

Unit 1: Fitness for Sport and Exercise

Level: **1 and 2**

Unit type: **Core**

Guided learning hours: **30**

Assessment type: **External**

Unit introduction

All sports performers want to be the best they can be. To reach optimal levels requires years of dedication to training, including successfully overcoming any barriers (such as injury) which might prevent a performer from achieving their goals. Working closely with their coach, the performer will gain an appreciation and understanding of the different fitness components, training principles, training methods and fitness tests which can be incorporated into their training regime to further enhance and improve their sports performance.

Physical and skill-related fitness components, including aerobic endurance, body composition and power, are related to positive health and wellbeing. Sports performers train regularly to improve and maintain their fitness levels and performance. Their training programmes are tailored to their specific training needs and their sport. A performer's training cycle can incorporate lots of different fitness training methods, such as circuits for muscular strength and endurance. Incorporating different fitness training methods keeps training interesting, which helps to keep motivation levels high.

Before different training methods can be explored, the sports performer needs to find out about their baseline fitness levels and what measures need to be improved. Fitness tests are essential; they help to identify areas that need improving and to track fitness improvements and progress over time. Fitness test results give an objective overview of performance and are used by sports coaches to ensure training continues to meet the performer's needs.

Fitness for sport and exercise is core to the programme of study. This unit has links to, and underpins, the other units for sport. In learning aim A you will cover the components of physical and skill-related fitness and the principles of training. Learning aim B explores different fitness training methods for developing components of fitness, and for learning aim C you will gain knowledge and skills in undertaking and administering fitness tests.

This unit is particularly relevant if you would like to work in sports coaching, elite sport or personal training.

Learning aims

In this unit you will:

- A know about the components of fitness and the principles of training
- B explore different fitness training methods
- C investigate fitness testing to determine fitness levels.

Learning aims and unit content

What needs to be learnt
<p>Learning aim A: Know about the components of fitness and the principles of training</p> <p>Topic A.1 Components of physical fitness:</p> <ul style="list-style-type: none"> ● aerobic endurance: <ul style="list-style-type: none"> ○ definition: the ability of the cardiorespiratory system to work efficiently, supplying nutrients and oxygen to working muscles during sustained physical activity. ○ alternative names: aerobic endurance is also known as cardiorespiratory fitness, cardiorespiratory endurance, or aerobic fitness. ○ the cardiorespiratory system consists of the cardiovascular system (the circulatory system – comprising the heart, blood, and blood vessels) together with the respiratory system (lungs and airways). The cardiorespiratory system is responsible for the uptake of oxygen from the air we breathe, the transport of nutrients and oxygen around the body and the removal of waste products including carbon dioxide. ● muscular endurance: <ul style="list-style-type: none"> ○ definition: the ability of the muscular system to work efficiently, where a muscle can continue contracting over a period of time against a light to moderate fixed resistance load. ● flexibility: <ul style="list-style-type: none"> ○ definition: having an adequate range of motion in all joints of the body; the ability to move a joint fluidly through its complete range of movement. ● speed: <ul style="list-style-type: none"> ○ definition: distance divided by the time taken. Speed is measured in metres per second (m/s). The faster an athlete runs over a given distance, the greater their speed ○ there are three basic types of speed: accelerative speed (sprints up to 30 metres), pure speed (sprints up to 60 metres) and speed endurance (sprints with short recovery period in-between). ● muscular strength: <ul style="list-style-type: none"> ○ definition: the maximum force (in kg or N) that can be generated by a muscle or muscle group. ● body composition: <ul style="list-style-type: none"> ○ definition: the relative ratio of fat mass to fat-free mass (vital organs, muscle, bone) in the body. <p style="text-align: right;"><i>continued</i></p>

What needs to be learnt

Topic A.2 Components of skill-related fitness:

- agility:
 - definition: the ability of a sports performer to quickly and precisely move or change direction without losing balance or time.
- balance:
 - definition: the ability to maintain centre of mass over a base of support
 - there are two types of balance: static balance and dynamic balance. A gymnast uses static balance when performing a headstand and dynamic balance to perform a cartwheel.
- coordination:
 - definition: the smooth flow of movement needed to perform a motor task efficiently and accurately.
- power:
 - definition: the product of strength and speed
 - expressed as the work done in a unit of time.
- reaction time:
 - definition: the time taken for a sports performer to respond to a stimulus and the initiation of their response.
- recognition of fitness components needed for sports performance.

Topic A.3 Why fitness components are important for successful participation in given sports in terms of:

- being able to successfully meet the physical demands of the sport in order to reach optimal performance
- being able to successfully meet the skill-related demands of the sport in order to reach optimal performance
- being able to perform efficiently
- giving due consideration to the type of event/position played.

Topic A.4 Exercise intensity and how it can be determined:

- intensity – be able to measure heart rate (HR) and apply HR intensity to fitness training methods
- know about target zones and training thresholds; be able to calculate training zones and apply HR max to training: $HR\ max = 220 - age\ (years)$
- be able to calculate 60–85% HR max and know that this is the recommended training zone for cardiovascular health and fitness
- know that the Borg (1970) (6–20) Rating of Perceived Exertion (RPE) Scale can be used as a measure of exercise intensity
- know about the relationship between RPE and heart rate where:
 $RPE \times 10 = HR\ (bpm)$
- application of the FITT principles to training methods, regimes and given exercise situations.

continued

What needs to be learnt

Topic A.5 The basic principles of training (FITT):

- frequency: the number of training sessions completed over a period of time, usually per week
- intensity: how hard an individual will train
- time: how long an individual will train for
- type: how an individual will train by selecting a training method to improve a specific component of fitness and/or their sports performance.

Topic A.6 Additional principles of training:

- progressive overload:
 - definition: in order to progress, training needs to be demanding enough to cause the body to adapt, improving performance.
- specificity:
 - definition: training should be specific to the individual's sport, activity or physical/skill-related fitness goals to be developed.
- individual differences/needs:
 - definition: the programme should be designed to meet individual training goals and needs.
- adaptation:
 - definition: how the body reacts to training loads by increasing its ability to cope with those loads
 - adaptation occurs during the recovery period after the training session is completed.
- reversibility:
 - definition: if training stops, or the intensity of training is not sufficient to cause adaptation, training effects are reversed.
- variation: it is important to vary the training regime to avoid boredom and maintain enjoyment
- rest and recovery are required so that the body can recover from the training and to allow adaptation to occur
- application of the principles of training to training methods, regimes and given exercise settings.

Learning aim B: Explore different fitness training methods

Topic B.1 Requirements for each of the following fitness training methods:

- safe, correct use of equipment
- safe, correct use of training technique
- requirements for undertaking the fitness training method, including warm-up and cool down
- application of the basic principles of training (FITT) for each fitness training method
- linking each fitness training method to the associated health-related/skill-related component of fitness.

continued

What needs to be learnt**Topic B.2 Additional requirements for each of the fitness training methods:**

- advantages/disadvantages
- application of exercise intensity to fitness training methods
- application of principles of training to fitness training methods
- appropriate application of fitness training method(s) for given situation(s)
- appropriate application of fitness training method(s) to given client needs/goals/aims/objectives.

Topic B.3 Fitness training methods for:**flexibility training:**

- static: there are two types of static flexibility training. Firstly active stretching, which is performed independently where the performer applies internal force to stretch and lengthen the muscle. The second is passive stretching, also known as assisted stretching, which requires the help of another person or an object such as a wall. The other person/object applies external force causing the muscle to stretch.
- ballistic: this is where the performer makes fast, jerky movements through the complete range of motion, usually in the form of bobbing or bouncing. Ballistic stretching is specific to the movement pattern of the sport/activity to be performed. It needs to be undertaken with care as the technique can cause muscle soreness and strains.
- Proprioceptive Neuromuscular Facilitation (PNF) technique: this is used to develop mobility, strength and flexibility. The technique may be performed with the help of a partner or alternatively by using an immovable object (as resistance to inhibit movement). PNF stretches can be used in rehabilitation programmes. To perform the PNF technique with a partner, the performer should stretch the muscle to the upper limit of its range of movement and then, with the help of a partner, hold the muscle in an isometric contraction, where there is no active shortening or lengthening of the muscle, for 6–10 seconds. Then relax the muscle and with the help of a partner a static (passive) stretch is performed to enable the muscle to stretch even further. The technique inhibits the stretch reflex which occurs when a muscle is stretched to its full capability, so that an even greater stretch and range of movement can occur.

strength, muscular endurance and power training:

- circuit training: this is where different stations/exercises are used to develop strength, muscular endurance and power. The stations/exercises use different muscle groups to avoid fatigue.
- free weights:
 - use of barbells or dumb-bells to perform different types of dynamic exercises
 - concepts to use when training for strength (low reps and high loads)
 - concepts to use when training for endurance (high reps and low loads)
 - order of exercises: focus on core exercises (working muscles which help to stabilise the spine and pelvis) before assistance exercises (working muscles associated with the events in a performer's specific sport, or the main exercises in a training programme if a performer is not training for a specific sport)

continued

What needs to be learnt

- perform exercises which alternate between upper and lower body, alternate push and pull exercises)
- intensity (% 1 Repetition Maximum – 1RM)
- training for strength endurance (50–60% 1RM and 20 reps – repetitive movements of a muscle or muscle group)
- training for elastic strength (75% 1RM and 12 reps – for producing movements in very close succession, like in gymnastics)
- training for maximum strength (90% 1RM and 6 reps – producing a single movement against a resistance/load), reps, sets, rest period.
- **plyometrics:** this type of training develops sport-specific explosive power and strength. It is used by sports performers such as sprinters, hurdlers, and netball, volleyball and basketball players. Plyometric exercises need maximal force as the muscle lengthens (eccentric action) before an immediate maximal force as the muscle shortens (concentric action). Types of exercises include lunging, bounding, incline press-ups, barrier hopping and jumping. This type of training needs to be performed carefully because it can cause muscle soreness.

aerobic endurance training:

- **continuous training:** this is training at a steady pace and moderate intensity for a minimum period of 30 minutes.
- **fartlek training:** this is where the intensity of training is varied by running at different speeds or over different terrain. The training is continuous with no rest period. It is important to know about other ways in which intensity of training can be increased, including the use of equipment (harness, running with weights or weighted backpack).
- **interval training:** this is where the individual performs a work period followed by a rest or recovery period. Typical work time can vary from training for 30 seconds to five minutes; recovery periods can be complete rest, walking or light jogging. Typical work intervals for aerobic endurance will be around 60% maximum oxygen uptake (VO_2 max). Decrease the number of rest periods and decrease work intensity to develop aerobic endurance.
- **circuit training:** this is where different stations/exercises are used to develop aerobic endurance. The station order/order of exercises is important to ensure different muscle groups are used to avoid fatigue. The number of stations, time spent at each station, number of circuits, rest period between exercises and number of circuit sessions per week can be varied.

speed training:

- **hollow sprints:** a series of sprints separated by a 'hollow' period of jogging or walking.
- **acceleration sprints.** This is where the pace is gradually increased from a standing or rolling start to jogging, then to striding, and then to a maximum sprint. Different drills can be used, such as resistance drills and hill sprints. Rest intervals of jogging or walking are used in between each repetition.
- **interval training:** the individual performs a work period followed by a rest or recovery period. For speed training, the work intervals will be shorter and more intense – performed at a high intensity, close to maximum. Increase the number of rest periods and increase work intensity to develop speed.

continued

What needs to be learnt**Learning aim C: Investigate fitness testing to determine fitness levels****Topic C.1 Fitness test methods for components of fitness:**

- **flexibility:** sit and reach test (usually measured in cm or inches)
- **strength:** grip dynamometer (usually measured in KgW)
- **aerobic endurance:**
 - multi-stage fitness test, known as the bleep test (usually predicted in ml/kg/min)
 - forestry step test (usually predicted in ml/kg/min)
 - definition of VO₂ max (ml/kg/min): the maximum amount of oxygen uptake, usually measured in ml of oxygen per kg of body mass per minute. It is a measure of cardiorespiratory endurance.
- **speed:** 35m sprint (usually measured in s)
- **speed and agility:** Illinois agility run test (usually measured in s)
- **anaerobic power:** vertical jump test (usually measured in kgm/s)
- **muscular endurance:** one-minute press-up, one-minute sit-up (usually measured in number of reps/minute)
- **body composition:**
 - Body Mass Index (BMI) (usually measured in kg/m²)
 - Bioelectrical Impedance Analysis (BIA), used for prediction of percent body fat
 - skinfold testing via the Jackson-Pollock nomogram method for prediction of percent body fat (sites for males: chest, abdominal and thigh; sites for females: triceps, suprailiac and thigh).

Topic C.2 Importance of fitness testing to sports performers and coaches:

- gives baseline data for monitoring/improving performance
- can design training programmes based on test results and determine if training programmes are working
- results can give a performer something to aim for/goal setting.

Topic C.3 Requirements for administration of each fitness test:

- pre-test procedures (informed consent, calibration of equipment)
- knowledge of published standard test methods and equipment/resources required
- purpose of each fitness test
- accurate measurement and recording of test results
- basic processing of test results for interpretation (using published data tables and appropriate units for comparison purposes)
- ability to safely select appropriate test(s) for given purposes, situations and/or participants
- the terms 'reliability', 'validity' and 'practicality' related to each fitness test method
- advantages and disadvantages of fitness test methods.

continued

What needs to be learnt

Topic C.4 Interpretation of fitness test results:

- compare fitness test results to normative published data
- compare fitness test results to those of peers
- be able to draw conclusions from data results
- be able to analyse and evaluate test results
- be able to suggest and justify appropriate recommendations for improvements to fitness for a given purpose/situation/participant
- be able to suggest and justify appropriate fitness training methods that could be used for a given purpose/situation/participant.

Teacher guidance

Resources

The special resources required for this unit are:

- informed consent forms
- access to a sports hall (for multistage fitness test and training methods)
- access to free weights, perhaps within a local leisure/sports centre
- fitness testing equipment: sit and reach box, grip dynamometer, benches for step test, stop watches, metronome, vertical jump board, skinfold calipers, Bioelectrical Impedance Analysis machine, heart rate monitor
- Rating of Perceived Exertion Scale
- published normative data tables for interpretation of fitness test results.

Assessment guidance

Onscreen on-demand testing

This unit is externally assessed using an onscreen test. Edexcel sets and marks the test. The test lasts for one hour and has 50 marks. The assessment is available on demand.

Learners will complete an onscreen test that has different types of questions including objective and short-answer questions. Where appropriate, questions contain graphics, photos, animations or videos. An onscreen calculator is available for questions requiring calculations. An onscreen notepad is available for making notes. Each item will have an accessibility panel that allows a learner to zoom in and out, and apply a colour filter.