

Physical Fitness

AEROBIC ENDURANCE

- # Aerobic Fitness
- # Cardiorespiratory Fitness
- # Cardiorespiratory Endurance

Def: The ability of the cardiorespiratory system to work efficiently, supplying the nutrients and oxygen to working muscle during sustained long lasting physical activity

About: being able to exercise the whole body for long periods of time
EG: Marathon Runner, Tour De France Cyclist, Rower, Triathlete
Important for those athletes as they are working for long periods of time and require the transportation of Oxygen to provide energy.
However, Sprinters only work for short periods of time, so aerobic endurance is not a physical fitness requirement for them.

How to improve Aerobic Endurance

Principles of Training

- F -Frequency (How often to train per week)
- I – Intensity (How hard to train)
- T – Time (How long to train for)
- T – Type (Which training method to use)
- S – **Specificity** (Training specific to an individual’s sport).
- PO – **Progressive Overload** (Training needs to be demanding enough for the body to adapt).
- R – **Rest and Recovery** (Body needs time to rest and allow it to recover).
- I – **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).
- V – **Variation** (Important to stop boredom).
- A – **Adaptation** (How the body adapts to different training loads).
- R – **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed).

Fitness Tests for Aerobic

Endurance Test (Bleep Test)

- # Need tape measure, bleep test recording.
- # MAXIMAL TEST
- # 2 lines 20m apart
- # Participants must keep in time with the bleeps, test finishes when they either miss three bleeps in a row or cannot continue.
- # Scored by getting a level and a number of shuttles completed.
- # Results used to predict VO2 Max from a data table.

Forestry Step Test

- # Need Steps at the correct height (33cm Females/40cm Males)
- # Need a stopwatch and a Metronome (set at 90 bpm / 22.5 steps per min) to keep time.
- # **SUBMAXIMAL TEST** – you only work for the time allowed, not until you cannot work any more.
- # Participant steps in time for 5 mins and then sit down for 15secs.
- # They then take their Heart Rate and this is used to predict VO2 Max from a data table.

Testing Aerobic Fitness

Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

How accurate is it? Does it measure what we want it to?

What is Reliability?

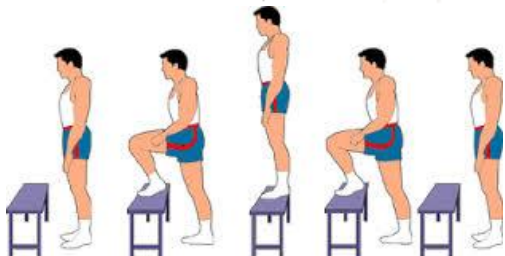
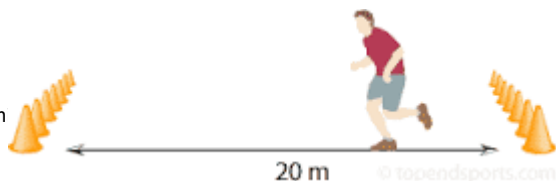
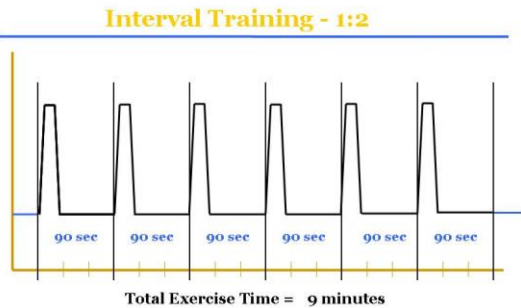
Ability to carry out the same test and get comparable results.

What is Practicality?

How suitable the test is for the participants, the space and equipment available

What is VO2 Max?

- # **VO2 Max** is the maximum amount of Oxygen that the body can take up in one min.
- # It is measured in ml/kg/min.



Rating of Perceived Exertion Borg RPE Scale		
6	Very, very light	How you feel when lying in bed or sitting in a chair relaxed. Little or no effort.
7		
8		
9		
10	Very light	Target range: How you should feel with exercise or activity.
11	Fairly light	
12	Somewhat hard	
13		
14		
15		
16	Hard	How you felt with the hardest work you have ever done.
17	Very hard	
18	Very, very hard	
19		
20	Maximum exertion	Don't work this hard!

How do I know how hard I am training?

What is your Maximum Heart Rate (MHR)?

220 – Age = MHR (measured in Beats Per Min – Bpm)

What are Training or Target Zones?

Lower Training Threshold = 60% of MHR

Upper training Threshold = 85% of MHR

Why is this important?

- # Training at the wrong intensity may not help improve the element of fitness you are trying to develop.
- # Training at too LOW intensity will mean that NO adaptations take place.
- # Training at too HIGH intensity will mean that you could injure yourself or you will not be able to work for long enough for adaptations to take place.

What is the BORG SCALE?

- # Rate of Perceived Exertion (RPE) – How hard you THINK you are working.
- # ESTIMATE of ACTUAL Heart rate. Used if actual HR information is not available.
- # Based on a scale of 6-20 (x number by 10 to get approx. HR EG Working close to maximum (18) would give a approx. HR of 180 Bpm).



Methods of Training to improve Aerobic

Continuous Training

- # Steady pace, Moderate intensity, doing the same type of exercise, without having a rest.
- EG Running, Rowing, Cycling or Swimming
- # Needs to last for 30mins or longer

Fartlek Training

- # Changes in exercise intensity with NO rest periods.
- # Intensity can be changed by changing the:
 - ~ Speed
 - ~ Terrain
 - ~ Equipment added eg Weights

Interval Training

- # Repeated periods of work followed by period of Rest or Recovery.
- # Work Period could be from 30secs – 5mins.
- # Rest Period could be sit down, stand still, walk or jog.
- # For Aerobic Endurance you should decrease the rest period and work at approx. 60% of VO2 Max.

Circuit Training

- # Different Stations/Exercises are used to develop Strength, Muscular Endurance and Power.
- # The stations/Exercises use different muscle groups to avoid fatigue.
- # Do one exercise after another in a set order.
- # Can vary to change the intensity:
 - ~ Number of Stations
 - ~ Number of Circuits
 - ~ Time at each Station

Physical Fitness

MUSCULAR ENDURANCE

Def: The ability of the muscular system to work efficiently, where a muscle can continue to work (contracting over a period of time) against a light to moderate fixed resistance load.

EG: Resistance load may be a tennis player's racquet. The racquet has to be held in position and swung repeatedly for a whole game.

How to improve MUSCULAR Endurance

Principles of Training

F - Frequency (How often to train per week)
I - Intensity (How hard to train)
T - Time (How long to train for)
T - Type (Which training method to use)

S - **Specificity** (Training specific to an individual's sport).
PO - **Progressive Overload** (Training needs to be demanding enough for the body to adapt).
R - **Rest and Recovery** (Body needs time to rest and allow it to recover).
I - **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).
V - **Variation** (Important to stop boredom).
A - **Adaptation** (How the body adapts to different training loads).
R - **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed).

Fitness Tests for MUSCULAR

Endurance 1 Minute Press Up Test

Measures upper body Muscular Endurance.
Equipment Required: Stopwatch and Mat.
Full PRESS UPS are done from the Start Position (arms straight) and each time the chest is lowered to the floor and returned to the start position one REP is counted.
Another person counts how many REPs are completed in one minute.
Results are recorded and measured in REPs/MINUTE and then compared to "Normal" values in a published data table.

1 Minute Sit Up Test

Measures ABDOMINAL Endurance.
Equipment Required: Stopwatch and Mat.
Full SIT UPS are done from the Start Position (back against the floor and knees bent) and each time they sit up until their elbows touch the knees and they lower themselves to the start position one REP is counted.
Another person counts how many REPs are completed in one minute.
Results are recorded and measured in REPs/MINUTE and then compared to "Normal" values in a published data table.

Testing Muscular

Fitness
Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

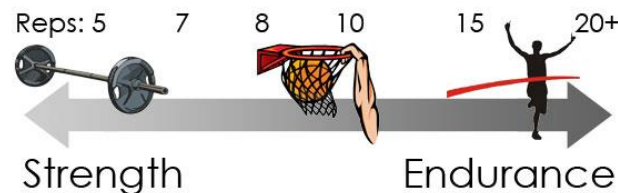
How accurate is it? Does it measure what we want it to?

What is Reliability?

Ability to carry out the same test and get comparable results.

What is Practicality?

How suitable the test is for the participants, the space and equipment available



MUSCULAR ENDURANCE

STRENGTH ENDURANCE

STRENGTH ENDURANCE TRAINING helps muscles to keep repeating the same movement.

For this training you would need:

LOW LOADS and **HIGH REPS**
50-60% 1RM and 20 REPS

ELASTIC STRENGTH

ELASTIC STRENGTH TRAINING helps muscles to do lots of movements straight after each other. EG GYMNASTICS floor routine.

For this training you would need:
MEDIUM LOADS and **MEDIUM REPS**
75% 1RM and 12 REPS

MAXIMUM STRENGTH

MAXIMUM STRENGTH TRAINING helps muscles to do lots of movements straight after each other. EG GYMNASTICS floor routine.

For this training you would need:

HIGH LOADS and **LOW REPS**
90% 1RM and 6 REPS

How do I know how hard I am training?

REPs, SETs and REST?

REPETITIONS (REPs): is one specific movement or exercise. Eg one BICEP CURL

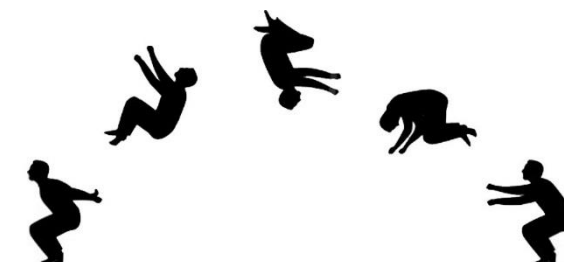
A **SET** is the number of **REPETITIONS** you do without a rest.

You should have a **REST** of approx. 1-2 minutes before completing another **SET**.
You might do 3 SETs of one exercise as part of a training session/programme. Eg 3 **SETs** of 15 **REPETITIONS** of a CHEST PRESS exercise with 1-2 minutes of **REST** between each SET.

What is 1RM?

The heaviest amount you can lift in 1 **REPETITION** is called the **ONE REPETITION MAXIMUM** (1RM).

INTENSITY of **TRAINING** (How hard you work) can be described as a **PERCENTAGE** (%) of the 1RM.

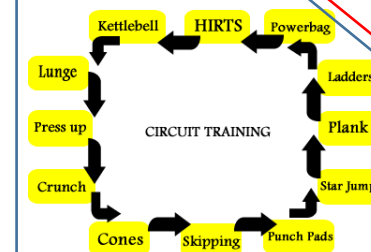


Methods of Training to improve Muscular Endurance?

FREE WEIGHT TRAINING

Weights that are not attached to a machine
Used to improve Muscular Strength and **MUSCULAR ENDURANCE**.
Use of Barbells and Dumbbells to perform different exercises.
MUSCULAR ENDURANCE: High Reps / Low Load/Weight.
CORE EXERCISES before **ASSISTANCE EXERCISES**
Alternate between different parts of the body (upper/lower).

Intensity is worked out of 1RM.
Training for Strength Endurance (50-60% 1RM / 20Reps).
Training for Elastic Strength (75% 1RM / 12 reps)
Training for MAX Strength (90% / 6 Reps)



CIRCUIT TRAINING

Different Stations/Exercises are used to develop
Strength, Muscular Endurance and Power.
The stations/Exercises use different muscle groups to avoid fatigue.
Do one exercise after another in a set order.
Can vary to change the intensity:
~ Number of Stations
~ Number of Circuits
~ Time at each Station



Def: The maximum force (strength) that can be generated (made) by a muscle or muscle group.

ABOUT: Muscular strength is how strong your muscles are. You can measure the force (strength) of your muscles in kilograms (kg) or newtons (N). It is about exerting maximum force and therefore is not about doing this repeatedly.

EG: Muscular strength is needed for sports like weightlifting in order to lift the heavy weights and in judo to work against your opponent and may be throw them.

How to improve MUSCULAR STRENGTH

Principles of Training

- F -Frequency (How often to train per week)
- I – Intensity (How hard to train)
- T – Time (How long to train for)
- T – Type (Which training method to use)
- S – **Specificity** (Training specific to an individual)
- PO – **Progressive Overload** (Training needs to let the body to adapt).
- R – **Rest and Recovery** (Body needs time to rest and allow it to recover).
- I – **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).
- V – **Variation** (Important to stop boredom).
- A – **Adaptation** (How the body adapts to different training loads).
- R – **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed).



Fitness Tests for MUSCULAR STRENGTH and ANAEROBIC POWER

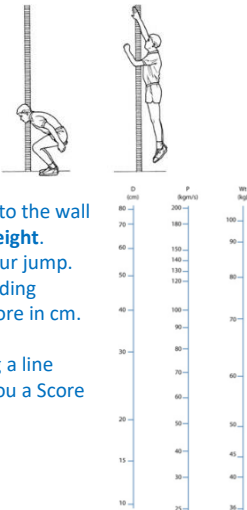
GRIP DYNAMOMETER

- # Measures the strength of the grip-squeezing muscles of the hand.
- # **Measured in:** KgW.
- # **Equipment Required:** Grip Dynamometer.
- # **Method:** Adjust the handgrip so that it is comfortable.
- # Stand with your arms by the side of your body.
- # Record the Maximum reading from three attempts using the dominant hand, allowing a one minute recovery between each attempt.



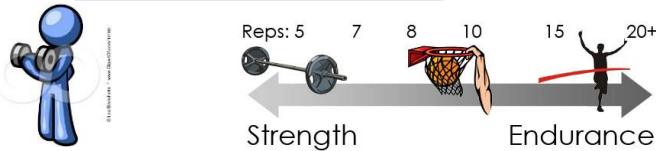
VERTICAL JUMP

- # **Measures ANAEROBIC POWER** in the LEGS.
- # **Equipment Required:** Tape measure or jump board..
- # **Method:** Perform a short warm up before starting.
- # Stand side on to the wall and reach up with the hand closest to the wall as high as possible. This is recorded as your **Standing Reach Height**.
- # Jump as high as possible and touch the wall at the peak of your jump. This should be recorded and the difference between your Standing Reach Height and your Jump Height is your **JUMP DISTANCE** score in cm. The best of three attempts is the final score.
- # Power is calculated using the **LEWIS NOMOGRAM** by drawing a line from your Weight (KG) to the Jump Distance (cm). This gives you a Score for **POWER** measured in Kg/Sec.



Testing Fitness

- Why do we test?**
So that we can measure improvement and see progress.
- What is Base Line Data?**
Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.
- What is Validity?**
How accurate is it? Does it measure what we want it to?
- What is Reliability?**
Ability to carry out the same test and get comparable results.
- What is Practicality?**
How suitable the test is for the participants, the space and equipment available



MAXIMUM STRENGTH

- # **MAXIMUM STRENGTH TRAINING** helps muscles to do lots of movements straight after each other. EG GYMNASTICS floor routine.
- # **For this training you would need:**
HIGH LOADS and LOW REPS
90% 1RM and 6 REPS

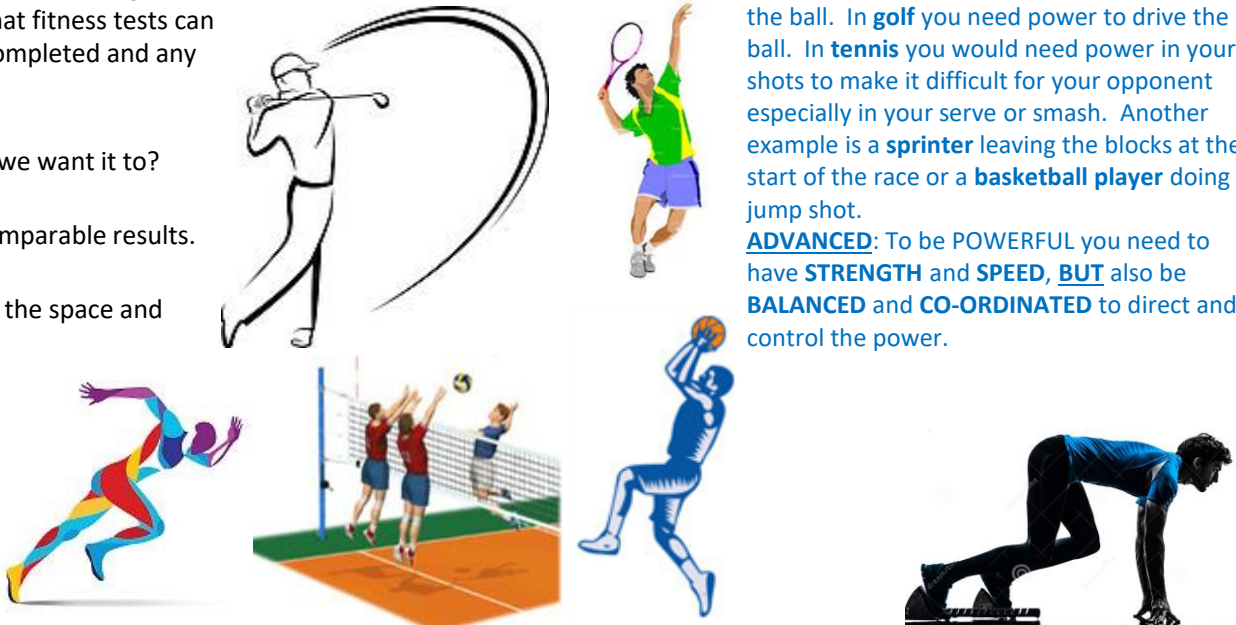
ELASTIC STRENGTH

- # **ELASTIC STRENGTH TRAINING** helps muscles to do lots of movements straight after each other. EG GYMNASTICS floor routine.
- # **For this training you would need:**
MEDIUM LOADS and MEDIUM REPS
75% 1RM and 12 REPS

STRENGTH ENDURANCE

- # **STRENGTH ENDURANCE TRAINING** helps muscles to keep repeating the same movement.
- # **For this training you would need:**
LOW LOADS and HIGH REPS
50-60% 1RM and 20 REPS

- Def:** The product (result of STRENGTH and SPEED. $P = \text{Strength} \times \text{Speed}$)
- ABOUT:** Power is given as the amount of work done in a unit of time. It is about being able to use muscular strength at speed. The faster or stronger the movement is, the more powerful it will be.
- EG:** You will need power to kick a **football**. This is because your leg does work by moving the ball. In **golf** you need power to drive the ball. In **tennis** you would need power in your shots to make it difficult for your opponent especially in your serve or smash. Another example is a **sprinter** leaving the blocks at the start of the race or a **basketball player** doing a jump shot.
- ADVANCED:** To be **POWERFUL** you need to have **STRENGTH** and **SPEED**, **BUT** also be **BALANCED** and **CO-ORDINATED** to direct and control the power.



Methods of Training to improve Muscular STRENGTH and POWER?

FREE WEIGHT TRAINING

- # Weights that are not attached to a machine.
- #Used to improve Muscular Endurance and **MUSCULAR STRENGTH**.
- # Use of Barbells and Dumbells to perform different exercises.
- # **MUSCULAR STRENGTH:** LOW Reps / HIGH Load/Weight.
- # **CORE EXERCISES** before **ASSISTANCE EXERCISES**
- # Alternate between different parts of the body (upper/lower).

PLYOMETRIC TRAINING

- # Develops sport specific explosive power and strength.
- # It involves lots of explosive movements and works by making muscles exert their maximum force in a short time period.
- # involves exercises that make the muscles contract and relax rapidly. This could be part of a **CIRCUIT TRAINING SESSION**.
- # Exercise Examples: Bounding, Jumping, Lunges, Inclined Press-ups, Hurdle Jumping, Press Ups with claps.
- # intensive warm up should be completed prior to **Plyometrics** to prevent injury and warm up muscles thoroughly.
- # Intensity can be increased by increasing the number of repetitions of an exercise, this should be done carefully as this training is intense and so can result in injury.
- # Sports Performers who would benefit from this type of training are:
 - ~ Sprinters: they need explosive power at take off when they hear the starting gun.
 - ~ Hurdlers: they need to jump over hurdles when maintaining speed.
 - ~ Volleyball Players: they need to jump high and contest the ball.

MAXIMUM STRENGTH

- # Intensity is worked out of 1RM.
- # Training for Strength Endurance (50-60% 1RM / 20Reps.
- # Training for Elastic Strength (75% 1RM / 12 reps)
- # **Training for MAX Strength (90% / 6 Reps**



Physical Fitness

SPEED

Def: Distance travelled by time taken. It is measured in m/sec.

ABOUT: There are three types of SPEED.

ACCELERATIVE SPEED

PURE SPEED

SPEED ENDURANCE

CALCULATING SPEED: Distance Travelled / Time Taken = SPEED (m/s)

EG: Speed is required in a number of sport, especially games based sports such as Football, Basketball, Netball, Rugby etc where you are required to beat or mark an opponent (SPEED ENDURANCE). The obvious example of SPEED in sport is Sprinting, where you are required to get from start to finish as quick as possible (PURE SPEED). However there are other examples such as the Gymnastics Vault where the gymnast is required to sprint a short distance. The faster their run up the greater height and distance generated in the vault.

Principles of Training

F -Frequency (How often to train per week)

I – Intensity (How hard to train)

T – Time (How long to train for)

T – Type (Which training method to use)

S – **Specificity** (Training specific to an individual's sport).

PO – **Progressive Overload** (Training needs to be demanding enough for the body to adapt).

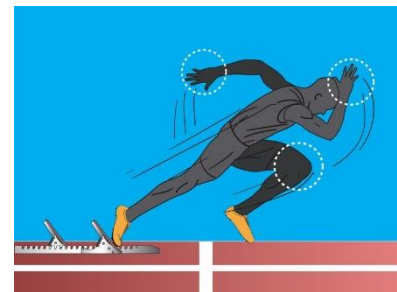
R – **Rest and Recovery** (Body needs time to rest and allow it to recover).

I – **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).

V – **Variation** (Important to stop boredom).

A – **Adaptation** (How the body adapts to different training loads).

R – **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed).



Fitness Tests for SPEED

35m SPRINT

TEST
Measures SPRINT SPEED.
Measured in: Seconds.
Equipment Required: Tape Measure, Stopwatch, Cones, Assistant.
Method: mark out 35m in a straight line with a run off area using cones.
Take up start position at the start point.
On the assistants command, sprint to the other cone 35m away.
The time is stopped when the sprinter's torso crosses the line.
Take the test 3 times and record the fastest time as the score.
Compare the results with normative values in the data table.



35 metre sprint.

Testing Fitness

Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

How accurate is it? Does it measure what we want it to?

What is Reliability?

Ability to carry out the same test and get comparable results.

What is Practicality?

How suitable the test is for the participants, the space and equipment available



SPEED & AGILITY

Methods of Training to improve SPEED and AGILITY

There is no specific training method used to improve AGILITY, however CIRCUIT TRAINING could be adapted to focus on agility with stations adjusted to meet the needs of the performer.

The stations/Exercises use different muscle groups to avoid fatigue.

Do one exercise after another in a set order.

Can vary to change the intensity:

~ Number of Stations

~ Number of Circuits

~ Time at each Station



SPEED. AGILITY. QUICKNESS.

ACCELERATION SPRINTS:

Pace is increased gradually from standing or rolling or jogging, then striding, and then to maximum sprint.

Different drills, such as resistance work and hill runs can be used.

Rest intervals of jogging or walking are used between each repetition.

They are a good form of **anaerobic** training.

HOLLOW SPRINTS:

A series of sprints followed by "hollow" periods of either rest, jogging or walking.

These are repeated approx. 5 times before a longer rest period.

They are used for in sports such as football where players who need constant change of speed during a game.

INTERVAL TRAINING:

A work period is followed by a rest or recovery period.

To develop speed, work intervals will be short and performed at high intensity.

Speed is developed by increasing work intensity and the number of rest periods.

Intervals will vary depending on the individual athlete goals.



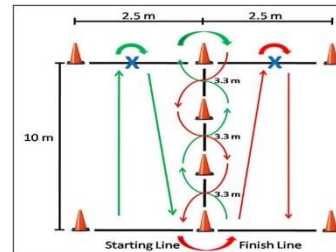
Skill-Related Fitness

AGILITY

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

ABOUT: Sports performers are often required to dodge and move quickly past the opposition to create space and score goals. This is most common in team sports where there are lots of players in the same space at the same time. If performers do not have good AGILITY, it is easier for the defence to mark them closely and make tackles, intercept passes and keep them out of the game.

EG: In rugby, you would need AGILITY to change direction quickly to avoid tackles from opposing players. In netball, AGILITY is required to create space between you and the defender, making yourself available for a pass. In Badminton, movement around the court is important. In order that you return the shuttle effectively you will need to be able to cover the whole court. However AGILITY is not important in events such as Javelin or 100m sprint, where participants do not have to change direction or worry about other players.



Fitness Tests for AGILITY

ILLINOIS AGILITY RUN TEST

Measures Speed and AGILITY.

Equipment Required: Flat non-slip surface, 8 Cones, Stopwatch, Assistant

Method: Set up course as shown in the diagram.

Warm up thoroughly.

Lie face down on the floor at the start in a press up position.

When the assistant give the command "GO" and starts the stopwatch, jump to your feet and run around the cones in the correct order through to the finish.

Assistant will stop the stopwatch and record the time when participant passes the finish cone.

Time is then compared with the normative data table.



Physical Fitness FLEXIBILITY

Def: Having a adequate range of motion in all joints of the body or the ability to move a joint fluidly through its complete range of movement.
ABOUT: Flexibility is required in everyday life, from doing shoe laces up to reaching for something on a shelf. It is particularly important in sport.

EG: **Gymnasts** and **Dancers** benefit from having increased flexibility which allows them to perform more complex moves and get into the required positions more easily. **Games players** would benefit from a greater range of movement when reaching for tackles so that they are **less prone to injury**. Sprinters would benefit from increased movement in the legs to generate a longer and more powerful stride. The movements in combat sports such **Karate** and **Judo** that participants are required to do will become easier and **more effective** with greater FLEXIBILITY.

Golfers will benefit from improved flexibility in their upper body, back and shoulders. This will enable them to swing the club through a greater range of movement, thus generating more power, increase club head speed and therefore hit the ball further.

Tennis players will benefit from improved flexibility in their upper body, back and shoulders. This will enable them to swing the racquet through a greater range of movement, thus generating more power, increase racquet speed and therefore serve or hit the ball harder, making it more difficult for the opponent to return.

Testing Fitness

Why do we test?
So that we can measure improvement and see progress.
What is Base Line Data?
Fitness Testing Data that is collected prior to a trainin programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.
What is Validity?
How accurate is it? Does it measure what we want it to?
What is Reliability?
Ability to carry out the same test and get comparable results.
What is Practicality?
How suitable the test is for the participants, the space and equipment available

Methods of Training to improve FLEXIBILITY?

STATIC STRETCHING: There are two types of STATIC STRETCHING.
ACTIVE STRETCHING
PASSIVE STRETCHING



ACTIVE STRETCHING:
This is where you use your own body to hold the stretch position.
EG Quadriceps Stretch
PASSIVE STRETCHING:
This is where you use someone else or an object/piece of equipment to help you hold your stretch position.
EG Calf/Gastrocnemius Stretch

BALLISTIC:
This is when you make fast, jerky movements, through the complete range of motion, to stretch your muscles.
This is usually in the form of bobbing or bouncing.
EG Bouncing down to touch you toes repeatedly.
this should be specific to the movement patterns of the sport/activity to be performed.
It needs to be performed with care as it can cause muscle soreness and strains.



How to improve FLEXIBILITY

Principles of Training

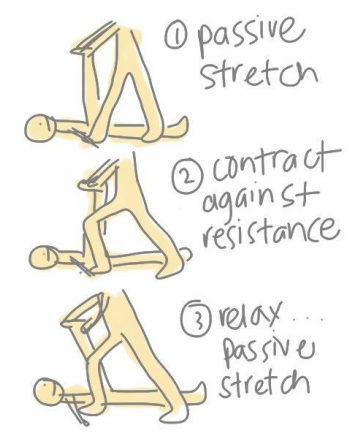
F -Frequency (How often to train per week)
I – Intensity (How hard to train)
T – Time (How long to train for)
T – Type (Which training method to use)
S – **Specificity** (Training specific to an individual’s sport).
PO – **Progressive Overload** (Training needs to be demanding enough for the body to adapt).
R – **Rest and Recovery** (Body needs time to rest and allow it to recover).
I – **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).
V – **Variation** (Important to stop boredom).
A – **Adaptation** (How the body adapts to different training loads).
R – **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, ther



Fitness Test for FLEXIBILITY

SIT and REACH TEST

Measures: the FLEXIBILITY of the lower back and hamstring muscles.
Equipment Required: Tape measure and Box, OR a Sit and Reach Box/Table, Assistant.
Method: Take your shoes off.
Sit comfortably on the floor with legs straight out in front of you.
Put the soles of your feet shoulder width apart against the box.
make sure your legs are straight with your knees locked. If your knees are bent the test will be inaccurate.
With your hands reaching towards you feet, lean forward and reach as far as possible with your fingertips.
you must hold the stretch for at least 2 seconds.
You have three attempts
Assistant record the best distance (cm) stretched.
0cm is where your feet are. You get a + score if you stretch beyond this and a – score if you do not reach your feet.
Results are then compared with normal values in a published data table.



PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF):
Used to develop MOBILITY, STRENGTH and FLEXIBILITY.
Performed with the assistance of someone else or an immovable object.
Can be used in rehabilitation programmes.
METHOD: The performer should stretch the muscle as far as they can and then, with the help of a partner, contract the muscle isometrically (without generating any joint movement / where there is no active shortening or lengthening of the muscle) for 6-10 seconds. Then relax the muscle after which a passive stretch is performed with the help of a partner, to enable the muscle to stretch even further.
The technique inhibits the stretch reflex which occurs when a muscle is stretched to its full capacity, so that an even greater stretch and range of movement can occur.

Physical Fitness

BODY COMPOSITION

Def: The relative ratio of FAT MASS to FAT-FREE MASS in the body.

ABOUT: FAT-FREE MASS includes the vital organs (like the Heart), Muscle and Bone. Therefore how much FAT v MUSCLE/BONE/VITAL ORGANS OR how much FAT we have compared to other BONES, MUSCLE and VITAL ORGANS, often measured as a SCORE, RATIO or PERCENTAGE.

EXAMPLES: Different sports performers have different ratios of FAT to FAT-FREE MASS.

EG. **SUMO WRESTLERS** would have a high ratio of FAT to FAT-FREE MASS ie they have lots of FAT MASS and much less FAT-FREE MASS. They need to be heavy to make it difficult for their opponents to push or lift them out of the Sumo



MARATHON RUNNERS have less FAT MASS and lots of FAT-FREE MASS. If they are lighter and have less FAT the body does not have to work as hard to get them around the cou



HORSE JOCKEY have less FAT MASS and lots of FAT-FREE MASS. This is because they need to be light weight so that they are not slowing the horse down, but strong as they need to control the horse which is much bigger than them.



TENNIS PLAYERS could have a fairly balanced ratio of FAT MASS to FAT-FREE MASS. They will need to be agile enough to get round the court, ensuring they return the ball, and strong enough to generate power in their shots to make it difficult for their opponent to return the ball as it has been hit hard with pace therefore limiting the time they have to make a decision and play a shot to return the ball.



How to improve BODY COMPOSITION

Principles of Training

F – Frequency (How often to train per week)

I – Intensity (How hard to train)

T – Time (How long to train for)

T – Type (Which training method to use)

S – **Specificity** (Training specific to an individual's sport).

PO – **Progressive Overload** (Training needs to be demanding enough for the body to adapt).

R – **Rest and Recovery** (Body needs time to rest and allow it to recover).

I – **Individual Differences/Needs** (Programme design needs to meet the individual training goals and needs).

V – **Variation** (Important to stop boredom).

A – **Adaptation** (How the body adapts to different training loads).

R – **Reversibility** (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed).

Testing Fitness



Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

How accurate is it? Does it measure what we want it to?

What is Reliability?

Ability to carry out the same test and get comparable results.

What is Practicality?

How suitable the test is for the participants, the space and equipment available

BODY COMPOSITION



DIET

DIET can effect the body composition of someone because of the number of calories consumed compared with the number of calories burnt. If you burn less calories than you consume you will put on weight and if you burn more calories than you consume you will lose weight.

EXERCISE



In everyday life we burn calories, whether this is getting dressed in the morning, running down the stairs for breakfast, getting up out of a chair or doing the shopping. These activities will all burn calories. The more intense and the longer lasting activities will burn more calories. Therefore if we participate in sport we are likely to burn more calories than someone that does not do any exercise. This will either mean that we can eat more and therefore increase our calorie intake without putting on weight, or if we do not increase our calorie intake, because we are burning more calories, we are likely to lose weight.

Measuring Body COMPOSITION

BIOELECTRICAL IMPEDENCE ANALYSIS (BIA)

PURPOSE: ESTIMATES percentage of BODY FAT.

EQUIPMENT: BIA analyser and a MAT.

PROCEDURE: Sports Performer lays down, face up on a mat. Electrodes from the BIA Analyser are attached to the right ankle and right wrist. The BIA Analyser is turned on:

A small electric current passes through the body.

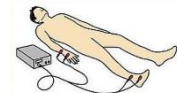
The current passes through FAT-FREE MASS EASILY.

The current passes through FAT LESS EASILY. This means there is RESISTANCE.

The less easily the current passes through the body, the more fat there is.

The BIA analyser gives a reading. This is the ESTIMATED PERCENT (%) Body Fat.

The result is compared to “Normal” values in a published data table.



BODY MASS INDEX

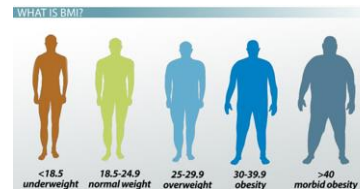
(BMI)

PURPOSE: It is a way of finding out if a person is IDEAL WEIGHT.

EQUIPMENT: Weighing Scales and Tape Measure

PROCEDURE: Sports Performer's BODY MASS is measured using scales and recorded in Kilograms (Kg). The HEIGHT is also measured using the tape measure. This is recorded in Metres (m). Their BODY MASS INDEX (BMI) is calculated using this equation:

$BMI (Kg/M^2) = BODY MASS (Kg) / HEIGHT^2 (M^2)$



SKINFOLD CALLIPER TEST

PURPOSE: It ESTIMATES PERCENTAGE (%) BODY FAT.

EQUIPMENT:SKINFOLD CALLIPERS

PROCEDURE: The Sports Performer should remove their clothing to show the test sites. The test sites are different for MALES and FEMALES.

MALES: CHEST (Diagonal Fold) / ABDOMINAL (Vertical Fold) / THIGH (Vertical Fold)

FEMALE: TRICEP (Vertical Fold) / SUPRAILIAC (Just above the hip / Diagonal Fold) / THIGH (Verical Fold)

At each test site, SKINFOLD CALLIPERS are used to pinch the SKIN and FAT away from the muscle. The measurement on the callipers is recorded in mm. THREE READINGS are taken at each site. An average value is calculated from this. The THREE TEST SITE AVERAGES are ADDED TOGETHER to give a TOTAL SKINFOLD VALUE.

The percentage (%) BODY FAT is worked out using a Jackson POLLOCK NOMOGRAM. You need to know the Sports Performer's Gender, Total Skinfold Value in mm and their AGE.

SKILL RELATED FITNESS

CO-ORDINATION



DEF: The smooth flow of needed to perform a MOTOR TASK EFFICIENTLY (wasting as little energy as possible) and ACCURATELY (without going wrong).

ABOUT: A Motor Task is a movement you make to achieve a goal.

EG: FOOTBALL: Moving your foot to kick a ball. To perform the action smoothly you need to be well co-ordinated.

GYMNAST: Co-ordination is important for the gymnast to perform a number of complex moves in a floor routine without making a mistake.

Principles of Training

BASIC:

F - FREQUENCY (How often to train per week)

EG: A Sprinter may train on the track 3 times per week and 2 times in the gym. In total, 5 times plus 2 days rest.

I - INTENSITY (How hard to train)

EG: A marathon runner may train at between 60-85% of their Maximum Heart Rate. If it is less than 60% the body is not worked hard enough and therefore no adaptation takes place. If the intensity is too high then the exercise will not last long enough for adaptations to take place.

T - TIME (How long to train for)

EG: for training to be effective it needs to last for a period of time, so that the body is stressed and will then make adaptations. If it is not long enough then no adaptations will take place

T - TYPE (Which training method to use)

EG: For a SPRINTER or RUGBY PLAYER it could be a combination of **Free Weight Training** to improve **STRENGTH** and **Speed Training** to improve **ACCELERATION**.

ADDITIONAL or ADVANCED PRINCIPLES:

S - SPECIFICITY (Training specific to an individual's sport). A RUGBY PLAYER would need to work on different components of fitness such as STRENGTH and POWER, as well as AGILITY and SPEED, as these would be required to perform at a high standard in driving players off the ball or avoiding being tackled. However a BADMINTON PLAYER may rely on CO-ORDINATION, AGILITY and REACTION TIME more in order to return the shuttle effectively.

PO - PROGRESSIVE OVERLOAD (Training needs to be demanding enough for the body to adapt). Over a period of time the body will become used to the training and therefore will find it easier. AT this point it is important to make it harder by increasing one of the FITT principles. For example if you follow a 6 week training programme in the gym, you may have to increase the weight or repetitions as your body adapts and the training becomes easier.

R - REST and RECOVERY (Body needs time to rest and allow it to recover). When your body has been stressed it is important that it has time to recover and for adaptations take place. This may mean a day off or just lighter training which could include a flexibility workout

I - INDIVIDUAL DIFFERENCES/NEEDS (Programme design needs to meet the individual training goals and needs). **EG:** There may be two tennis players who each have different strengths and areas for improvement and therefore have different needs from their training.

V - VARIATION (Important to stop boredom). In order for athletes to be motivated they need to stay focused. If they become bored they will not train as hard and the training will be less effective.

A - ADAPTATION (How the body adapts to different training loads). When the body is stressed by training at the appropriate intensity then (60-85%) then the body has to make adjustments or adaptations. The body becomes fitter and therefore gets used to the training.

R - Reversibility (If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed). When an athlete cannot train (may be because of injury), the body is not being stressed and therefore no adaptations are taking place. It becomes used to this environment which requires a lower level of fitness and the body reverts back to this.

SKILL RELATED FITNESS

REACTION TIME



DEF: The time it takes for a Sports Performer to RESPOND to a STIMULUS and INITIATE a RESPONSE.

ABOUT: As SIMULUS is a change in the environment.

EG: SPINTER: The time it takes for them to respond to the noise from a starter's gun. The quicker you respond the better chance of winning the race.

TENNIS PLAYER: The time it takes for you to respond to the opponent's serve or shot. If you can respond quickly then you have a better chance of playing a more effective return and possibly beating your opponent.

CO-ORDINATION, BALANCE and REACTION TIME

FITNESS

DEF: The ABILITY OF THE BODY TO MEET THE DEMANDS OF THE ENVIRONMENT



DEF: The ability to maintain **CENTRE OF MASS** over a **BASE OF SUPPORT**.



KARATE: A athlete doing KARATE may have to balance on one leg to perform a kick. This would be DYNAMIC BALANCE as they would be moving in order to strike their opponent.

ARCHERY: An archer would have to be perfectly balanced when the pull the bow back. Just prior to release of the arrow, they need to be still and focused on the target reducing movement as much as possible.

SKILL RELATED FITNESS

BALANCE



ABOUT: All objects including us have a **CENTRE OF MASS**. You need to have your **CENTRE OF MASS** over whatever is **SUPPORTING** you (your base of support) to **BALANCE**. If your **CENTRE OF MASS** is not over you **BASE OF SUPPORT** you will fall over. There are **TWO TYPES** of **BALANCE**:

STATIC BALANCE: This is where the performer is **STILL**.

EG: When a GYMNAST is doing a HEADSTAND or HANDSTAND.

DYNAMIC BALANCE: This is when the performer is **MOVING**.

EG: When a GYMNAST is doing a CARTWHEEL.

Testing Fitness



Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

How accurate is it? Does it measure what we want it to?

What is Reliability?

Ability to carry out the same test and get comparable results.

What is Practicality?

How suitable the test is for the participants, the space and equipment available



FITNESS TESTS

METHODS of TRAINING

AEROBIC ENDURANCE:

Multi Stage Fitness Test
Forestry Step Test

Def: The ability of the cardiorespiratory system to work efficiently, supplying the nutrients and oxygen to working muscle during sustained long lasting physical activity

MUSCULAR STRENGTH:

Grip Strength
Dynamometer

Def: The maximum force (strength) that can be generated (made) by a muscle or muscle group.

MUSCULAR ENDURANCE

1min Sit Up Test
1min Press Up Test

Def: The ability of the muscular system to work efficiently, where a muscle can continue to work (contracting over a period of time) against a light to moderate fixed resistance load.

POWER:

Vertical Jump Test

Def: The product (result of STRENGTH and SPEED. $P = \text{Strength} \times \text{Speed}$)

SPEED:

35m Sprint Test

Def: Distance travelled by time taken. It is measured in m/sec.

AGILITY

Illinois Agility Test

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

FLEXIBILITY:

Sit and Reach Test

Def: Having a adequate range of motion in all joints of the body or the ability to move a joint fluidly through its complete range of movement.

BODY COMPOSITION:

Skinfold Calliper Test
Bioelectrical Impedance
Analysis
BMI

Def: The relative ratio of FAT MASS to FAT-FREE MASS in the body

Sprinting for the train: **Speed**

Log on the track. Have to jump over it: **Plyometric**

Train stops at different stations: **Circuit**

Train travels round and round the track: **Continuous**

Shovel coal onto a carriage: **Free Weight**

Barrier has to move up and down : **Flexibility**

Pass a mountain range. The mountains are different terrain: **Fartlek**

Quick Revision

Components of Fitness

Health Related Fitness	Skill Related Fitness
A erobic Endurance	B alance
M uscular Strength	C o-ordination
M uscular Endurance	R eaction Time
B ody Composition	A gility
S peed	P ower
F lexibility	

FITNESS TESTING

Why do we test?

So that we can measure improvement and see progress.

What is Base Line Data?

Fitness Testing Data that is collected prior to a training programme being undertaken/started, so that fitness tests can be redone after the programme has been completed and any progress recorded.

What is Validity?

How accurate is it? Does it measure what we want it to? A fitness test is valid if it measures the type of fitness that it is supposed to measure. EG if you were testing strength in your legs you would not use the grip dynamometer (tests grip strength) or the sit and reach box (tests flexibility in the lower back and hamstrings).

What is Reliability?

Ability to carry out the same test and get comparable results. A fitness test is reliable if a sports performer gets the same results when they repeat the test under the same conditions. Different conditions could make the test and its results less reliable. EG tests completed outside have to cope with weather and surface conditions which may differ at the time of the test.

What is Practicality?

How suitable the test is for the participants, the space and equipment available. How possible is it to carry out the test. This could include the Cost, Time, Ease, Number of People. Some tests can be completed with more than one person at the same time.

PRINCIPLES OF TRAINING

BASIC Principle Of Training	Definition / Sport Example
F – FREQUENCY	How many times you train per week
I – INTENSITY	How Hard you train
T – TIME	How long you train for
T – TYPE	What type of training

ADVANCED Principle Of Training	Definition / Sport Example
V – Variation	Having variety in your programme will stop you getting bored. Therefore each session does not have to be the same.
I – Individual Needs / Differences	Athletes will have different strengths and areas for improvements even though they play the same sport. For example some players in the same rugby team may need to work their muscular strength and other may need to work on their speed.
P – Progress Overload	As your body adapts to the stress put on it, it becomes fitter. In order for you to improve further you need to again stress the body by increasing the intensity. This could be by increasing the time, weight, resistance, repetitions etc.
R – Reversibility	If training stops or the intensity of training is insufficient to cause adaptation, then training effects are reversed. This may be due to injury or rehabilitation or just that you do not have access to the facilities because you are on holiday.
A – Adaptation	This is where your body adapts to the stress it is put under, meeting the demands of the environment (FITNESS). Exercise must be long enough and hard enough for this to happen.
R – Rest and Recovery	Your body needs time to recover in order for adaptations to take place.
S – Specificity	Training should be specific for your sport. A swimmer would definitely work on their arms as well as their legs

EXAMPLES FROM SPORT

Select the top 5 Components of
fitness for each Sport and explain
why you have chosen these.

SWIMMER (1000m)

JAVELIN THROWER

EXAMPLES FROM SPORT

Select the top 5 Components of fitness for each Sport and explain why you have chosen these.

TRI-ATHLETE

HORSE JOCKEY