

BTEC SPORT



Knowledge and Assessment Organiser

**Unit 1 Fitness for Sport and
Exercise**

Learning Aim A

Student name:



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What's the Story?



My name is Morgan Lake and I am the current British high jump champion, I dream of being an Olympic champion and always want to be the best I can be. I am aware to reach optimal levels of performance requires years of dedication to training. I work closely with my coach to gain an appreciation and understanding of the different fitness components, training principles, training methods and fitness tests which can be incorporated into my training regime to further enhance and improve my sports performance. As a sports performer I train regularly to improve and maintain my fitness levels and performance. With my training programme tailored to my specific training need. As a performer my training cycle incorporates lots of different fitness training methods, incorporating different fitness training methods keeps training interesting, which helps to keep motivation levels high.

Why does this matter?

- To improve your performance in a specific sport it is important to identify the components of fitness that are most important, so you know how to plan effective training.
- You need to understand how to structure your training programme, through understanding the principles of training for the training to be effective and lead to improvements in performance.
- You need to be able to identify how hard you are working to know if training is having an effect.

Sounds familiar?

In KS3 you will have participated in fitness lessons, where you will have identified different components of fitness and also tested your own fitness levels.



To understand the components of fitness and the principles of training.



1. What are the skill related components of fitness?



2. What are the physical related components of fitness?



3. Why are fitness components important for successful participation in sport?



4. What is exercise intensity and how can it be measured?



5. What are the basic principles of training?



6. What are the additional principles of training?

Curricular Concepts

Have you ever noticed how some of the things you study in one subject appear in another subject too?

(All of the essential knowledge is healthy living in TASK A)

Students are able to understand their work more and remember more if there are clear links between subjects. Throughout your learning at Colton Hills, we will be asking you to think about some of the most important ideas in the world to enable you learning to be deeper than ever before. Look for these 'curricular concepts' in your learning.



**SOCIAL
JUSTICE**



**CULTURAL
DIVERSITY**



**CIVIC
RESPONSIBILITY**



**TECHNOLOGICAL
PROGRESS**



**PRECIOUS
PLANET**



**HEALTHY
LIVING**



**ETHICAL
ENTERPRISE**



**CREATIVE
ARTISTRY**

Components of Fitness

Components of fitness

- Agility
 - Balance
 - Coordination
 - Power
 - Reaction time
 - Muscular strength
 - Speed
 - Flexibility
 - Aerobic endurance
 - Muscular endurance
 - Body composition
-
- The diagram features a central list of fitness components. Two blue curved arrows point from the list to two categories on the right. The first arrow groups Agility, Balance, Coordination, Power, and Reaction time under 'Skill-related components'. The second arrow groups Muscular strength, Speed, Flexibility, Aerobic endurance, Muscular endurance, and Body composition under 'Physical fitness components'.
- Skill-related components
- Physical fitness components

The physical related components of fitness.

Aerobic endurance

The ability of the cardiorespiratory system to work efficiently, supplying nutrients and oxygen to working muscles during sustained physical activity.



Strength

The maximum force (in kg or N) that can be generated by a muscle or muscle group.



Speed

Distance divided by the time taken.



Muscular Endurance

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

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.



Body Composition

The relative ratio of fat mass to fat-free mass (vital organs, muscle, bone) in the body.



The skill-related components of fitness.

Power

The product of strength and speed.



Balance

The ability to maintain centre of mass over a base of support.



Coordination

The smooth flow of movement needed to perform a motor task efficiently and accurately.



Reaction Time

The time taken for a sports performer to respond to a stimulus and the initiation of their response.



Agility

The ability of a sports performer to quickly and precisely move or change direction without losing balance or time.



Extra key information on components

Aerobic Endurance

1. Aerobic endurance may also be called cardiorespiratory fitness, cardiorespiratory endurance or aerobic fitness.
2. Cardiorespiratory system includes the cardiovascular system (heart, blood, lungs) and the respiratory system (lungs and airways).

Speed

1. Speed is measured in metres per second (m/s).
2. Three types of speed
 1. Accelerative speed-sprints up to 30 metres
 2. Pure speed- sprints up to 60 metres
 3. Speed endurance-sprints with short recovery period in between.

Balance

1. Static balance- a type of balance when the performer is still
2. Dynamic balance-a type of balance when the performer is moving

Sports performers need high levels of physical and skill related fitness to be succesful, ecah sport needs different types of physical and skill realted fitness and someyimes this may change depending on the position of the performer in a game activity.

Why are fitness components important for successful participation in sport?

Tennis Example



Agility-players need to change direction quickly without losing balance when returning shots. Failure to change direction quickly will mean they will be unable to reach the ball and return it over the net and their opponent will win the rally.

Aerobic endurance-players need a good level of aerobic endurance to keep going for the length of the game. If players are not able to keep going they will not be able to maintain the rally and return the ball to the opponent.

Muscular endurance- players need muscular endurance to perform their sport because in tennis you must repeatedly work the specific muscles needed to play shots and run across the courts, therefore if a tennis player had poor muscular endurance they would become fatigued and be unable to hit the shots as the muscles would be unable to continue to replicate the required motion.

Coordination- the racket and ball are fairly small and you are required to make contact with the ball preferably in the centre of the racket. Therefore if you had poor coordination you wouldn't be able to hit the ball successfully.

Heart rate



Heart Rate (HR) is the number of times your heart beats per minute (BPM).

You can measure your heart rate using your pulse.

The higher the heart rate the greater the intensity of exercise.

Maximum Heart Rate

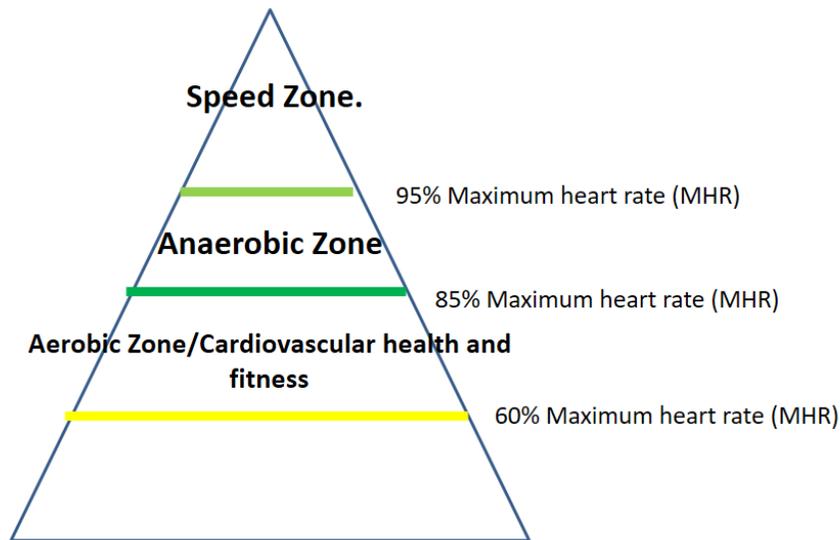
$220 - \text{Age (years)} = \text{Maximum Heart Rate in BPM}$

For an 18 year old this would be

$220 - 18 = \underline{202 \text{ bpm}}$

Heart Rate Target Zones

Training pyramid



- To develop your cardiovascular health and fitness the recommended target zone is 60-85% of your maximum heart rate.
- To develop your anaerobic zone the recommended target zone is 85-95% of your maximum heart rate.
- To develop your speed zone the recommended target zone is above 95% of your maximum heart rate.

For a 20 year old work out there aerobic zone/cardiovascular health and fitness training zone?

220- Age = maximum heart rate (MHR)

$$220-20=200$$

The cardiovascular health and fitness zone for a 20 year old

60-85% of maximum heart rate

60-85% of 200

MHR/100*60=60% of maximum heart rate

$$200/100*60=\underline{120\text{bpm}}$$

MHR/100*85=85% of maximum heart rate

$$200/100*85=\underline{170\text{bpm}}$$

The cardiovascular health and fitness zone for a 20 year old is working between 120-170 bpm

Borg rating of perceived exertion

6	20% effort
7	
8	
9	50% effort: very light intensity
10	
11	
12	
13	70% effort: somewhat hard intensity
14	
15	80% effort: hard intensity
16	
17	90% effort: very hard intensity
18	
19	100% effort: very, very hard intensity
20	Exhaustion

The performer is asked to rate their perceived level of exertion

Borg found that there is a direct relationship between how a performer feels and their heart rate.
 $RPE * 10 = HR$

The basic principles of training

FITT

Frequency: number of times you train a week.
Intensity: how hard the exercise is.
Time: how long each session lasts.
Type: refers to the activities that you do.

FITT for SPORT followed by some R & R

The additional Principles of training

SPORT

Specific
Progressive overload
AdaptiOn
Reversibility
VariaTion

R & R

Rest and Recovery are required so that the body can recover from the training and to allow adaptation to occur.

The principles of training

Type	How an individual will train by selecting a training method
Progressive overload	In order to progress training needs to be demanding enough to cause the body to adapt, improving performance.
Specificity	Training should be specific to the individuals sport, activity or physical/skill related fitness goal.
Time	How long an individual will train for
Adaption	How the body reacts to training loads by increasing its ability to cope with those loads
Reversibility	If training stops or the intensity of training is not sufficient to cause adaptation, training effects are reversed.
Intensity	How hard an individual will train
Individual needs	The programme should be designed to meet the individual training goals and needs
Frequency	The number of training sessions completed over a period of time.
Variation	Changing training regime to avoid boredom and maintain enjoyment.
Rest and Recovery	This is required so the body can recover from training and allow adaptation to occur.

Example exam questions

Model Answer for the TASK A

Sports performers need a variety of components of fitness to perform their sports.

Explain why tennis players need muscular endurance and coordination to perform in their sport. (4 marks)

- 1 *Tennis players need muscular endurance to perform their sport because in*
- 2 *tennis you must repeatedly work the specific muscles needed to play shots*
- 3 *and run across the courts, therefore if a tennis player had poor muscular*
- 4 *endurance they would become fatigued and be unable to hit the shots as*
- 5 *the muscles would be unable to continue to replicate the required motion.*
- 6 *Coordination is also important because the racket and ball are fairly*
- 7 *small and you are required to make contact with the ball preferably in*
- 8 *the centre of the racket. Therefore if you had poor coordination you*
- 9 *wouldn't be able to hit the ball successfully. Also you must coordinate*
- 10 *your limbs to maintain balance and stability when playing the shot.*

Performance in volleyball is dependent on the performers using components of skill-related fitness.

Explain why power and reaction time are important components of fitness for volleyball players. (4marks)

- 1 *Power is important for volleyball players so that they can explosively*
- 2 *push off the floor and jump high, this power will produce the height*
- 3 *needed and time in the air to be effective in blocking the volleyball at the*
- 4 *net or playing a smash at the net.*

- 5 *Volleyball players need good reaction time to react very quickly to get*
- 6 *into position to play a good shot as the volleyball will travel quickly and*
- 7 *may be hit or deflected by an opponent/team member.*

Elaine is a long distance cyclist who uses the principles of training to improve her performance.

Explain why using progressive overload would lead to an improvement in her performance? (2 marks)

By using progressive overload Elaine will improve her aerobic endurance. This will improve Elaine's performance as she is able to cycle further and at higher speeds and intensities during a race.

Explain why using specificity would lead to an improvement in her performance? (2 marks)

By using specificity, it will enable Elaine to target specific muscles or components of fitness which would improve her speed and endurance throughout the race.

Robert has a maximum heart rate of 160, he wants to improve his aerobic fitness, calculate his upper and lower heart rate training zones in beats per minute. Show calculations. (2 marks)

Lower heart rate training zone.....

Upper heart rate training zone.....



Student responses?

Performance in Volleyball is dependent on the performers using components of skill-related fitness. Explain why power and reaction time are important components of fitness for a volleyball player. (4 marks)

Student 1

Power is important for a volleyball player because they need strong hits of the ball this is important because it would be harder for the opposition to hit. Reaction time is important because the ball moves very fast and they need to be able to hit it. This is important because if they don't hit the ball up in time then the other team will get lots of points.

Student 2

They need power to jump higher, to block the shots and to catch the ball. They need reaction time to hit the ball.

Student 3

The volleyball player needs enough power to get the ball to the other side of the net to score points or simply evade scoring a goal. They need power so that they can explosively push off the floor and jump high, this power will produce the height needed and time in the air to be effective in blocking the volleyball at the net or playing a smash at the net.

A gymnast uses balance and power to perform effectively in their sport. Explain why balance and power are both important for a gymnast to perform a floor routine effectively (4 marks).

Student 1

Gymnasts need balance to prevent them from falling and injuring themselves and power is important to keep the momentum going in their stunts.

Student 2

Balance is important for gymnasts performing on the floor because they perform movements that change the centre of mass over the base of support. Having good balance is required so that the gymnast is in the correct position and is able to perform complex movements (e.g. handstands).

Power is important for a gymnast on the floor so that they can generate sufficient height this power is required so that the gymnast can have enough time in the air to perform the complex techniques/movements whilst they are in the air e.g. somersault before they land.

Student 3

Gymnast needs balance, because during their performance they need good balance to stay on their feet and not fall all over the place.

Retrieval Quiz

When you can answer all the questions on this page without looking at any notes, you are ready for your exam.

Components of Fitness

In each example which component of fitness is being described

1. 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.
2. The ability of the cardiorespiratory system to work efficiently, supplying nutrients and oxygen to working muscles during sustained physical activity.
3. 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.
4. The maximum force (in kg or N) that can be generated by a muscle or muscle group.
5. The relative ratio of fat mass to fat-free mass (vital organs, muscle, bone) in the body.
6. The ability of a sports performer to quickly and precisely move or change direction without losing balance or time.
7. The ability to maintain centre of mass over a base of support.
8. The product of strength and speed.
9. The smooth flow of movement needed to perform a motor task efficiently and accurately.
10. Distance divided by the time taken.
11. The time taken for a sports performer to respond to a stimulus and the initiation of their response.
12. Name the components of physical fitness?
13. Name the components of skill related fitness?
14. Name two other terms for aerobic endurance?
15. What is dynamic balance?
16. What is static balance?

17. What is accelerative speed?
18. What is pure speed?
19. What is speed endurance?

Heart Rate and training intensities

1. What is the MHR for a 7 year old?
2. What is the MHR for a 25 year old?
3. What is the MHR for a 87 year old?
4. What does RPE stand for?
5. What RPE would a heart rate of 12 give?
6. What RPE would a heart rate of 19 give?
7. What RPE would a heart rate of 8 give?
8. What zone would you be working in if you were working between 60-85% of your maximum heart rate?
9. What zone would you be working in if you were working between 85-95% of your maximum heart rate?
10. What zone would you be working in if you were working above 95% of your maximum heart rate?

Training Principles

1. What does FITT stand for?

Which training principles are the following definitions describing?

2. How an individual will train by selecting a training method
3. In order to progress training needs to be demanding enough to cause the body to adapt, improving performance.
4. Training should be specific to the individuals sport, activity or physical/skill related fitness goal.
5. How long an individual will train for
6. How the body reacts to training loads by increasing its ability to cope with those loads
7. If training stops or the intensity of training is not sufficient to cause adaptation, training effects are reversed.

8. The programme should be designed to meet the individual training goals and needs
9. How hard an individual will train
10. This is required so the body can recover from training and allow adaptation to occur.
11. Changing training regime to avoid boredom and maintain enjoyment.
12. The number of training sessions completed over a period of time.

Retrieval Quiz – Answers

Components of Fitness

In each example which component of fitness is being described

1. 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. (Flexibility)
2. The ability of the cardiorespiratory system to work efficiently, supplying nutrients and oxygen to working muscles during sustained physical activity. (Aerobic endurance)
3. 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. (Muscular endurance)
4. The maximum force (in kg or N) that can be generated by a muscle or muscle group. (Strength)
5. The relative ratio of fat mass to fat-free mass (vital organs, muscle, bone) in the body. (Body composition)
6. The ability of a sports performer to quickly and precisely move or change direction without losing balance or time. (Agility)
7. The ability to maintain centre of mass over a base of support. (Balance)
8. The product of strength and speed. (Power)
9. The smooth flow of movement needed to perform a motor task efficiently and accurately. (Coordination)
10. Distance divided by the time taken. (Speed)

20. The time taken for a sports performer to respond to a stimulus and the initiation of their response. (Reaction time)
21. Name the components of physical fitness? (Aerobic endurance, Speed, Flexibility, Body composition, Muscular endurance, Strength)
22. Name the components of skill related fitness? (Balance, Coordination, Reaction time, Agility, Power)
23. Name two other terms for aerobic endurance? (Cardiorespiratory fitness, Aerobic fitness, cardiorespiratory fitness)
3. What is dynamic balance? (a type of balance when the performer is moving)
24. What is static balance? (a type of balance when the performer is still)
25. What is accelerative speed? (sprints up to 30 metres)
26. What is pure speed? (sprints up to 60 metres)
27. What is speed endurance? (sprints with short recovery period in between)

Heart Rate and training intensities

11. What is the MHR for a 7 year old? (213 bpm)
12. What is the MHR for a 25 year old? (195 bpm)
13. What is the MHR for a 87 year old? (133 bpm)
14. What does RPE stand for? (Rating of perceived exertion)
15. What RPE would a heart rate of 12 give? (120)
16. What RPE would a heart rate of 19 give? (190)
17. What RPE would a heart rate of 8 give? (80)
18. What zone would you be working in if you were working between 60-85% of your maximum heart rate? (Aerobic zone)
19. What zone would you be working in if you were working between 85-95% of your maximum heart rate? (Anaerobic zone)
20. What zone would you be working in if you were working above 95% of your maximum heart rate? (Speed zone)

Training Principles

13. What does FITT stand for? (frequency, intensity, time, type).

Which training principles are the following definitions describing?

14. How an individual will train by selecting a training method
15. In order to progress training needs to be demanding enough to cause the body to adapt, improving performance. (Progressive overload)
16. Training should be specific to the individuals sport, activity or physical/skill related fitness goal. (Specificity)
17. How long an individual will train for (Time)
18. How the body reacts to training loads by increasing its ability to cope with those loads (Adaptation)
19. If training stops or the intensity of training is not sufficient to cause adaptation, training effects are reversed. (Reversibility)
20. The programme should be designed to meet the individual training goals and needs (Individual needs)
21. How hard an individual will train. (Intensity)
22. This is required so the body can recover from training and allow adaptation to occur. (rest and recovery).
23. Changing training regime to avoid boredom and maintain enjoyment. (Variation)
24. The number of training sessions completed over a period of time. (Frequency).

Revision Cycle

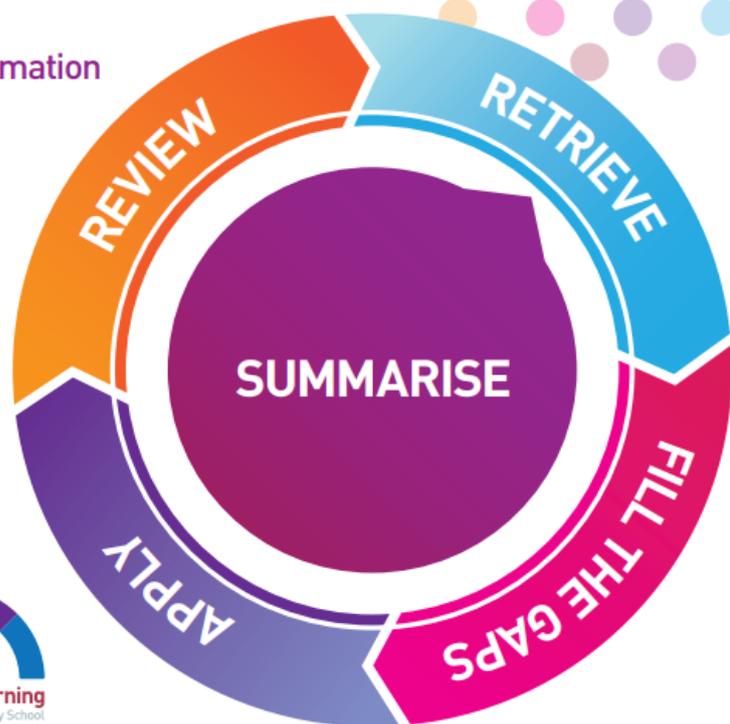
1. **SUMMARISE:** shorten information

2. **RETRIEVE:** find out what you know

3. **FILL THE GAPS:** look at what you don't remember

4. **APPLY:** practice using the information

5. **REVIEW:** reflect on how you have done and repeat



Articles for Wider Reading and Flipped Learning

Skill Related Components of Fitness and Basketball

by Christopher Riches

The Components of Fitness is a term given to grouping of aspects relating to conditioning and attributes athletes can work on for sport. The components of fitness include Strength, Power, Speed, Endurance, Balance, Coordination, Reaction Time, Muscular Endurance, Cardiovascular Fitness, Body Composition and Flexibility. These are broad areas but help with categorising drills and activities as well as assisting in describing the different physiological requirements for a sport such as basketball.

It does not matter if you are playing in the NBA or running around your local gym one of the great benefits from playing basketball is it requires a high degree of fitness. At a professional level the physical demands of basketball are so high that pre-season training starts many months in advance to try and prepare athletes for the sports high requirements. In training for basketball many aspects are worked on making the players good enough to deal with the pressure and physical requirements of the game. It is this sports specific training that helps ensure that the players have good muscle endurance to enhance their technical skills.

There are two different groupings that help with our description of the Components of Fitness. The first area is Skill Related Components of Fitness. These component areas focused on the performance of technical and tactical activities involved in sports specific movements. The second area is the Physical Components of Fitness. These components look at the physiological condition of the athlete. The Physical components can expressed in general fitness and well-being.

For this discussion the Skill Related Components of Fitness are to be focused on. Skill Related Components are:

Agility refers to the ability to be able to change direction at pace while still remaining under control. In basketball when thinking of agility think of changing direction while in a defensive stance or the ability to create a lane to the basket while cutting.

Balance revolves around the concept of equilibrium and this describes the ability of an individual to remain in control of their body and maintain the desired technique. In basketball balance can be seen in the performance and execution of a jump-shot or a defensive stance.

Coordination refers to bring all the body parts together in a purposeful movement. Commonly used terms are things like hand-eye coordination. In basketball, coordination can be seen in the shooting action where the whole body is utilised to achieve a very specific movement sequence.

Power is focused on short but extreme effort. In basketball activities, power can be seen when an athlete jumps and is also in the explosive acceleration needed in transition.

Reaction Time describes the time it takes an individual to act upon stimuli. In basketball this can be seen in the movements of players off the ball reading and reacting (or delay) to where the ball is and where their defensive assignment also is in relation to the ball. In this situation the better the reaction time the faster the player moves into the correct position.

When speaking about fitness and conditioning an important aspect to discuss is fatigue. Fatigue gives a name to the time when players move past what their optimum level of output is and into a stage where they are unable to perform tasks as efficiently or to as high a standard as previously demonstrated. When you are tired, you will try to take shortcuts in the game and no game has ever been won using shortcuts. The quality of the play will become poor which highlights how fatigue will affect the Skill Related Components of Fitness. Areas which are first to suffer are technical skills like catching the ball in a triple threat stance, passing with accuracy or using basic movement principles such as change of pace. Being tired also means you are less likely to play defence and on the defensive end of the floor fatigue will affect rebounding as aggressively as needed. In general you will not play at your best when you are fatigued.

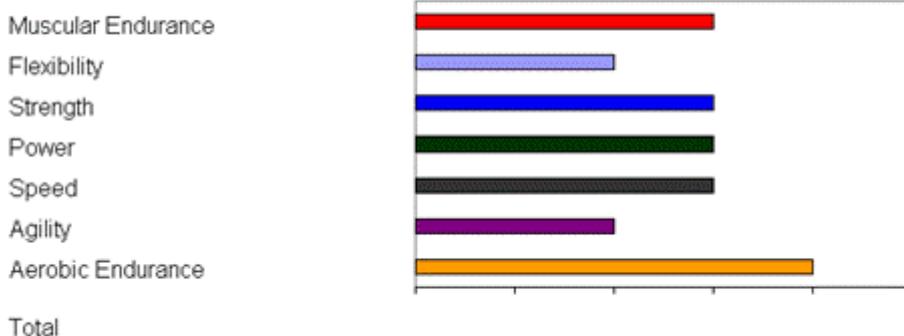
Basketball is a sport which demands a highly efficient level of competence and performance of technical skills found across all the Skill Related Components of Fitness. By taking this into account as a coach you can tailor your training sessions to include these elements and help your athletes become exposed to all these areas of development.

Fitness components in sport

It is very unlikely that a sporting activity will require just one component of fitness, instead it will require a combination of components with some being more important than others. One way to represent this is by using graphs, like the examples below.

The importance of different components of fitness for different sporting activities

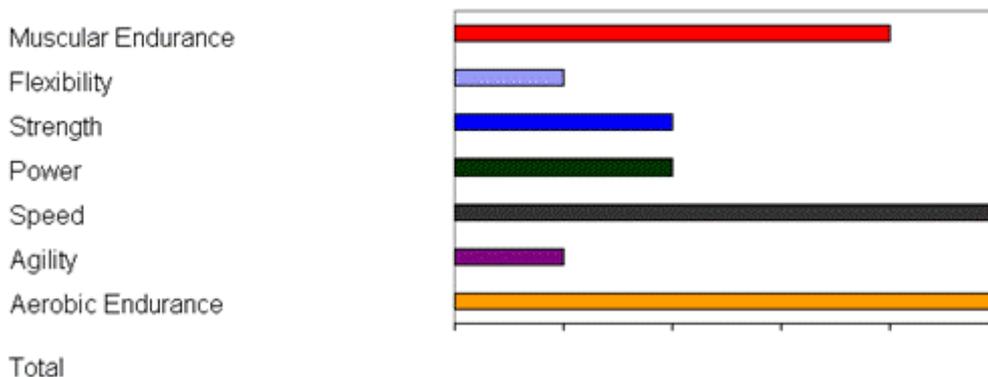
Cricket



This shows that in cricket aerobic endurance is the most important attribute, and agility is the least important.

The importance of different components of fitness for different sporting activities

3000m Athlete



[\[D\]](#)

In this example aerobic endurance and speed, followed by muscular endurance and the most important attributes for a 3000m athlete.

Athletics

In the sprinting events, the main aim is to run as fast as possible over a short, specified distance and reach the finishing line before your opponents. Sprinting requires:

- reaction time - the sprinter must leave the blocks as fast as possible

- muscular strength - especially at the start of the sprint to get the body moving from a stationary position in the blocks
- co-ordination - through good co-ordination the athlete can use the correct technique for sprinting and not waste energy and power
- speed - good leg and arm speed is required to move the body over the distance as quickly as possible
- power - required in the legs and arms
- body composition - a large percentage of fast-twitch muscle fibres is needed in the sprinter's legs. Fast-twitch fibres can exert a large amount of force over a short period of time, which is vital for producing high levels of power in the legs

In an event such as shot put, the athlete has to push, rather than throw, the shot as far as possible. It requires good:

- body composition - shot putters normally have large amounts of both lean and fat tissue to increase the power generated
- strength - required in the legs to generate the force needed to propel the shot
- co-ordination - the correct technique involves the use of the legs, waist, arms and hand, which must be co-ordinated correctly
- power - needed to apply to the shot to gain a good distance
- balance - dynamic balance is required for the athlete to remain within the designated area while putting the shot
- flexibility - this is vital in this discipline due to the range of movement shown by the athlete.

Swimming

In competitive swimming there are a number of events over a distance from 50 metres to 1500 metres. Four different swimming styles are used. The components of fitness and muscle groups required differ quite significantly because of the different techniques covered. For example, for the 50-metre sprint freestyle event, the following are required:

- reaction time - the swimmer must react quickly to the start of the event, normally a bleep or pistol
- strength - a large amount of force is required in the leg muscles to push off the block with the aim of generating horizontal speed
- co-ordination - all muscle groups need to work together in the correct order; poor technique, especially when tired, will reduce the swimming speed
- muscular endurance - the swimmer must make continuous and repeated arm and leg movements over a significant period of time
- power - generated through the arms and legs to propel the swimmer through the water.

As the distance of swimming increases, there is a greater reliance of aerobic endurance and intensity decreases.

Rugby

Each positional role of a rugby player has different physical demands. A winger requires a great deal of speed, whereas a forward requires strength. The basic components of fitness for a rugby player are:

- upper and lower body strength - due to the contact nature of the sport, this is required in situations such as the scrum
- speed - when breaking with the ball and sprinting for the try line, it is important for players to have a good level of speed
- power - power in the legs is important for jumping for the ball
- agility - it is vital for the player running with the ball to avoid being tackled by the opposition, which means changing direction quickly
- balance - in changing direction at speed
- aerobic endurance and muscular endurance - a game lasts 80 minutes and players need to keep running throughout the game and make repeated sprints

Useful websites

<https://www.hoddereducation.co.uk/getattachment/Subjects/Sport-PE/Series-pages/BTEC-Sport/Series-Boxes/Sample-chapter/Fitness-for-Sport-and-Exercise-2.pdf.aspx>

Books

Pearson REVISE BTEC First in Sport Revision Guide: for home learning, 2021

New BTEC First in Sport: Study & Exam Practice - for the exams in 2020 and beyond (CGP BTEC First) Paperback – 29 July 2019 by CGP books