

GCE PHYSICAL EDUCATION

PE2 UNIT GUIDE

Content Title: Methods of training

Key points

- Different methods of training
- How to design specific training sessions
- How to design a training programme

Practical Application/Explanation

As stated previously, it is important that an athlete trains as specifically as possible in order to prepare for competition. This means selecting the most appropriate methods of training to suit the components of fitness being used in the sporting activity e.g. fartlek training is specific to a games player because of the different intensities used in the game situation. Inevitably specific skills relevant to the sport will also be developed during training sessions, but the following methods of training develop the physical components of fitness.

Fartlek training

Fartlek is a Swedish word meaning 'speedplay'. Fartlek is training at varying intensities at different distances often at different gradients. This is method of training is used to develop all the energy systems. Fartlek is often used by games players to replicate the varying intensities that occur during matches.

Examiner's tip – it is important to state the intensities and distance covered when explaining the type of fartlek session specific to the sport. Fartlek sessions can vary greatly e.g. a netballer would have more shorter bursts of high intensity running (90-100% effort) over 10-15m in their session than a midfield footballer who would have longer distances of intense exercise (85-95%) over distances of 60-80m.

Continuous training

This method of training predominantly develops the aerobic system by working **continuously** at the same intensity. Endurance athletes such as marathon runners, road cyclists and tri-athletes predominantly use the continuous method of training.

Examiners tip – when using continuous training as an example, always refer to the specific intensity and duration of sessions e.g. a cyclist working between 65-75% of max heart rate for 3 hours.

Plyometrics/SAQ training

This method is used to develop speed, agility and power. It is often carried out using hurdles of varying heights, ladders, and gymnastic boxes. It is a maximum intensity activity of a relatively short period of time, usually no more than 10 seconds with a rest period allowing near full recovery between repetitions and sets.

Examples of plyometric exercises:



Power Skipping



Repeated Tuck Jumps



Repeated Long Jumps



Diagonal Obstacle Jump



Alternate Leg Bounding



Squat Jump



Single Leg Hops

performbetter.com

Weight training

When weight training the three components of fitness that are developed are strength, power and muscular endurance. It must also be noted that any increase in leg strength and leg power will often result in subsequent speed and agility improvements. This is because all of these components of fitness use fast twitch type II b fibres. Therefore any gains in one component can also influence the other components.

In order to train for strength, power and muscular endurance, sets, reps, weight and recovery must all be applied differently. It is also vital that an athlete has knowledge of their '1 rep max' for any weight training exercise undertaken.

Weight training for strength

Because strength is a maximal activity, then the weight training must also be carried close to the maximum in order to recruit the strongest fast twitch fibres (Type II b). A typical exercise to develop shoulder strength would be the shoulder press.

Exercise	Sets	Reps	Weight (% of 1 rep max)	Recovery time between sets
Shoulder press	3	3	95%	3-4 mins

The weight is close to the 1 rep max; hence the number of repetitions is low. Also a 4 minute recovery allows almost full recovery of the creatine phosphate (CP) system.

Weight training for power

As with strength, power is generally working close to maximum effort. However, because it is a combination of speed and strength the actual weight lifted is slightly less than is often used at strength. This reduction in weight allows the movement/exercise to be carried out with greater speed, thus placing greater emphasis on power development. Power training also attempts to develop the fast twitch type II b fibres.

An excellent example of a power exercise is the **power clean**, which is a full body exercise widely, used in athletics events such as sprinting, long jump and shot putt.

A Power Clean



Exercise	Sets	Reps	Weight (% of 1 rep max)	Recovery time between sets
Power clean	3	6	80%	3-4 mins

Working at 80% of the athlete's 1 rep max allows the movement to be carried out highly explosively which maximises power development. As with strength the recovery period of 3-4 minutes allows full replenishment of the CP system.

Weight training for muscular endurance

Muscular endurance exercises are often used to improve muscle tone or when there is repetition, using similar muscle groups over a period of time e.g. during a judo bout. When training for muscular endurance both fast twitch and slow twitch fibres are recruited and hence the predominant energy systems used are both the anaerobic glycolysis system and the aerobic system. Because muscular endurance involves working a muscle or muscle group over a prolonged period, the following example is typical of an exercise that could be used.

Exercise	Sets	Reps	Weight (% of 1 rep max)	Recovery time between sets
Shoulder press	4	16	50-60%	1 min

Both the sets and reps are higher than would be used when strength training, only lifting far less weight in order to complete the high number of repetitions. Also because of the endurance nature of the exercise, then the recovery period between sets is reduced to constantly stress the working muscles. This form of exercise is often associated with 'muscle pump' and a build up of lactic acid. Lactic acid build up is due to the athlete using ATP from the anaerobic glycolysis system.

Interval training

Interval training is any form of training with a set recovery period built into the session. Hence weight training, circuit training, and plyometrics are forms of interval training. Nevertheless most coaches associate interval training with periods of running, swimming, rowing etc. with periods of rest between exercises. As a result, interval training can develop any energy system depending on the intensity and duration of the exercise or the length of recovery between bouts of exercise.

Interval training for aerobic fitness

Middle distance runners, rowers as well as cyclists commonly use this type of interval training. Because the development of the aerobic system is the main aim of this type of interval session, then working at an intensity close to the anaerobic threshold is essential. The following example could be applied.

A typical session for a middle distance runner:

Exercise	Sets	Reps	(% of maximum HR)	Recovery time between reps
800m intervals	1	6	80-85%	2 mins

Such a session would mean the athlete is constantly working very close to their anaerobic threshold or even slightly beyond it towards the end of the repetition. However, the predominant energy system being stressed through the running is the aerobic system

Interval training for speed

Speed is a maximum activity and therefore when training, it is important to train as close to maximum effort as possible. Examples of sportspeople who would use such a method would be sprinters, 50m swimmers and sprint track cyclists as well as wingers in many team games. As stated, it is vital when training speed that 100% effort is put into the training, hence it is important that sufficient recovery time is given to allow full replenishment of CP. A typical session for a 100m sprinter would be:

Exercise	Sets	Reps	(% of maximum HR)	Recovery time between reps
40m intervals from starting blocks	1	5	100%	4 mins

This type of session is developing the explosive speed out of the starting blocks. The effort has to be 100% to replicate what is happening in a race with long recovery periods for almost full replenishment of CP.

Circuit Training

Circuit training can include a variety of exercises that can be either sport specific or fitness related. It is important that whatever the type of circuit is being carried out, then the time on each station meets the needs of the sport or activity. Below are two examples of how circuit training can be applied very differently depending on what the sporting needs of the individual are.

A general fitness circuit

An individual working on a general fitness circuit working on muscular endurance would work the various muscle groups for an extended period of time (up to a minute). The recovery time between stations would be relatively short (30 seconds) to continually stress the anaerobic glycolysis and aerobic systems.

A speed and agility circuit

An individual working on speed and agility would be carrying the activities on the stations at almost 100% effort. This means the time on each station would be far shorter because of limited stores of creatine phosphate. Each continuous bout of exercise on each station should not last longer than 10 seconds. In order to overcome this, an individual may include a short recovery period with the time on each station e.g. when using agility ladders on a particular station, the performer will walk back slowly before another repetition to allow recovery of CP stores. Also a longer recovery time between stations may be necessary to fully replenish CP stores before the next bout of maximal exercise.

Quick revision

Methods of training include:

Fartlek

Usually used for games players because of the varying speeds, distances etc. used in the training. The session should replicate the amount of sprinting, jogging etc. that takes place in the actual game situation specific to the position played. This method of training develops all the energy systems.

Continuous

This is an aerobic method of training used primarily used by long distance athletes in athletics, swimming, cycling etc. It involved working at a fairly continuous intensity over a long period of time below the anaerobic threshold.

Interval

Interval training can vary greatly depending on the intended training goal. The energy system or systems targeted will depend on the intensity and duration of the exercise e.g. developing sprint speed will involve distances no more than 60-80m with a long recovery, while aerobic development would use distances over 800m with a shorter recovery time between repetitions.

Plyometrics/SAQ

These methods of training primarily develop speed and power. Exercise mainly uses jumping, hopping and resistance type activities. All repetitions should be carried out at 100% effort with enough recovery between sets and repetitions to allow replenishment of CP stores.

Weight training

Weight training can be used to develop strength, power or muscular endurance.

To develop strength, high weight (80-100% 1 rep max) should be used with 1-6 repetitions with 3-4 mins recovery.

To develop power, high weight (70-90% 1 rep max) should be used with 2-8 repetitions carried out as fast as possible with 3-4 mins recovery.

To develop muscular endurance a medium to low weight should be used (40-60% of 1 rep max) with 10-20 repetitions with only a 1-2 minute recovery.

Circuit

Circuit training can be adapted to meet the needs and the goals of the individual. Circuits can be general fitness or sports specific, depending on the activities used on each of the stations. The energy systems targeted depend on the intensity and duration of each of the stations and the recovery between each station.

DESIGNING A TRAINING PROGRAMME

Training programmes can be designed for general fitness purposes such as when individuals attend fitness and well being suites. Training programmes can also be highly specialised and specific to the sport and the individual sportsperson. Nevertheless, the processes of planning the training programmes are generally the same.

The following points should be carried out in order to carry out a successful and safe training programme:

Health check

A health check prior to undertaking any form of exercise programme is vital for the safety of the individual carrying out the programme. While it is not a common practice in most sports particularly below elite levels, a health check is always a requirement for any individual who is joining a health, fitness and well being suite. The health check carried out often involves some very basic tests and includes the following checks:

- ✓ Physical Activity Readiness Questionnaire (PAR-Q) see appendix 1. This is a questionnaire to find out about the general health status of the individual and the type of lifestyle they currently lead.
- ✓ Measurement of height and weight resulting in the calculation of Body Mass Index (BMI) see appendix 2.
- ✓ Measurement of resting heart rate.
- ✓ Measurement of blood pressure.
- ✓ Basic cholesterol testing.
- ✓ % Body fat measurement (see fitness testing).

Fitness testing of the components specific to the sport or activity

The type of testing will depend on whether the intended training is for general health or for sport specific purposes. The sport specific tests are more likely to be maximal and represent the components of fitness specific to the individual's sport e.g. 30m sprint for a wing in rugby union. If the sportsperson is of an elite level, then laboratory testing is often used providing far more accurate, reliable and valid test results. A drawback with such laboratory testing is the highly specialised equipment and the subsequent cost e.g. Wingate Cyclergometer test for a track cyclist sprinter. For general fitness purposes, sub maximal tests are often used, particularly if the individual has not carried any training for a long period of time. This is inevitably a safer method of testing because it reduces the potential health risks that a maximal test may pose. The PWC 170 is an example of such a test (see fitness testing).

Set goals/targets for improvement

Goal setting is important in any training programme because of the motivation and sense of achievement that can be gained when an individual reaches a goal or can see improvement towards a goal. When goal setting, to ensure correct application of the goal, we apply the SMART principle.

Training SMART

SMART simply stands for Specific Measurable Achievable Realistic and Timely, when applied to an exercise program.

Be Specific

Specific goals are crucial. Goals like "getting stronger" or "losing weight" are too vague and do not provide sufficient detail for appropriate goal setting. These kinds of goals give you a direction, but try to set specific goals like "improve 1 rep max bench press to 80kg or "squat 120kg". These goals will give you something which can actually be measured. Once a specific goal is set, you can build a plan around reaching it.

Some questions to ask:

What specifically are you going to accomplish? e.g. lose 20 pounds, run 5km in 25 minutes. Why is this important? e.g. high blood pressure, place higher in the next race. How are you going to do it? e.g. through better nutrition and exercise, through a structured training plan.

Measurable

Once your long-term goal is established, it is important to make sure you stay on track. This is where you make your goals measurable. Having measurable goals means ensuring that you can check in on your progress from time to time. The biggest failing of unspecific goals is that they are hard to measure. And when you can't track a vague goal, you can't see how close you are to success. This eventually leads to frustration, boredom, and, ultimately, failure.

As soon as you've set a specific goal, map out some testing points. If your goal is to run a faster 5K, test yourself at race pace every few weeks. If you want to lose 10kg in 6 months, record your bodyweight at regular intervals. Being measurable is an extension of being specific. If your goal is not specific, how can you possibly know if you're any closer to attaining it?

By introducing measurable standards into your training plan, you will be able to see how far you are from attaining your goal, and will be able to make adjustments if necessary. Regular testing will also help you keep your eye on the goal, and that's the whole point of goal setting in the first place.

Achievable

Creating achievable goals is going to ensure success and ensure that you feel successful. Too hard a goal will leave you feeling like a failure. Likewise, too easy a goal will just leave you feeling empty. The point of an attainable goal is that it challenges you, makes you commit to it, and produces a feeling of success when it's accomplished.

Realistic

When you create a goal, you have to ask yourself a few questions:

- Am I capable of attaining this goal?
- Do I have the necessary skills?
- Is this something I actually want to do?

It is important to understand what you really want to accomplish. It will save you a lot of time and frustration and you'll be much more motivated to reach the end result.

Time

All goals should be time based so there should be a definite point at which goals should be achieved e.g. lose 5kg in weight in 6 weeks. Goals can have a number of time frames, often this is done when setting short term followed by long term goals.

Planning and carrying out the training programme

How the training programme is carried out will depend on the goals set by the individual, this will dictate the methods of training used and how the principles of training are applied. An example would be that an individual carrying out a training programme for health related reasons is more likely to use a fitness suite and work on cardio-vascular type exercises with weight training to develop muscle tone. While an individual training for sports specific goals will often use more specific training methods related to their sport e.g. plyometrics for developing leg power. In terms of the application of the principles of training, progression and overload are inevitably important for improvements to be made in a health related training programme. However, the speed of progression and the amount of overload applied would often not be as great as a sport specific training programme.

This is only an outline of how the methods and principles of training should be applied. See the rest of the information on training for full application of methods and principles of training.

Re-Testing

After a period of training then re-testing of the fitness components should be carried out. The processes for re-testing are exactly the same as the start of the training programme. Results can be compared to the previous results to monitor any progress that has been made. As a result of the re-test scores the training programme can be adjusted and developed to allow for further improvements to be made. Also, an individual can observe if the goals previously set have been achieved and further goals can then be set.

Quick revision

The following procedures should be carried out when developing a training programme for health related or sports specific reasons:

- Check the individual's health.
- Fitness test relevant components of fitness.
- Set goals
- Carry out programme, applying the methods and principles of training appropriate to the goals set
- Re-test fitness and re-evaluate goals. Warm up and cool down.

Warm Up

A warm up is generally used by athletes and coaches, before an activity to prepare the body and mind for exercise and to reduce the risk of injury. A warm up can be classified into two categories:

General warm up - includes pulse raising, mobility and calisthenics, static and dynamic stretching and general body movements that are related to the activity being used in a training session.

Specific warm up – all of the above and a rehearsal of the skills of the actual activity i.e. kicking a football, tennis serve or golf swing.

Benefits of a warm up:

- Prevents injury by increasing muscle temperature by reducing likelihood of muscle strains and ligament damage
- Increases range of movement of the joints
- Increases heart rate, stroke volume and cardiac output
- Vasodilates blood vessels, increasing blood flow to the muscles
- Increases oxygen delivery to the muscles and helps haemoglobin release oxygen faster into the muscle cell
- Speeds up the production and the release of energy in the muscle tissue
- Increases the speed of impulses through nerves
- A specific warm up can facilitate the recruitment of motor units required for the type of physical activity.
- Increases speed of muscle action and relaxation.

Cool Down

The cool down should consist of 5-10 minutes of jogging or low intensity exercise in order to remove any waste products such as lactic acid from the working muscles that have accumulated during physical activity. A cool down also decreases body temperature gradually and stops any blood pooling in the lower limbs. Static, passive and PNF stretching is also commonly used to increase the range of movement of joints and muscles.

The cool down will also:

- Aid in the removal of waste products, including lactic acid and carbonic acid (CO² in blood).
- Prevent the blood from pooling, therefore reducing the risk of fainting and dizziness.
- Reduce the level of adrenaline in the blood.

Lactic acid levels decrease more rapidly during active recovery rather than just stopping exercise. This is because the oxygen is responsible for breaking down the lactic acid, hence the more oxygen present the more lactic acid can be broken down. Also, the lactic acid can be re-converted back to ATP at a faster rate, also helping recovery.

The types of activities that may be involved in a cool down can be those that are used in a warm up only in reverse order. For example, low intensity exercise followed by stretching and flexibility exercises. During this time, athletes/performers may notice an increase in the range of movement (ROM) in and around a specific joint, compared to the ROM during the warm up.

Quick revision

- The method of training must develop the specific components of fitness or skills used in a particular sport or activity (Specificity).
- In order for improvements to be made the training must be progressive and overload the body e.g. weight training increasing the intensity of the leg squat by increasing the weight by 10kg. Then increase by another 5kg 2 weeks later.
- Always provide specific information about the type of training and the intensity used e.g. % of maximum heart rate when using continuous or Fartlek or % of 1 rep max for strength, power or muscular endurance.
- Provide specific information on the number of sets, repetitions, times, distances etc. when providing information on progression and overload.
- Provide specific recovery times when applicable e.g. 4 minutes rest after 1 set of weights when working on strength or power in order to replenish CP stores.

Top Tips:

Many of the responses from candidates in the examinations lack the necessary depth and detail to gain marks. When the question requires a description of a method of training or application of the principles of training then the following responses are common.

Question

- (i) Describe an appropriate method of training for power and explain how you could apply a principle of training to develop such power. (3)

Response lacking necessary detail:

Plyometrics is a method of training to develop power and you can use increased intensity and duration to develop your power.

What is wrong with the answer?

Plyometrics (this is not a description of a method of training) is a method of training to develop power and you can use increased intensity and duration to develop your power. (Merely stating intensity and duration is not enough to obtain marks at AS level. An example of what is required is set out below).

Plyometrics is a high intensity activity involving hopping, bounding and jumping over hurdles and boxes etc. In order to develop power an athlete could increase the intensity of the plyometric session by increasing the height of the hurdles by 5cm or the number of hurdles in a set e.g. increasing the number of hurdles from 5 to 6.

As can be seen from the answer, it describes plyometrics and provides specific information demonstrating good knowledge and understanding of both the method of training and the application of the principles of training. It is often good practice to provide examples to support your answer even if the question does not specifically ask for it.



Exam Style Questions

1. Describe an appropriate method of training for power and explain how you could apply the **principles of training** to develop that power. [3]

