



Topic Guide 3: Physical Training

GCSE (9-1) Physical Education

Pearson Edexcel Level 1/Level 2 GCSE (9-1) in Physical Education (1PE0)

Topic Guide: GCSE Physical Education 2016 – Physical Training

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Introduction

This topic guide gives an overview of the specification topic: Physical Training. The guide is designed to give support by detailing content changes in relation to this topic and to give further clarity over the required breadth and depth that needs to be covered. The guide signposts possible resources to aid preparation and delivery and also gives some teaching ideas to assist with planning and delivery.

Content and content changes

Component 1, Topic 3: Physical Training

Subject content	What learners need to learn
<p>In this topic, learners will develop knowledge and understanding of the principles of training and different training methods in order to plan, carry out, monitor and evaluate personal exercise and training programmes, through the following content.</p>	
<p>3.1 The relationship between health and fitness and the role that exercise plays in both</p>	<p>3.1.1 Definitions of fitness, health, exercise and performance and the relationship between them</p>
<p>3.2 The components of fitness, benefits for sport and how fitness is measured and improved</p>	<p>3.2.1 Components of fitness and the relative importance of these components in physical activity and sport: cardiovascular fitness (aerobic endurance); strength; muscular endurance; flexibility; body composition; agility; balance; coordination; power; reaction time; and speed</p> <p>3.2.2 Fitness tests: the value of fitness testing; the purpose of specific fitness tests; the test protocols; the selection of the appropriate fitness test for components of fitness and the rationale for selection</p> <p>3.2.3 Collection and interpretation of data from fitness test results and analysis and evaluation of these against normative data tables</p> <p>3.2.4 Fitness tests for specific components of fitness: cardiovascular fitness – Cooper 12 minute tests (run, swim), Harvard Step Test; strength – grip dynamometer; muscular endurance – one-minute sit-up, one-minute press-up; speed – 30 m sprint; power – vertical jump; flexibility – sit and reach</p> <p>3.2.5 How fitness is improved (see section 3.3.1–3.3.3)</p>

Subject content	What learners need to learn
<p>3.3 The principles of training and their application to personal exercise/training programmes</p>	<p>3.3.1 Planning training using the principles of training: individual needs; specificity; progressive overload; FITT (frequency, intensity, time, type); overtraining; reversibility; thresholds of training (aerobic target zone: 60–80% and anaerobic target zone: 80%–90%, calculated using the Karvonen formula)</p>
	<p>3.3.2 Factors to consider when deciding the most appropriate training methods and training intensities for different physical activities and sports (fitness/sport requirements, facilities available, current level of fitness)</p>
	<p>3.3.3 The use of different training methods for specific components of fitness, physical activity and sport: continuous; Fartlek; circuit; interval; plyometrics; weight/resistance. Fitness classes for specific components of fitness, physical activity and sport (body pump, aerobics, Pilates, yoga, spinning). The advantages and disadvantages of different training methods</p>
<p>3.4 The long-term effects of exercise</p>	<p>3.4.1 Long-term effects of aerobic and anaerobic training and exercise and the benefits to the musculo-skeletal and cardio-respiratory systems and performance</p>
	<p>3.4.2 Long-term training effects: able to train for longer and more intensely</p>
	<p>3.4.3 Long-term training effects and benefits (for performance of the musculo-skeletal system): increased bone density; increased strength of ligaments and tendons; muscle hypertrophy; the importance of rest for adaptations to take place; and time to recover before the next training session</p>
	<p>3.4.4 Long-term training effects and benefits (for performance of the cardio-respiratory system): decreased resting heart rate; faster recovery; increased resting stroke volume and maximum cardiac output; increased size/strength of heart; increased capillarisation; increase in number of red blood cells; drop in resting blood pressure due to more elastic muscular wall of veins and arteries; increased lung capacity/volume and vital capacity; increased number of alveoli; increased strength of diaphragm and external intercostal muscles</p>

Subject content	What learners need to learn
3.5 How to optimise training and prevent injury	3.5.1 The use of a PARQ to assess personal readiness for training and recommendations for amendment to training based on PARQ
	3.5.2 Injury prevention through: correct application of the principles of training to avoid overuse injuries; correct application and adherence to the rules of an activity during play/participation; use of appropriate protective clothing and equipment; checking of equipment and facilities before use, all as applied to a range of physical activities and sports
	3.5.3 Injuries that can occur in physical activity and sport: concussion; fractures; dislocation; sprain; torn cartilage and soft tissue injury (strain, tennis elbow, golfers elbow, abrasions)
	3.5.4 RICE (rest, ice, compression, elevation)
	3.5.5 Performance-enhancing drugs (PEDs) and their positive and negative effects on sporting performance and performer lifestyle, including: anabolic steroids; beta blockers; diuretics; narcotic analgesics; peptide hormones (erythropoietin (EPO), growth hormones (GH)); stimulants; blood doping
3.6 Effective use of warm up and cool down	3.6.1 The purpose and importance of warm ups and cool downs to effective training sessions, and physical activity and sport
	3.6.2 Phases of a warm up and their significance in preparation for physical activity and sport
	3.6.3 Activities included in warm ups and cool downs

Many areas of this topic are covered in the current (2009) GCSE PE Specification. Where there are significant changes, these are highlighted below.

Subject content	Comments
3.2.1 Components of fitness	These are no longer split into health-related exercise or skill-related fitness.
3.2.3 Collection and interpretation of data from fitness test results and analysis and evaluation of these against normative data tables	While the 2009 specification required learners to use graphs to demonstrate, explain and evaluate the use of various heart rates and target zones, due to the need for new specifications to assess 'use of data', this has been extended to fitness testing. Skills developed here will be transferable to the analysis section of the learners' Personal Exercise Programme (PEP).
3.3.2 Factors to consider when deciding the most appropriate training methods and training intensities for different physical activities and sports	While there was some expectation that learners could justify their choice of training method in the 2009 specification, this has been extended; factors such as current level of fitness, fitness requirements of the sport and the resources available should be considered. Knowledge gained here will be useful in the learners' PEP.

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This area of the specification naturally lends itself to being taught alongside Component 4, the PEP. It is the perfect opportunity to combine theory with practice. While learners will still need to be able to recall, apply, analyse and evaluate this topic area for assessment in the written paper (Paper 1), what better way than to develop these skills in a practical, meaningful setting, i.e. in support of their PEP work. What follows is a selection of ideas that could be utilised to reinforce learning of relevant content for this topic area, while also giving a useful resource for the learners' PEP.

Physical Training: definitions and relationships between terms

3.1 The relationship between health and fitness and the role that exercise plays in both

Learners will be expected to **know and understand**:

- definitions of fitness, health, exercise and performance
- the relationship between fitness, health, exercise and performance.

Definitions are given in the specification glossary for health, fitness and exercise. These can be rote learnt but learners will also need to understand the terms and how they influence each other, for example, exercise can increase health and fitness. Higher levels of fitness can impact positively on performance. The reverse, of course, can also be true and learners should be aware of this.

Learners will be expected to **apply** their knowledge.

For example:

- by considering suitable exercise to increase health, fitness or performance.

Learners will be expected to **analyse and evaluate**.

For example:

- the possible impact of exercise on health, fitness or performance.

Physical Training: measuring and improving the components of fitness

3.2.1 The components of fitness and their relative importance in physical activity and sport

Learners will be expected to **know and understand**:

- The components of fitness:
 - cardiovascular fitness (aerobic endurance)
 - strength
 - muscular endurance
 - flexibility
 - body composition
 - agility
 - balance
 - coordination
 - power
 - reaction time
 - speed.

This means that learners should be aware of what each component is and be able to give an example of the type of activity where high levels of the component would be an advantage. For example, 100 m sprint requires reaction time, power and speed.

Learners will be expected to **apply** their knowledge.

For example:

- by selecting appropriate components of fitness for a given scenario, e.g. a squash player who experiences fatigue in the final game, or the swimmer who needs to improve their start.

Learners will be expected to **analyse and evaluate**.

For example:

- the relative importance of the components of fitness to performers in a range of physical activity and sport.

3.2.2 to 3.2.4 Fitness testing: values, protocols and data.

Learners will be expected to **know and understand**:

- the reasons for fitness testing
- the purpose of fitness tests to measure specific components of fitness:
 - Cooper 12 minute run/swim and Harvard Step Test for cardiovascular fitness (aerobic endurance)
 - grip dynamometer for strength
 - one-minute sit-up and one-minute press-up for muscular endurance
 - 30 m sprint for speed
 - vertical jump test for power
 - sit and reach test for flexibility.
- the test protocol for each of these fitness tests
- how to use normative data tables.

NB learners should understand normative data tables and be able to read them, but there is no requirement to learn the ratings for each test.

Learners will be expected to **apply** their knowledge.

For example:

- by selecting appropriate fitness tests for a given scenario, e.g. a squash player who experiences fatigue in the final game who needs to test their aerobic endurance, or the long jumper who needs to test their power because they are not getting the required flight from the board for a good jump.

Learners will be expected to **analyse and evaluate**.

For example:

- to make recommendations for areas of fitness needing improvement for a selected sport, based on fitness test rating results, giving a rationale/justification for recommendations
- the value of fitness testing in improving performance.

Physical Training: principles and methods of training

3.3.1 to 3.3.3 The use of training methods and principles for different physical activities and sports

Learners will be expected to **know and understand**:

- the principles of training (individual needs, specificity, progressive overload); FITT (frequency, intensity, time, type); overtraining; reversibility; thresholds of training (aerobic target zone: 60–80% and anaerobic target zone: 80%–90% calculated, using the Karvonen formula)
- factors to consider when deciding the most appropriate training methods and training intensities for different physical activities and sports (fitness/sport requirements, facilities available, current level of fitness)
- training methods for specific components of fitness, physical activity and sport: continuous; Fartlek; circuit; interval; plyometrics; weight/resistance. Fitness classes for specific components of fitness, physical activity and sport (body pump, aerobics, Pilates, yoga, spinning)
- the advantages and disadvantages of different training methods.

Note some minor changes to 2009 specification list of principles of training. While learners do need to know about the principle of reversibility, emphasis here is on appropriate planning using the other principles to avoid it. Also note that, while more refined versions of Karvonen exist at level 2, the basic Karvonen formula (Max HR – age) is the method learners will need to know for assessment.

For example, a 16 year old learner would calculate the lower threshold of their aerobic training zone as follows:

$$\begin{aligned} & (220 - \text{age}) \times 60\% \\ & (220 - 16) \times 60\% \\ & 204 \times 60\% \\ & = 122 \text{ beats per minute.} \end{aligned}$$

To calculate their upper threshold, they would replace the 60% with 80%.

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Some adjustments have been made to the methods of training: plyometrics has been added, recognition of the role of resistance training and specific examples of popular fitness classes have been included.

Learners will be expected to **apply** their knowledge.

For example:

- by explaining a training method that should be utilised for a specific sports performer
- by demonstrating application of the principles of training for a specific sports scenario.

Learners will be expected to **analyse and evaluate**.

For example:

- the target zones and/or thresholds of training for performers in a given scenario
- the value of one training method compared to another to bring about specific training gains based on a scenario or fitness test results.

Physical Training: the long-term effects of exercise

3.4.1 to 3.4.4 The long-term effects of exercise on the body systems

Learners will be expected to **know and understand**:

- the long-term effects of aerobic and anaerobic training and exercise on the:
 - musculo-skeletal system
 - cardio-respiratory system.
- the benefits of these adaptations (see specification) to the musculo-skeletal and cardio-respiratory systems and, therefore, performance.

Depending on the order in which this topic is taught it may give a good opportunity to recap the specification content for Topic 1: Applied Anatomy and Physiology, in relation to the main characteristics of the different body systems and their functions so that the adaptations are more meaningful for learners.

Learners should be familiar with the terms musculo-skeletal and cardio-respiratory systems and of the systems they comprise as assessment questions may use any of this terminology.

Learners will be expected to **apply** their knowledge.

For example:

- by explaining specific training effects of a particular method of training and the impact on performance for a given sporting context.

Learners will be expected to **analyse and evaluate**.

For example:

- the possible impact of a specific training method on the body systems and the impact this has on performance for a given sporting context
- the likely adaptations to a specific sport performer's body system(s) based on a training method and whether this would bring about required adaptations for the performer

Physical Training: how to optimise training and prevent injury

3.5.1 to 3.5.5 Injuries, injury prevention and performance-enhancing drugs

Learners will be expected to **know and understand**:

- PARQ's:
 - what a PARQ is
 - why they are used
 - when they are used.

- typical sports injuries from participation in physical activity and sport: concussion; fractures; dislocation; sprain; torn cartilage and soft tissue injury (strain, tennis elbow, golfers elbow, abrasions)

- treatment of injuries (sprains and strains) through RICE (rest, ice, compression, elevation)

- injury prevention through:
 - correct application of the principles of training (to avoid overuse injuries)
 - correct application and adherence to the rules of an activity during play/participation
 - use of appropriate protective clothing and equipment
 - checking of equipment and facilities before use.

- the positive and negative effects on sporting performance and performer lifestyle of these performance-enhancing drugs:
 - anabolic steroids
 - beta blockers
 - diuretics
 - narcotic analgesics
 - peptide hormones (erythropoietin (EPO), growth hormones (GH))
 - stimulants
 - blood doping.

PARQs should not be confused with informed consent forms, or fitness testing. Focus in the specification is on the individual's readiness to participate in physical activity from a health perspective. This specification continues to use RICE for basic treatment of sports related injuries (sprains and strains). Although other mnemonics exist, e.g. PRICE, the underlying principles of RICE remain; therefore, at level 2 RICE is the treatment required.

Learners will be expected to **apply** their knowledge.

For example:

- through consideration of likely sports injuries that could occur for a given sporting scenario, e.g. a local football match where the players have no respect for the referee, or failure to secure padding to posts supporting chair lifts on a ski run.
- by explaining risk reduction measures for specific sporting scenarios, e.g. a gymnast learning a new skill on a balance beam, or a canoeist in open water.

Learners will be expected to **analyse and evaluate**.

For example:

- an evaluation of the reasons why a performer may take performance-enhancing drugs.

Physical Training: effective use of warm up and cool down

3.6.1 to 3.6.3 Warm ups and cool downs

Learners will be expected to **know and understand**:

- the purpose and importance of
 - warm ups
 - cool downs.
- the phases of a warm up
- the relevance of each stage of the warm up in preparation for physical activity and sport (mental preparation within a warm up is also dealt with in Component 2, Topic 2 but should also be covered here)
- typical activities that can be included in each phase of a warm up and cool down.

Learners should appreciate that cool downs do not reduce injury per se, but can reduce the occurrence of delayed onset of muscle soreness (DOMs). The main value of the cool down is to gradually reduce work rate and therefore control the rate at which the body systems reach resting levels.

Learners will be expected to **apply** their knowledge.

For example:

- by explaining how a cool down can prevent blood pooling/fainting after a vigorous exercise session
- through examples of relevant activities for the phases of a warm up for a performer in a specific sporting context.

Learners will be expected to **analyse and evaluate**.

For example:

- the possible impact of exercise on health, fitness or performance
- the relative importance of warming up for different activities, e.g. aerobic versus anaerobic activities.

Physical Training – activity ideas

As mentioned previously, this topic could be taught alongside the PEP. Knowledge from this component will support development of an appropriate PEP for assessment in Component 4.

Components of fitness and fitness testing – activity 1

To introduce the topic and check understanding, learners could work in pairs to create a poster (soft or hard copy depending on access to IT facilities) of a montage of different sports performers in action.

Alternatively, performance cards could be created and used as a resource for several topics. These could be A4 images of specific sporting actions, for example: a bowl in cricket; the start of a 100 m race; a line-out in rugby; a tennis serve; a footballer on the ball; a hurdler clearing a hurdle and so on.

Whichever visual stimulus is used, learners could annotate the images:

- identifying the most important component of fitness to complete the action in the image (or a rank order)
- justifying why they consider it most important
- identifying a standard fitness test to measure that component of fitness.

Learners could then verbally explain some further points to another group or the whole group, for example:

- the main points of the standard protocol for the test.

Methods of training – activity 5

As a quick recap, learners could play 'verbal tennis' in pairs, taking it in turns to state a sport and the partner replying with a training method to improve an aspect of that sport (linked to a specific component of fitness).

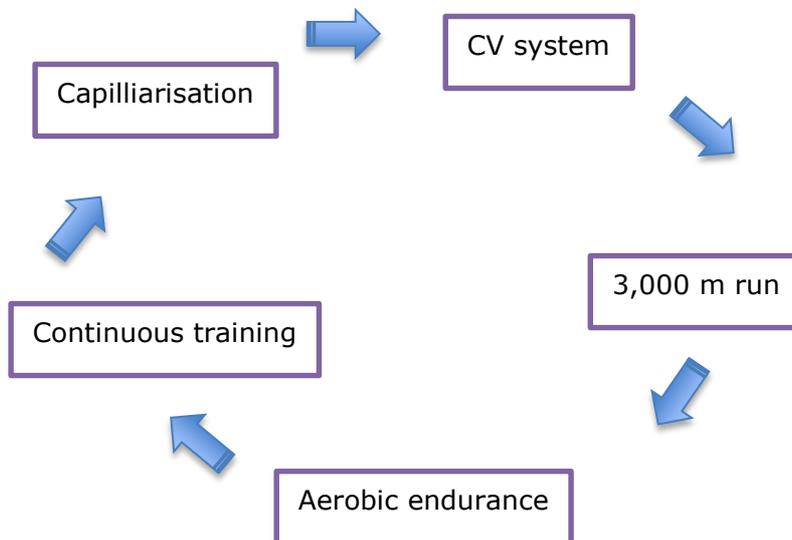
Alternatively, still working with the data collected from the practical session, learners could link each component of fitness to a suitable method of training to improve it.

Long-term effects of training – activity 6

Several sets of cards, similar to that below, could be created, for each body system/adaptation. Each card could state **one** of the following:

- a body system
- a sport or physical activity
- a long-term adaptation as a result of regular exercise
- a training method
- a component of fitness.

Each learner would need to organise the cards so they were correctly grouped, i.e. the adaptation that matched the correct body system would be linked to a sport where this adaptation would be an advantage, the component of fitness this would impact on and the training method that would be likely to bring about the adaptation.



Developing statements in written responses

To ensure learners acquire the ability to use their knowledge and understanding to develop any response to match the demands of the question, they should practice this skill. This skill can be developed in the classroom by giving a series of statements that need justifying. This idea can be applied to any theoretical topic in the specification. For example, learners could be given the following statements and asked to expand on them to develop the initial point being made.

- A warm up is useful to physically prepare the body for exercise....
- Correct application of the rules can help to reduce injury....
- Some athletes still take EPO even though it is a banned substance....
- An increase in the strength of the diaphragm is a long-term benefit of exercise....

Sample assessment questions

Most questions will demand a range of skills from the response, for example, question 13 spans knowledge, application and evaluation; all skills are required to gain maximum marks. The questions below will also span skills with the exception of question 8a and 9a, which only require knowledge.

Assessment of knowledge:

9 Heart rate is measured in beats per minute (bpm).

Table 3 shows a performer’s heart rate at three different times during an exercise session.

156 bpm	72 bpm	80 bpm
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Table 3

(a) Identify from **Table 3** the heart rate values recorded just before exercise starts and during recovery.

(2)

.....

.....

14

(a) Define the term **agility**.

(1)

.....

.....

Assessment of ability to apply knowledge:

(b) Give reasons for your answers in 9(a).

(2)

Tom is 16, has a resting heart rate of 64 bpm and has just completed a six-week personal exercise programme (PEP).

Figure 2 shows Tom’s working heart rate during each week of his training.

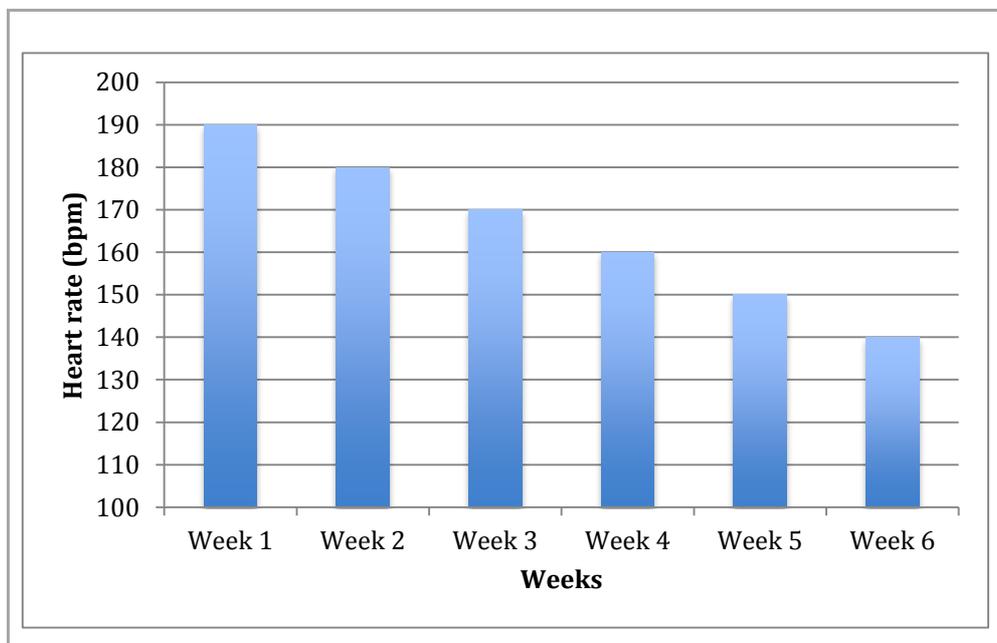


Figure 2

(g) State the total number of weeks Tom’s heart rate was **within** his aerobic target zone.

(1)

Jenny is a 16-year-old GCSE PE learner. She has just taken the Cooper

12-minute run test.

Table 1 shows ratings for the Cooper 12-minute run test.

Age	Excellent	Above Average	Average	Below Average
13-14	>2000m	1900-2000m	1600-1899m	1500-1599m
15-16	>2100m	2000-2100m	1700-1999m	1600-1699m
17-20	>2300m	2100-2300m	1800-2099m	1700-1799m
20-29	>2700m	2200-2700m	1800-2199m	1500-1799m

Table 1

(h) Which one of the following is the correct rating for Jenny, given her score of 2050m in the Cooper 12-minute run test?

(1)

A	Excellent	[]
B	Above average	[]
C	Average	[]
D	Below average	[]

14 (b) Give **one** example of when a basketball player would use agility in a game.

(1)

Assessment of ability to analyse and evaluate:

13 Muscular endurance and body composition are components of fitness.

Assess the relative importance of each of these components of fitness to a 100 m sprinter.

(3)

(i) Muscular endurance

(ii) Body composition

(3)

15 (b) Miriam is following a six-week circuit-training programme to improve her fitness for netball. **Table 4** shows her fitness test results collected during her six-week training programme.

Fitness test	Weeks					
	1	2	3	4	5	6
Cooper's run	1700m	1750m	1800m	1850m	1900m	1950m
Vertical jump test	41.0cm	41.5cm	42.0cm	42.5cm	43.0cm	43.5cm
35m sprint	5.50s	5.55s	5.55s	5.57s	5.57s	5.59s

Table 4

i) Analyse the data in **Table 4** to determine the trends for each fitness test

(3)

19 Evaluate whether a 50 m front crawl competitive swimmer should use a combination of interval training and weight training to improve their performance.

(6)

Extended answer responses

In the new specification there will be two extended answer questions at the end of each paper. These questions will be marked out of 9 marks. The increase in the available number of marks should allow a better differentiation between learners, and give more opportunity to reward learners for the skills they demonstrate.

Each extended answer question will be used to assess the learner's ability to:

- demonstrate knowledge and understanding (AO1)
- apply their knowledge and understanding (AO2)
- analyse and evaluate relevant knowledge and understanding (AO3).

Each of these Assessment Objectives will be credited with a maximum of three of the nine available marks. This means that a learner who is very knowledgeable about a topic but unable to apply their knowledge could still gain 3 marks for their knowledge. If they were able to apply this knowledge the number of marks gained could increase to 6 marks. If they are able to form a judgement based on the knowledge presented they will be able to access the final 3 marks for these questions.

In this sample question, learners are asked to evaluate whether or not a competitive swimmer should use a combination of interval and weight training to improve their performance.

A learner that knows about these training methods and responds by simply describing them could gain 3 marks (AO1). For example, they may say that in interval training you have a repeated pattern of work followed by periods of rest.

Compare this to the learner who is able to link this characteristic of interval training to the activity; for example, in interval training you have a repeated pattern of work followed by periods of rest so a swimmer might swim 10 lengths, rest for 15 seconds, swim another 10 lengths, rest for 15 seconds. Alternatively, the learner might apply their knowledge of weight training; for example, a swimmer would try to improve their power so would need to lift heavy weights quickly. This learner could score up to 6 marks.

Finally, a learner that is able to analyse and evaluate would gain access to the last set of 3 marks. For example, they may conclude that both methods offer advantages and therefore should be used in combination; this conclusion would need to be supported with statements such as those given in the mark scheme on page 44 of the Sample Assessment Materials (SAMs). Alternatively they might argue that one method would be better than another and should be the focus of the training; for example, as power is required, it would be better to use plyometrics than weight, and interval is best as it can be carried out in the pool so it is more sport specific.

Resources

Components of fitness

<http://www.brianmac.co.uk/conditon.htm>

Fitness testing

<http://www.topendsports.com/testing/>

Principles of training

http://www.bbc.co.uk/schools/gcsebitesize/pe/exercise/1_exercise_principles_rev1.shtml

edexcel 



ALWAYS LEARNING

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