculate her maximum heart rate.
- What training zone would you recommend she works within?
- Work out her training heart rate.

Continuous and fartlek training

There are several different types of aerobic endurance training – each with a different, specific outcome and suitable for different events and sports.

Continuous training

This is also known as steady state training:

- training is completed at a steady pace over a long distance
- intensity should be moderate – aerobic training zone
- 20 minutes minimum up to several hours (e.g. marathon runners)
- suited to long distance athletes, such as runners or swimmers
- useful for beginners
- suited to athletes recovering from injury
- suited to specific populations – such as children, elderly people.

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Small amount of easy-to-use, accessible equipment, if any. 👍 Effective for aerobic fitness. 👍 Effective for losing weight. 	<ul style="list-style-type: none"> 👎 Can be boring. 👎 Doesn't improve anaerobic fitness – used in team games. 👎 Risk of injury. 👎 Not always sport-specific.

Continuous training can be **gym-based** using a treadmill, rower, cross trainer or bike, or **outdoors** at a suitable park / track.

Fartlek training

- Intensity is varied for the individual's specific needs, for instance a running session could include sprinting for 10 sec, fast walking for 20 sec, jogging for 1 min and repeating this.
- Intensity is varied by terrain or by pace.
- It can be more individual and sport-specific than continuous training.
- It uses both aerobic / anaerobic energy systems to improve aerobic endurance.
- It can involve changes in direction – which can closely mimic a sport.
- There are no rest periods.
- The athlete tends to have more control and is able to decrease intensity to rest.

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Less technical than other methods. 👍 Easy to use – adapt to level of fitness and sport. 👍 Athletes control their own pace. 👍 Boredom is reduced. 👍 Good for sports requiring a change in pace. 	<ul style="list-style-type: none"> 👎 Too easy to skip the hard sections. 👎 Can be difficult to see how hard an individual is training.

Fartlek training can be **gym-based** using a treadmill, rower, cross trainer or bike as long as the speed, resistance, and gradient can be changed regularly. It can also take place **outdoors** at a suitable park which has varying terrain, for instance sandy or hilly terrain.

Now try this

Which sports would utilise fartlek as a method of training?

Interval and circuit training

There are several different types of aerobic endurance training – each with a different, specific outcome and suitable for different events and sports.

Interval training

Interval training involves the following:

- improves both anaerobic and aerobic endurance
- varying intensity and work periods – for example, alternating periods of high-intensity exercise / effort with periods of low-intensity exercise / effort
- can be repeated, depending on fitness
- when designing the number of intervals, the intensity and duration of work and rest intervals, need to be considered
- allows for progression and overload by increasing work periods, increasing number of intervals, decreasing rest periods or increasing intensity of the rest period (for example a slow jog instead of a walk).

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Can mix aerobic / anaerobic, which replicates team games. 👍 Can be easier to observe the athlete who is not trying. 	<ul style="list-style-type: none"> 👎 Hard to keep going when you start to suffer fatigue. 👎 Can become boring.

Interval training can be **gym-based** using a treadmill, rower, cross trainer or bike as long as speed / resistance / gradient can be changed at the required intervals, or **outdoors** at a suitable park or track.

Circuit training

Circuit training involves the following:

- different exercises / stations
- set time to perform exercises – for instance, 1 minute per station
- rest periods in between stations
- can be designed for aerobic / muscular endurance or strength or a combination of all three
- stations should be structured to use different muscle groups
- to alter intensity: decrease the rest, increase the number of stations / circuits, increase the time spent at each station or increase the number of sessions per week.

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Less boring as it changes all the time. 👍 Easily adapted for strength / endurance. 👍 Easily adapted for different sports. 	<ul style="list-style-type: none"> 👎 Takes a while to set up. 👎 Requires a lot of equipment.

Circuit training can be **gym-based** using a range of equipment, depending on space. Circuit training can use cardiovascular equipment, free weights, fixed resistance machines or body weight exercises. Circuit training can be performed **outdoors** at a suitable venue.

Now try this

- Which types of aerobic training would be most beneficial for a footballer player?
- Explain your answer to question (a).

Muscular strength training

Generally, individuals take part in weight training to increase their **strength**. Other reasons include improving muscle tone or muscle size.

Frequency (F)

Frequency is dependent on the individual and format of the programme.

- A programme that works every body part should be completed three to four days per week with rest days in between.
- A programme that focuses on just one or two body parts can be completed as frequently as six days per week.

Intensity (I)

Workload is the measure of intensity for strength training. Workload has three components: **1. weight, 2. number of repetitions (reps), 3. number of sets**.

- The number of sets depend on fitness levels / training experience / muscle areas.
- Rest: 2–4 min between sets. **Higher intensity = more rest. Lower intensity = less rest.**
- To prevent fatigue, large muscle groups should be worked first, then smaller.
- All muscle groups should be exercised to avoid an imbalance.
- Abdominals should be left until the end to avoid fatigue (as they act as a stabiliser whilst exercising other groups).

Time (T)

- Common consensus is no longer than 45–60 minutes.
- Intense sessions may last as little as 20–30 minutes.

Type (T)

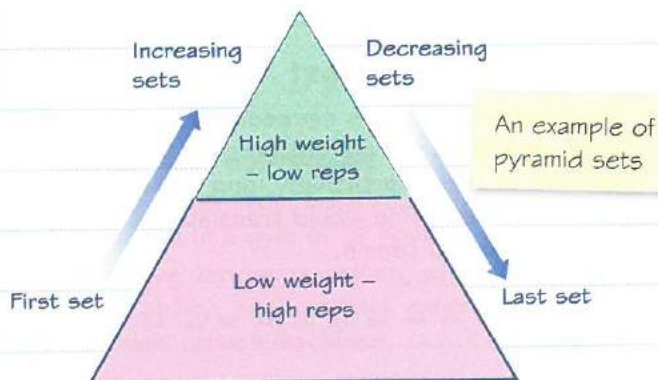
Types include:

- resistance machines
- free weights
- medicine balls
- circuit training
- core stability training.

Pyramid sets

These are a highly effective technique, performing an exercise or two for a particular rep, then working your way down to one exercise, which is intended to suffer fatigue:

- upward / downward sequence in weight / reps / sets
- starting with a light weight allows the body to warm up
- involves an intense routine as the muscles become overloaded.



Equipment

Free weights

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Large muscle groups can be worked at once – saves time. 	<ul style="list-style-type: none"> 👎 Risk of injury.
<ul style="list-style-type: none"> 👍 Can be used at home or at the gym. 	<ul style="list-style-type: none"> 👎 Heavy weights require a spotter.
<ul style="list-style-type: none"> 👍 A full range of motion is used. 	<ul style="list-style-type: none"> 👎 More suited to advanced trainers.
<ul style="list-style-type: none"> 👍 Functional to everyday and sport-specific movements. 	<ul style="list-style-type: none"> 👎 Requires good knowledge to use effectively.

Resistance machines

Advantages	Disadvantages
<ul style="list-style-type: none"> 👍 Safer than free weights. 	<ul style="list-style-type: none"> 👎 Expensive – gym based.
<ul style="list-style-type: none"> 👍 Used by beginners / injury rehabilitation. 	<ul style="list-style-type: none"> 👎 Focuses on one muscle group at a time.
<ul style="list-style-type: none"> 👍 Guided range of movement. 	<ul style="list-style-type: none"> 👎 Not functional everyday movement.

Now try this

Would you recommend a beginner uses free weights or resistance machines? Why?

Muscular endurance

Muscular endurance is the ability to repeat a series of muscle contractions without fatiguing.

Principles

We must train the muscles to overcome fatigue.

- Muscular endurance works on the principle of performing many repetitions against a given resistance for a prolonged period of time.
- It should come after muscular strength training.
- Its benefits are increased muscle tone and some hypertrophy. It creates an increase in size and number of mitochondria.

Frequency

- **Beginner:** 2–3 days per week.
- **Advanced:** 4–5 days per week.



Remember to incorporate rest to avoid over-training and injury.

Intensity (I)

Intensity varies:

- high reps and low loads: 15–30 reps
- sets: 4–6
- light / medium resistance: 46–60 per cent of 1RM
- rest periods are short
- work largest muscle groups first then smaller groups
- ensure all muscle groups are worked to avoid an imbalance.

Time (T)

The time involved per session varies:

- 30–60 min
- dependent on intensity of session
- 10–30 sec rest periods.

The work–rest ratio of 1:1 can be used here. This means spending the same amount of time resting as it took to complete the previous set.

1RM = maximum amount of force that can be generated in one maximal contraction

Type (T)

Types include:

- free weights
- resistance machines
- circuits
- resistance bands / tubing.

Relevance to sport

Muscular endurance is necessary for people who make repetitive muscle movements for extended periods of time, particularly long distance runners and triathletes. This would translate into sports like football and tennis.

Now try this

Name a circuit training exercise used to develop muscular endurance in these three muscle groups:

- Legs
- Arms
- Stomach.

Core stability training

'Core stability' describes the ability to control the position and movement of the central portion of the body.

Principle

The core muscle groups include more than just the abdominal muscles. Other core muscles are the erector spinae, external obliques, internal obliques, rectus abdominis, transverse abdominis.

The **main function** of the core is to stabilise and provide support, to allow large amounts of power to be transferred to the extremities of the body.

Core stability plays an important role in postural balance and injury prevention.

Popular core exercises

These include:

- ✓ crunches
- ✓ the plank with variations (such as side plank / reverse plank)
- ✓ leg raises with variations
- ✓ superman or dead fish
- ✓ the bridge with variations.



Superman / dead fish pose

Yoga

Yoga focuses on core stability, strength, flexibility and breathing for physical and mental well-being. It:

- focuses on back / abdominals
- can use light weights / resistance bands
- can be used towards physical activity guidelines for adults – strengthening activities
- classes are usually 45 min to 1 hour.

Pilates

- Pilates focuses on core strength to improve general fitness and well-being.
- Exercises are done on a mat or using specialist equipment.
- Pilates has a system of pulleys, springs, handles and straps, thus providing resistance or support.
- It is appropriate for all ages, levels of ability and fitness, from beginners to elite athletes.

Gym-based exercise

- Exercise taken from both yoga / pilates can be conducted in a gym or at home.
- Gyms have various machines, which focus on core stability, such as back extension and abdominal crunch machines.

Equipment

Core stability exercises can now be enhanced by using additional core / balance equipment (such as kettle bells, medicine balls, stability discs, bosu or foam rollers), making them more challenging and fun.

Now try this

Identify **three** benefits of core stability training.

Flexibility training

By increasing the range of motion about a joint, performance may be enhanced and the risk of injury reduced. Various types of stretching improve flexibility.

Maintenance stretch

Good for: after the exercise session.

Why: to maintain general flexibility after exercising / return muscle back to its normal length.

How: 10–20 sec.

Type: usually static stretching.

A maintenance stretch is not meant to improve your flexibility and, as such, is not held for very long.

Developmental stretch

Good for: end of session or as a stand-alone flexibility session.

Why: to develop general flexibility / improve ROM.

How: initial 6–10 sec – progress to a deeper stretch, repeat until last stretch is 20–30 sec.

Type: usually static stretching.

Try to increase the depth of the stretch slowly over time.

Pre-activity stretch

Good for: pre-workout warm-up.

Why: muscles ready for exercise, to improve performance and reduce injury risk.

How: increase ROM over a series of 10–20 reps or for 8–10 sec.

Type: usually dynamic stretching and focusing on the muscles which are going to be exercised.

Pre-activity stretches provide an excellent opportunity to rehearse the movements an athlete is about to perform in their coming workout.

Static stretching

Static stretching is controlled and slow:

- **active** stretching involves the athlete moving the joint through its range of motion and holding it at the point of stretch themselves
- **passive** or **assisted** stretching involves a partner / object moving the joint to the point of tension in the muscle and holding it for the athlete, while they relax.

Dynamic stretching

Dynamic stretching replicates the kind of movements which are common in sports, and can be adapted to suit the sport and individual. It involves taking a muscle through its entire ROM. Examples of these types of drills include high knees, lunges and heel flicks.

Proprioceptive neuromuscular facilitation (PNF)

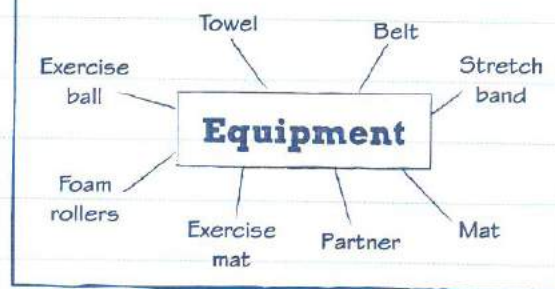
PNF:

- is an advanced technique
- is effective for increasing flexibility
- alternates contraction and relaxation.

PNF usually involves a 10 sec push phase followed by a 10 sec relaxation phase, which is repeated several times.



Stretching equipment



Now try this

- Which type of stretching do you recommend for a netballer preparing for a match?
- Explain your answer to question (a).

Speed training: principles

Speed is one of the main fitness components, important for success in many sports.

Principles

- Good acceleration is vital.
- Acceleration from a standing position is required for team sports.
- Speed training should be sports- and position-specific.
- Speed training should follow a warm-up and any training within the session should be of a low intensity.
- Speed training should be conducted after rest or light training – to reduce injury / overtraining.

Training thresholds / % MHR

Sprinting is anaerobic, meaning athletes need to work in their anaerobic target zone while training between 80–100 per cent of their MHR.

Anaerobic threshold is the heart rate above which we gain anaerobic fitness. We cross our anaerobic threshold at 80–100 per cent of our MHR.

Peak speed should be towards 80–100 per cent – this would only make up a small percentage of the training time. Working anaerobically creates an oxygen debt so we can only keep going for a short time.

Recovery

This is:

- an essential part of speed training
- required to replenish energy stores / maintain correct technique and reduce injury risk
- recovery between speed sessions should be 72+ hours.

Factors influencing speed

These are:

- flexibility
- strength
- endurance
- technique.

FITT principle for speed

Frequency	2–3 sessions per week
Intensity	Intensity: 80–100% Peak speed: 90–100% Reps: 4–10 Sets: 1–4 Rest periods: 1–3 min between sets
Type	Acceleration training, hollow sprints, interval training, resistance drills
Time	5–20 sec time under tension

Work–rest ratio of 1:5 so 10 sec maximal sprint followed by a 50 sec rest period.

Links Go to page 81 to revise the FITT principles.



Circuit training using FITT principle

Now try this

Why is recovery important for speed training?

Speed training: methods

Speed can be improved by completing one or a combination of the following training methods, best suited to the athlete's sport.

Hollow sprint

This method:

- replicates the pattern of a constant change of pace
- involves sprinting for a set distance, slowing down and accelerating for a set distance
- trains fast twitch fibres to accelerate over a short distance.

Example: Sprint 20m, jog 5m, sprint 15m, jog 5m, sprint 10m and jog 5m. Rest for 2 min then repeat for 1–4 sets.

Appropriate for team and individual sports, which require varying speed whilst competing.

Acceleration sprints

This is an aerobic training method.

- Speed is gradually increased: jog to stride to sprint.
- The progressive nature reduces the risk of injury.
- A slight incline can help with conditioning on the calf, thigh and hip muscles.

Example: 8 × 30m hills at a 15 degree gradient. Walk back with a 2 min rest between each repetition.

Interval training

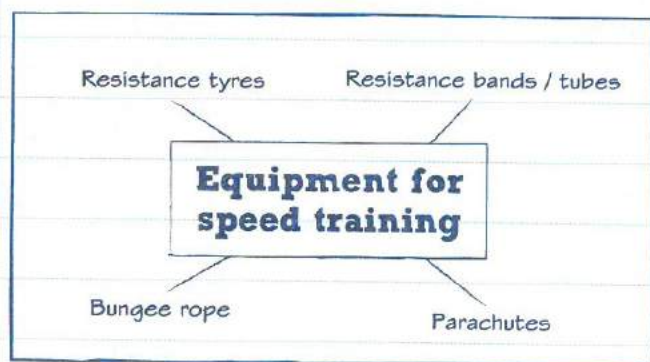
This method can improve anaerobic endurance and speed.

- Work intervals are short but intensity is maximal or near to maximal.
- Overload / progression can be incorporated by manipulating the rest periods.

Resistance drills

Using resistance when accelerating can develop speed over a short distance.

- This method makes muscles work harder.
- When resistance is removed, the athlete is ready to accelerate faster.
- Equipment includes resistance bands / parachute / sled / bungee ropes
- Resistance can be simply added by running up a hill or sand dunes, etc.



The importance of speed

The more efficiently you can run, the faster you can be.

- Therefore, technique is important with speed training.
- Good technique results in a more efficient use of energy.
- There are basically two phases to sprinting – the **acceleration phase** and the **top speed phase**.

Now try this

Is acceleration or top speed phase important for a footballer?

Agility and balance

There are several components of skill-related fitness; two important elements are agility and balance.

Agility

Agility is the ability of a sports performer to quickly and precisely move or change direction without losing balance or time. Agility is influenced by body balance, coordination, the position of the centre of gravity, running speed and skill.

This is an example of an agility drill for football.



Improving agility

Agility can not only be improved by agility training drills, but also by improving the following elements: speed, balance, power and coordination. SAQ (speed, agility, quickness) training works over short distances (5 m) and with a zig-zag pattern between cones. It requires performers to perform the drills as quickly as possible, forcing changes of directions with correct technique.

Balance

Balance is the ability of the performer to maintain their centre of mass over a base of support.

Balance is used through all sport, but in certain sports its importance is greater.

Static balance

Static balance involves maintaining balance in a stationary position.



A gymnast uses static balance for a handstand on a balance beam.

Dynamic balance

Dynamic Balance involves maintaining balance in motion.

A gymnast uses dynamic balance for control within a cartwheel.



Improving balance

Improving balance is useful:

- to engage core muscles
- to prepare for a rapid change in direction.

Pilates and yoga are effective methods of training for balance.

Static training can involve one-legged balances. Once effective, this should progress to dynamic training.

Dynamic training can include a wobble cushion / balance board or exercise such as a squat on one leg.

The principles of progression can be incorporated here, from static to dynamic.

Now try this

- Choose a sport from the following and explain why agility is important: basketball, football or rugby.
- Give **one** reason why balance is important in a game of netball.

Coordination and reaction time

There are several components of skill-related fitness, two important elements are coordination and reaction time.

Coordination

Coordination is the ability to use parts of the body together to move smoothly and accurately.

Good coordination ensures tasks are performed efficiently and accurately.

Types of coordination

There are three types of coordination.

Hand-eye coordination, such as that needed for racquet sports.

Foot-eye coordination, for instance to keep a ball under control.

Hand-to-hand coordination, such as that needed in basketball to switch hands when dribbling the ball.

Improving coordination

Methods of improving coordination include:

- 1 **ball-catching exercises**: throw a tennis ball against the wall, catching with one hand and then the other
- 2 **racquet drill**: bounce a ball on a racquet, palm facing up first, then alternate with palm facing up and palm facing down
- 3 **juggling drills** help with coordination and ball control.

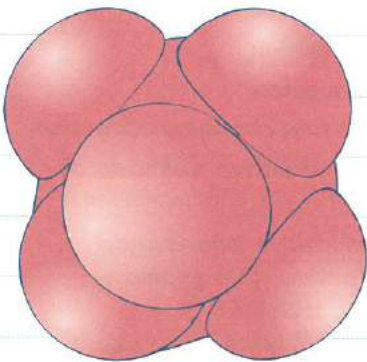
Reaction time

Reaction time is the time taken for a sports performer to respond to a stimulus and the initiation of this response.

Reaction time is vital for sports that are timed and of short duration, such as a 100 m sprint, a goalkeeper saving a penalty or a volleyball player reacting to a smash.

Poor reaction time in athletics can result in 'false starts', which mean an athlete could be warned or disqualified.

Reaction balls



Reaction balls are usually six-sided and made from rubber, meaning they bounce irregularly and aid the development of hand-eye coordination and quick reaction time for players of any sport.

Other equipment that may be used for reaction-time training are: stopwatch, whistle, visual stimulus (flags, etc) and auditory stimuli (shouting, sounds, etc).

Improving reaction time

Two examples of reaction drills are:

- 1 **kneeling to sprint**: kneel on all fours; on a command given by the coach react quickly and sprint 10 m
- 2 **ball and drop reaction drill**: with a partner the ball should be held at shoulder height and out to one side of the body and then dropped. The athlete needs to react, accelerate and attempt to catch the ball before it bounces for a second time.

Now try this

Explain the importance of reaction time for a cricket batsman.

Power

Plyometric exercise is used in sport-specific training to enhance power and performance.

Plyometrics

Plyometrics is one of the most effective methods of improving power.

- ✓ It can benefit a range of athletes.
- ✓ Effectiveness relies on maximal effort and a high speed of movement for each repetition.
- ✓ Plyometrics is ideal for sports / activities that involve explosive actions, such as a slam dunk in basketball.
- ✓ It is most effective following maximal strength training.
- ✓ The skill / speed of performing a plyometric exercise is of importance.
- ✓ Athletes should stop before fatigue breaks down technique.

Frequency

- 2–3 sessions of plyometrics can be completed in a week.
- Alternatively, recovery time between sessions can be used to decide frequency and is recommended at 48–72 hours.
- Plyometric training should not follow a heavy weight training session, when muscles may still be sore. This can cause issues for athletes who may need to strength-train 3–4 times per week.

Intensity

- Plyometric exercises should be performed at 100 per cent effort.
- Skipping exercises are classed as low intensity, while reactive drop jumps from height are the most intense.
- Training should progress gradually from lower to higher-intensity drills.
- For lower-body exercises, reps are known also as ground contact.

Time

- Each set should last no longer than 6–8 seconds.
- Full recovery should occur between sets.

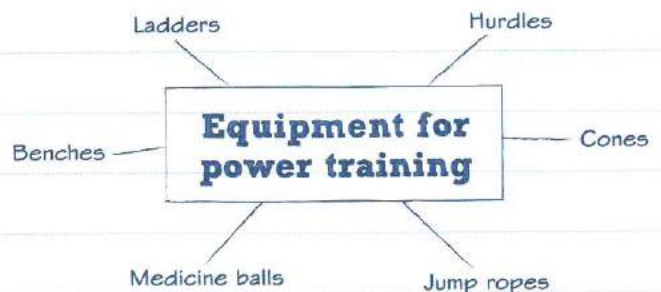
Plyometrics for different intensities:

- **low** – 10–30 reps, 10–15 sets, 2–3 min rest
- **sub-maximal** – 3–25 reps, 5–15 sets, 3–5 min rest
- **maximal** – 3–5 reps, 10–20 sets, 8–10 min rest.

Type

Exercises should try to mimic the movement patterns of the sport as closely as possible.

- **Lower-body plyometric exercises** such as squat jumps, bounding and box drills are suitable for sports such as basketball, track and field athletics, football or hockey.
- **Upper-body plyometric drills** such as medicine-ball throwing and catching, claps and push ups are suitable for sports such as basketball, volleyball, tennis or badminton.



Now try this

Provide **two** lower-body plyometrics exercises suitable for a basketball player.

Aims, objectives and SMARTER targets

To create the most effective training programme, an important question you need to ask first is: what is the individual's **specific fitness goal**?

Goal setting

Research has shown that goal setting has a positive effective on performance. The benefits are:

- ✓ giving the athlete an aim / focus / purpose
- ✓ increasing motivation
- ✓ increasing confidence level.

Aims

An aim is an intention or aspiration; what you hope to achieve.

The most common aims include:

- to build muscle / to increase strength
- to lose fat / to get 'toned'
- to gain/lose weight
- to improve performance
- to get in shape / to be healthier / to look better.

Objectives

An objective is a goal or a step on the way to meeting the aim and how you will achieve it.

Objectives use specific statements which define measurable outcomes (for example: what steps will you take to achieve the desired outcome?).

The SMARTER principle

When setting goals, the **SMARTER** principle should be applied to make your goals challenging, but attainable.

- S** **Specific** – make sure your goals are precise and stated in performance terms, such as, 'to complete my first 10K race in the next three months'.
- M** **Measurable** – goals must be quantifiable to track progress, for instance measuring minute-mile pace with weekly tempo runs to ensure on target.
- A** **Achievable** – sometimes goals are set which are unattainable. Goals should be set high, but they must also be realistic, such as, 'I used to enjoy running, and I have time to train now'.
- R** **Realistic** – goals have to be within the performer's reach to increase confidence.
- T** **Time phased** – a set period must be stated in which the goal should be reached, to allow for progression to be monitored and evaluated, for instance three months.
- E** **Exciting** – the goal has to be motivational, for instance to improve the time of certain runs each week.
- R** **Recorded** – the progress has to be written down, to account for progress, such as distance and times.

Now try this

Why is it important that goals are agreed by the performer and the coach?

FITT principles

FITT principles are a set of rules that must be adhered to in order to benefit from any form of fitness programme.

Frequency / intensity / type / time

The four principles of fitness training are applicable to individuals exercising at:

- low to moderate training levels
- both aerobic and resistance training.

FITT is used to guide the development of unique and bespoke fitness plans that cater for an individual's specific needs.

Frequency

The frequency of exercise is a fine balance between providing just enough stress for the body to adapt to and allowing enough time for healing and adaptation to occur.

Frequency refers to the number of sessions per week.

Point to remember:

Beginners should start with approximately three sessions per week and build up to more.

Intensity

The principle of intensity defines the amount of effort / how hard you are working in your training programme. Like frequency, there must be a balance between finding enough intensity to overload the body (to adapt) but not so much that it causes overtraining.

Intensity refers to factors such as weight, distance and time .

Points to remember:

- HR (Heart Rate) is used to measure the intensity of aerobic exercise.
- Workload is used to define the intensity of resistance training.
- Only increase the intensity using one parameter; such as just weight and not reps, sets too.

Type

The principle of type dictates the exercise chosen to achieve the appropriate training response.

Examples are:

- **aerobic** – running, swimming, cycling (continuous, interval, fartlek)
- **strength** – resistance machines, free weight, circuits.

Points to remember:

- Consider the individual's sport / fitness levels.
- Consider personal preferences (likes / dislikes).
- Consider accessibility to equipment / facilities / finances.
- Ensure exercise is varied to avoid boredom and work a range of areas.

Time

The final component is time; how long you should be exercising for. For example:

- **Aerobic** – beginners should work for 20–30 min, working up to 45–60 min as fitness levels increase
- **Strength** – sessions should be no longer than 45–60 min; more intense sessions may last 20–30 min.

Beyond these times there is very little effect, and the individual runs the risk of overtraining and injury (with exception of a marathon runner).

Rest

An important extra principle is **rest**.

Over-exercising can prove to be detrimental to the training and the body.

The rule here should be: **the harder you train, the more recovery you should allow for.**

Now try this

You are required to design an aerobic training programme for a new client who would like to begin running.

Apply the principle of frequency to their training programme.

Principles of training

By using the principles of training as a framework, we can plan a personal training programme that uses scientific principles to improve performance, skill, game ability and physical fitness.

Specificity

Application of this principle means that training must be matched to the needs and demands of the sport you are training for.

It should be specific to the individual in terms of initial fitness levels, their strengths, weaknesses and goals.

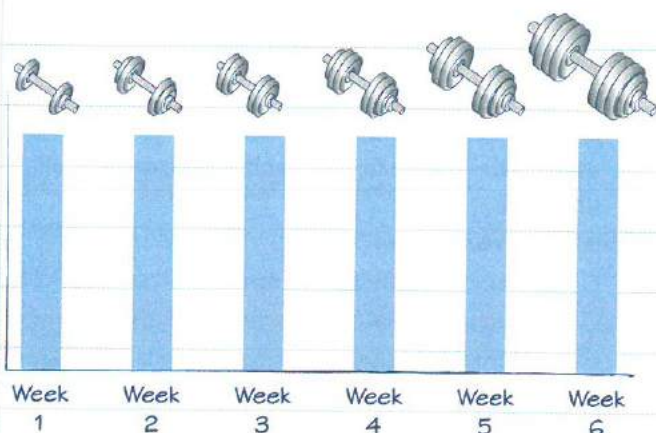
Overload

Application of this principle means that fitness can only be improved by training above what you normally do (overloading). You need to work harder to allow the body to adapt and improve.

Overload is possible by varying the frequency, intensity or time of training.

Progression

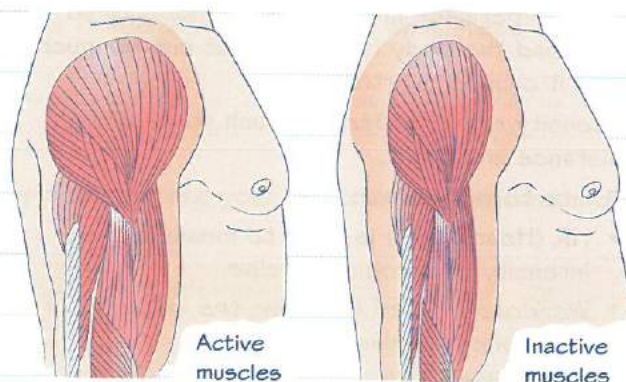
This involves the gradual application of progression. This process needs to be gradual to avoid injury and overtraining.



Start slowly and gradually increase.

Reversibility

This is also called 'detraining'. If you stop training, due to injury for example, any adaptations that have been developed as a result of training will deteriorate.



On the left is an image of a trained muscle, compared to an untrained muscle on the right.

Adaptation

This principle is the way the body 'programmes' the muscles to remember movement or skills. This ultimately encourages the body to adapt so the training becomes easier to perform.

Variation

Remember to vary training, to keep performers interested and to give the body a different challenge.

Individual training needs

A successful training programme will meet individual needs, which are personal fitness needs based on age, gender, fitness level and the sport for which you are training.

Rest and recuperation

Adequate time to rest and recover from training / competition is essential for both physiological and psychological reasons. Rest is physically necessary so that the muscles can repair, rebuild, and strengthen.

Now try this

One of the principles of training is reversibility.

What is meant by reversibility when training for an active healthy lifestyle?

Periodisation

Periodisation is simply known as a structured training cycle.

Ensuring optimum performance

Sports performers and their coaches must carefully plan their training programmes to ensure that optimum performance levels coincide with major events.

Periodisation ensures continued physiological and psychological changes; it prevents over-training, boredom and helps to achieve peak performance.

Main phases

A training year can be split into different phases, working back chronologically from a date where you wish to peak.

The **three** main phases are:

- ✓ off season (transition period)
- ✓ preseason (preparation period)
- ✓ in season (competition period).

Macrocycles

Macrocycles are 1-year to 4-year training cycles.

Examples:

- **Footballers** will work on a macrocycle from June–May, aiming to peak for weekly or bi-weekly matches.
- **Olympic athletes** will have a 4-year macrocycle, aiming to peak for the Olympic games.

Macrocycles are divided into a number of mesocycles.

Mesocycles

These are monthly training cycles.

- They are the main method of controlling the work-to-rest ratios (for example, 3:1 – work for three weeks followed by 1 active rest week).
- The technique uses a repetitive work-to-rest ratio, with a 4-week mesocycle and a ratio of 3:1, this could then be repeated but the intensity increased.

Each mesocycle is divided into a number of microcycles.

Microcycles

These are weekly or individually planned training sessions.

- Specific adaptations are the focal point and should demonstrate the FITT principles.
- Microcycles typically last for a week or can range between 5 and 10 days.

Individual training sessions



Three basic components should be included in any training session.

Now try this

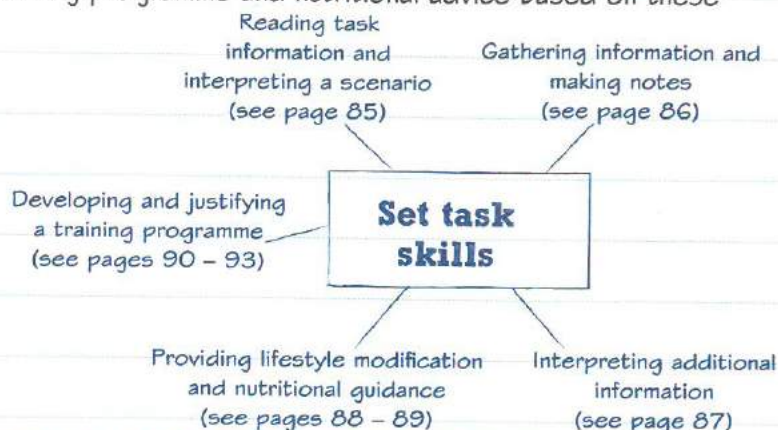
Give **three** reasons for the importance of periodisation within training.

Your Unit 2 set task

Unit 2 will be assessed through a task, which will be set by Pearson. This will assess your ability to interpret lifestyle factors and health screening data from a scenario and additional information, in order to develop and justify a fitness training programme and nutritional advice based on these interpretations.

Revising your skills

Your assessed task could cover any of the essential content in the unit. You can revise the unit content in this Revision Guide. This skills section is designed to revise skills that might be needed in your assessed task. The section uses selected content and outcomes to provide an example of ways of applying your skills.



Workflow

The process of developing and justifying a fitness training programme and nutritional guidance for an individual might follow these steps:

- ✓ Read the task and interpret a scenario.
- ✓ Gather information and make notes.
- ✓ Interpret lifestyle factors and screening information for a client.
- ✓ Provide lifestyle modification techniques for a client to promote their health and well-being.
- ✓ Provide nutritional guidance for a client.
- ✓ Propose relevant training methods for a client.
- ✓ Design a training programme for a client.

Check the Pearson website

The activities and sample response extracts in this section are provided to help you to revise content and skills. Ask your tutor or check the Pearson website for the most up-to-date **Sample Assessment Material and Mark Scheme** to get an indication of the structure of your actual assessed task and what this requires of you. The details of the actual assessed task may change so always make sure you are up to date.

Preparation

It may be useful to gather information and notes on the following areas:

- Lifestyle factors and their effect on health and well-being.
- Recommendations to promote health and well-being.
- Screening processes for training programming, including health monitoring test.
- Nutritional programming requirements.
- Training methods for different components of fitness.
- Appropriate training activities to meet the needs of a selected individual.
- Principles of fitness training.

Now try this

Visit the Pearson website and find the page containing the course materials for BTEC National Sport. Look at the latest Unit 2 Sample Assessment Material for an indication of:

- the structure of your set task, and whether it is divided into parts
- how much time you are allowed for the task, or different parts of the task
- what briefing or stimulus material might be provided to you
- any notes you might have to make and whether you are allowed to take selected notes into your supervised assessment
- the questions you are required to complete and how to format your responses.

Reading task information

Make sure you understand the key points of a task and scenario so the information and notes you gather are relevant.

Understanding the task and scenario

- ✓ Read and take time to consider the instructions carefully.
- ✓ Read through the scenario and make a list of areas for gathering information.
- ✓ Highlight or underline key words / points about the client. You can make notes as you read through.

Key points of information

When reading a scenario consider the key pieces of information provided.

Consider Mrs Smith's **age**, particularly in terms of the type of exercise and possibly her fitness levels.

Is Mrs Smith's **lunch break** a long enough opportunity to include some element of physical activity?

What are Mrs Smith's **current physical activity** levels and what type of **exercise / sport** does she currently do? What exercise is she looking to start? Think about government recommendations.

Mrs Smith is 40-years-old, she works 9-5 pm as a Receptionist at a dentist's surgery. She has the car on most days and drives the 1 mile to work. When she doesn't have the car, her husband drops her off. She takes 45 min for her lunch each day. The staff at the dental surgery are signed up to take part in a charity triathlon, but Mrs Smith hasn't run or cycled for a number of years, however she is a regular swimmer and is a member of the local swimming club. The triathlon is 6 weeks away. Mrs Smith attends her gym and takes part in a fitness assessment and will afterwards receive a personal training programme. She has previously completed a PAR-Q and has indicated that she has no medical conditions and is fit to take part in activity.

Think about her **occupation**, her working hours and how active / inactive will she be at work.

Consider her **transport** to and from work. Could exercise be incorporated here?

Consider her **goal**. The training programme will focus towards this.

Consider Mrs Smith's **medical conditions**.

Now try this

Use the above scenario based on Mrs Smith.

Practise preparing introductory notes addressing the key pieces of information identified in the scenario above.

Making notes

Here are some examples of skills involved if gathering information and making notes in response to information provided in a scenario.

Lifestyle factors and modification techniques

- Exercise / physical activity
- Balanced diet
- Smoking
- Alcohol
- Stress
- Sleep
- Barriers to change
- Strategies – physical activity
- Smoking-cessation strategies
- Strategies – reduce alcohol consumption
- Stress management techniques
- Blood pressure
- Resting heart rate
- Body mass index
- Waist-to-hip ratio

Use a checklist to ensure that you cover the relevant areas.

Exemplar learner notes for exercise and physical activity.

Sample notes extract

Positive:

- Mrs Smith is a regular swimmer participating twice a week for 45 minutes per session. In comparison to government recommendations this is positive.
- Mrs Smith is used to moderate exercise.
- She needs to expand her training to cover the other elements of a triathlon – running and cycling.
- She would benefit from spreading her activity across more days of the week.
- She should incorporate some low weight training, in order to achieve the government recommendation of 75 minutes per week.

Links Go to pages 44–57 to revise this topic.

Only include relevant information; e.g. government recommendations for below 19, and above 64 years are irrelevant for Mrs Smith.

Government recommendations for adults (19–64 years).

Nutrition

- Nutritional terminology
- A balanced diet
- Nutritional strategies

Think about: Analysing the client's current diet and strategies that could be incorporated to improve it. Remember to consider their future physical plans here.

Links Go to pages 58–64 to revise this topic.

Principles of fitness training

- Aims / objectives
- Goals
- FITT principles
- Additional principles

Think about: Consider these aspects when designing your training programme.

Now try this

You know that that Mrs Smith is preparing to complete a triathlon.

Consider the rest of the FITT principles and prepare suitable notes (intensity, type, time).

Training methods

- **Physical fitness components:** aerobic endurance, muscular strength, muscular endurance, core stability, flexibility, speed
- **Skill-related fitness components:** agility, balance, coordination, reaction time, power
- Training methods for each of the above

Which are the most appropriate training methods for the individual, goal or sport?

Exemplar learner notes on frequency from FITT principle.

Sample notes extract

- Frequency – Mrs Smith is not a beginner; already swims twice a week. Increase sessions to 3 / 4 then to 5 in latter part of programme.
- Rest – at least two rest days each week.
- Variety – include variety to train for different elements of a triathlon.

Preparatory notes

You may be allowed to take some of your preparatory notes into your supervised assessment time. If so, there may be restrictions on the length and type of notes that are allowed. Check with your tutor or look at the most up-to-date Sample Assessment Material on the Pearson website for information.

Interpreting lifestyle

Here are some examples of skills involved if asked to interpret lifestyle factors and screening information for a selected individual.

Lifestyle information

If you are given additional information about the client, this may contain:

- personal details
- current activity levels
- nutritional status
- lifestyle
- health monitoring tests
- physical activity / sporting goals.



Go to pages 44–48 to revise this topic.



This topic is covered on pages 54–57.



You can revise this topic on pages 65–79.

Answering the questions

- Note the number of marks available for each question.
- For longer questions, you will be required to include a number of explanations.
- Plan and structure your answers – consider what you need to cover in each question
- Support your answer with information you have gathered, such as normative data for blood pressure.
- Read your answer through once completed.

Sample response extract

The extracts from these sample responses focus on interpreting lifestyle and health screening data.

Health monitoring tests for Mrs Smith: Blood pressure (BP) – 135/82 mmHg; Body Mass Index (BMI) – 25; Waist-to-hip ratio (WHR) – 0.81; Resting heart rate (RHR) – 78bpm.

Mrs Smith's blood pressure is pre-high this could be negative for her health. Her BMI and waist-to-hip ratio highlight she is not at an ideal weight. This could also affect her health. Her resting heart rate is 78 bpm, which is average.

An interpretation of health monitoring test results is attempted but this is generic; lacking relevance to the individual.

Improved response extract

Mrs Smith is 40 years old. Her BMI and waist-to-hip ratio compared to normative data suggests she is slightly overweight. Her BMI of 25 is just inside the overweight category, with 24 being classed as normal. Her waist to hip ratio is 0.81, putting her at moderate risk, with 0.80 being low risk. As Mrs Smith is only slightly overweight, it would mean small changes to her physical activity and diet to see changes to her BMI and WHR results. The negative impact of being overweight for Mrs Smith could include her developing diabetes, high blood pressure and many other health problems. Mrs Smith's BP is both classed as pre-high and normal, her systolic is 135, which is classified as pre-high BP. Her diastolic reading is 82, which is classified as normal. As one figure is above the normal level, Mrs Smith BP is classified as pre-high BP. This can impact negatively on Mrs Smith's health causing an increase risk to the heart, which puts her at greater risk of a stroke and a heart attack. Mrs Smith's resting heart rate of 78 bpm is classified as average for her age. This is positive for her health, and with increased training over time her resting heart rate should decrease further.

A detailed analytical approach, leading to an interpretation of health monitoring test results; interpretation is specifically relevant to the individual.

Now try this

Consider Mrs Smith's monitoring results as a whole.

Suggest **two** ways in which Mrs Smith could work towards changing her health monitoring results.

Lifestyle modification

Here are some examples of skills involved if asked to provide lifestyle modification techniques for a client to promote their health and well-being.

Lifestyle factors

- Smoking
- Stress
- Diet
- Alcohol
- Sleep
- Physical activity

Remember the lifestyle factors you should be suggesting modification to. For each lifestyle factor, there are several techniques. Choose the most suitable for the client.

The extracts from these responses focus on lifestyle modification techniques for alcohol consumption. Mrs Smith has indicated on her screening form that she drinks 15 units of alcohol per week.

Sample response extract

She should drink less alcohol as she is above the government limit. This could be achieved by not drinking every day or by drinking smaller measures or drinks with less alcohol. They could avoid rounds and stay in more often. It might be a good idea for them to try counselling or yoga to help reduce alcohol intake. Some of these strategies are free and are provided by the NHS.

General techniques, assumption that the individual drinks alcohol only while out. Mrs Smith indicated on her screening form that she drinks 15 units of alcohol per week.

General and limited relevance to the individual's requirements.

Improved response extract


Mrs Smith consumes 15 units of alcohol per week, which exceeds the government recommendations. Reducing alcohol consumption is therefore a priority to Mrs Smith's health and also to support her training for the forthcoming triathlon. There are strategies that Mrs Smith could try before seeking external help. Firstly, suggestions will be made for drinking while at home. Mrs Smith should try to drink alcohol alongside food and avoid leaving the bottle on the table, which can cause temptation and over-consumption. Drinking at home may mean that Mrs Smith pours her own measures and drinks the bottle just because it is open. To avoid this, Mrs Smith could use a smaller glass or even measure her drinks or simply keep track of her intake. Whilst at home, Mrs Smith may drink at the same time of day, so breaking habits and finding distractions could also be an easy solution. Exercise particularly can break habits and, as Mrs Smith is preparing to complete a triathlon, planning her training at times when she would normally drink could be a simple strategy. As she will be increasing training, she may decide that training does not combine well with drinking alcohol and this could be a good opportunity to reduce or even stop drinking. Mrs Smith may drink while out, so strategies to try are to set herself a limit of alcoholic drinks, alternating with non-alcoholic drinks where possible. She should avoid rounds, which will allow her to drink at her own pace rather than to keep up with others. As Mrs Smith doesn't excessively exceed the government recommendations, I think she should try the self-help strategies first, which entail minor lifestyle changes, before seeking external support from self-help groups, counselling, etc.

Relevance to client throughout answer.

Specific relevance to individual's lifestyle and requirements.

Alternative strategies suggested.

Justification is relevant to the individual's lifestyle.

 **Links** Go to page 51 to revisit this topic.

Now try this

Mrs Smith has indicated that she doesn't hit the prescribed hours of sleep per night.

Suggest **three** suitable strategies to improve this.

Nutritional guidance

Here are some examples of skills involved if asked to provide nutritional guidance for a client.

Nutritional guidance

- ✓ The Eat Well Plate and choices of food
- ✓ Fluid intake (including caffeine / alcohol)
- ✓ Timing and number of meals
- ✓ Portion sizes, organisation and preparation
- ✓ Training needs

Breakfast	Toast	Extract from diet
Lunch	Cheese and tomato sandwich (white), crisps	
Dinner	Pasta with garlic bread	
Snacks	Cake, cheese and biscuits, chocolate bar, cheesecake	
Fluid intake	Coffee (2 cups), tea (1 cup), water (1.5 litres), white wine (2 small glasses)	

In these sample response extracts, the learner has provided nutritional guidance for the client, Mrs Smith.

Sample response extract

Mrs Smith needs to alter her diet; she should eat more carbohydrates, more fruit, vegetables and fish. She needs to cut down on saturated fat, sugary foods and salt.

She should drink more water each day and drink less caffeine and alcohol. She needs to make sure she eats more food now that she is starting to train for her triathlon.

Generic guidance.

Limited relevance to individual's dietary requirements.

Improved response extract

Mrs Smith eats breakfast, providing a good start to her day. However, this could be swapped with a healthier choice, such as cereal, which would increase her intake of calcium and carbohydrates required to supply energy. Or maybe a smoothie, which would contain both fruit and vegetables, supporting Mrs Smith towards achieving her five-a-day.

For lunch, she could modify her sandwich choices by using brown bread and swapping the cheese and tomato sandwiches with a tuna salad sandwich, containing less saturated fat and more protein. Her crisps could be swapped for a healthier alternative such as rice cakes, cashews or pistachio nuts. Another item of fruit or dairy such as yoghurt could be added to her lunch menu to offer a balance of food groups. Her tea includes a base of carbohydrates, which is recommended as well as meat and vegetables. The garlic bread could be removed as it might be high in fat. Her takeaway option should be avoided, with her opting to cook something homemade such as chicken stir fry, which would offer both protein and vegetables. Mrs Smith's snack choices could be adapted with items such as the slice of cake, cheese and biscuits, chocolate bar and cheesecake, all high in saturated fat and sugar, being removed and replaced with fruit. Mrs Smith should plan her meals ahead and use the Eat Well Plate as a basis for ensuring all food groups are included.

Mrs Smith's hydration is an area which needs addressing. Although she does not exceed the recommendations for caffeine intake, she would benefit from swapping caffeine drinks for more water. She is currently below the recommendation of 2–2.5 litres per day. A way to encourage herself to drink more water is to have a bottle on her desk while at work. Mrs Smith would also benefit from reducing her alcohol intake, as alcohol contains empty calories which are of no use to the body.

When training for her triathlon, she will need to ensure she eats the right amount of calories for her increased activity. She should consider supplementing her diet with more complex carbohydrates, which will offer her 'slow release energy'. This could be in the form of wholegrain pasta, rice and nuts, etc.

Specific relevance to the individual's requirements.

Justification of diet recommendations.

Justification of hydration guidance.

Specific relevance to individual's requirements.

Now try this

Explain **one** nutritional strategy you would recommend Mrs Smith to use prior to her triathlon.

Training methods

Here are some examples of skills involved if asked to propose relevant training methods for a client.

Training methods

- ✓ **Physical related components** – aerobic, strength, muscular endurance, flexibility, speed, body composition.
- ✓ **Skill-related fitness** – agility, balance, coordination, reaction time, power.

For each component there are several types of training methods. Consider the most suitable for the individual and their goal.

The extract from these responses focus on training methods for Mrs Smith, who swims twice a week.

Sample response extract

Mrs Smith needs to do more cardiovascular training, such as running, cycling, rowing. She could do continuous, interval and fartlek training.

She does swim but she doesn't participate in any other training. She should start off with training at a low intensity and build this up over the weeks of training.

Links Go to pages 68–70 to revisit cardiovascular training methods.

Methods are generic, with limited relevance to the individual's training requirements.

Mrs Smith indicated on her screening that she swims twice a week.

Improved response extract

Mrs Smith's training aims are towards completion of a triathlon. She already swims twice a week, but needs to incorporate both cycling and running into her weekly routine.

I suggest including two extra training sessions per week, which will focus on aerobic training to improve her cardiovascular fitness. Alongside this training, muscular endurance and strength training could also be incorporated to support the requirements of a triathlon and due to the fact she currently does no strength training during the week.

Training should be heavily based on running, cycling and swimming to specifically prepare for the triathlon. Her initial cardiovascular training would be low to moderate intensity (that of a beginner) as Mrs Smith hasn't completed these types of exercise for a number of years, so to begin with she would be working within the activity recovery zone of 60 per cent of her MHR, eventually working towards 70–80 per cent MHR to improve her cardiovascular fitness.

Continuous training is suitable for a beginner like Mrs Smith, but it is also an effective method for her training goal of a triathlon. However, a variety of training methods will be included to avoid repetition and boredom.

Although she already swims, her swimming training would be adapted to imitate this event within the triathlon, given the fact that a certain number of lengths have to be completed as fast as possible.

Specific relevance to the individual's training requirements.

Specific relevance to the individual's training needs.

Justification for proposed training methods, relevant to the individual's training needs.

Justification.

Specific relevance to her training aim and individual needs.

Links Go to pages 68–79 to revisit training methods for the various components of fitness.

Now try this

Explain **one** additional aerobic training method suitable for Mrs Smith to use within her training.

Training programmes

Here are some examples of skills involved if asked to design a training programme for a selected individual.

Training programme

- ✓ Principles of training – specificity, progression, overload, reversibility, adaptation, variation, individual training needs, rest and recuperation.
- ✓ FITT principles – frequency, intensity, time and type.

Some of the areas you should consider when designing a training programme.

The extracts from these responses provide a training programme for week one of six-week programme.

Limited understanding of the principles of training, such as overload, individual training needs, intensity, and time within each activity.

Sample response extract

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Physical activity	Rest day	30 min swim moderate pace	Rest day	30 min bike moderate pace	30 min swim	Rest day	30 min run moderate pace

Certain requirements are omitted, such as intensity, the breakdown of the activity, warm-up, cool-downs.

Generic detail, limited relevance to the fitness requirements of the individual, such as pace for a beginner, training thresholds.

Specific activities for a triathlon are included.

Improved response extract

Variation, overload, specificity, rest, individuality, FITT principles included.

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Physical activity	Rest day	30 min swim – 50m easy warm-up 16 x 25 m – 30 sec rest / interval; 50 m cool-down	Rest day	30 min bike / run 20 min bike; 10 min run as 2 x 4 min jog; 1 min walk after each jog (conversational pace / 60%–70% MHR = 108 bpm–126 bpm)	30 min swim as easy warm-up; 25 m, 50 m, 75 m, 100 m, 75 m, 50 m, 25 m all on 30 sec rest / interval; cool-down	Rest day	45 min bike / run 30 min outdoor ride 15 min run as 3 x 4 min easy jog; 1 min walk after each jog (conversational pace / 60%–70% MHR = 108 bpm–126 bpm)

Combines all three events within a triathlon.

Intensity is suitable for a beginner and training thresholds are specific to the individual.

Links Go to pages 80–83 to revisit this topic.

Now try this

Look specifically at Tuesday's swimming session in Week 1 (improved response). Suggest **two** ways progression could be incorporated.

Providing justification

Here are some examples of skills involved when justifying a training programme that has been produced for a selected individual.

Justification

- ✓ The individual's aim / level of fitness / current exercise routine / sport.
- ✓ Principles of training – specificity, progression, overload, reversibility, adaptation, variation, individual training needs, rest and recuperation.
- ✓ FITT principles – frequency, intensity, time and type.

Some of the areas to consider when justifying a training programme.

In these sample response extracts, the learner has justified their training programme for week one of a six-week training programme.

14 marks

Sample response extract

The programme has four training days and three rest days; this would change over the six weeks.

It incorporates swimming, cycling and running as Mrs Smith requires these sports for a triathlon and so she doesn't get bored. She will need to work at a moderate pace in her activities and build this up over the six weeks.

Her training sessions are all 30 min, which is acceptable for aerobic training.

Limited understanding of the principles of training.

Limited relevance to the training requirements of the individual.

Improved response extract

The training programme focuses on developing aerobic fitness in preparation for her triathlon. **Specifically** running, cycling and swimming are included. **Overload** is included by ensuring that she is working above what her body is normally used to. Although she swims, her current exercise regime includes no running or cycling.

With this in mind, the **intensity** of running and cycling is a suitable level for her as a beginner. A **variation** of training methods is incorporated with no training day identical, allowing for greater progress and to ensure Mrs Smith does not become bored. **Rest and recuperation** is incorporated; week one includes three rest days, and as the weeks progress this will decrease to two days to allow for more training. The programme is **individual** for Mrs Smith, considering her aim, level of fitness and current exercise regime. The **frequency** of the sessions is four per week; two of her current sessions, with two additional. Together these ensure she achieves the government targets for physical activity but also trains towards the triathlon.

Intensity is set to a challenging yet realistic level for Mrs Smith with recovery periods in all sessions in the form of a 30 sec rest period or the pace altering to walking. Heart rate thresholds are utilised to ensure she is working her aerobic system at the right level for a beginner, but also for **adaptation** and progress to be made. During future training, factors will be manipulated to ensure **progression**, such as rest periods, heart rate, pace, etc. The **time** of all sessions is 30 min plus, this is an optimal time to develop aerobic fitness whilst also considering her fitness levels.

Specifically relevant to the requirements of the individual.

The words highlighted demonstrate a thorough understanding of the principles of training applied to the training programme.

Now try this

On the previous page you suggested **two** ways progression could be incorporated. Justify the suggestions made.