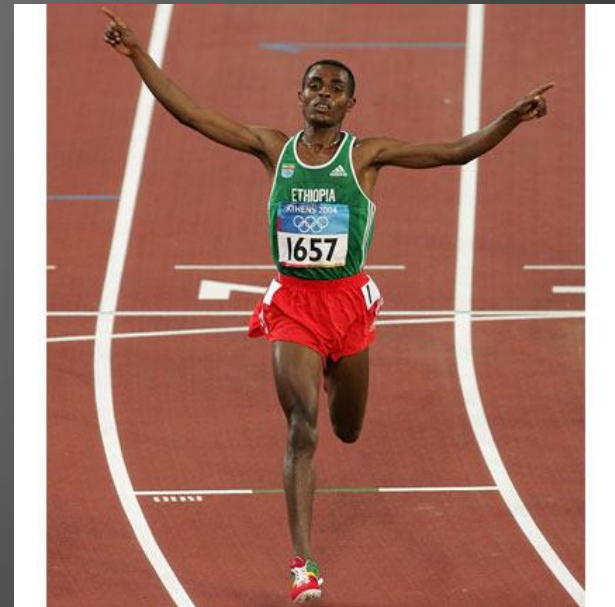


Fitness Components & Training Principles

Year 10 PE Academic

What is Fitness?

- In sport, fitness refers to the characteristics required of an athlete to be successful.
- The fitness required in one sport may therefore be detrimental to an athlete's performance in another sport. However, a number of sports have similar fitness requirements.



Fitness Components

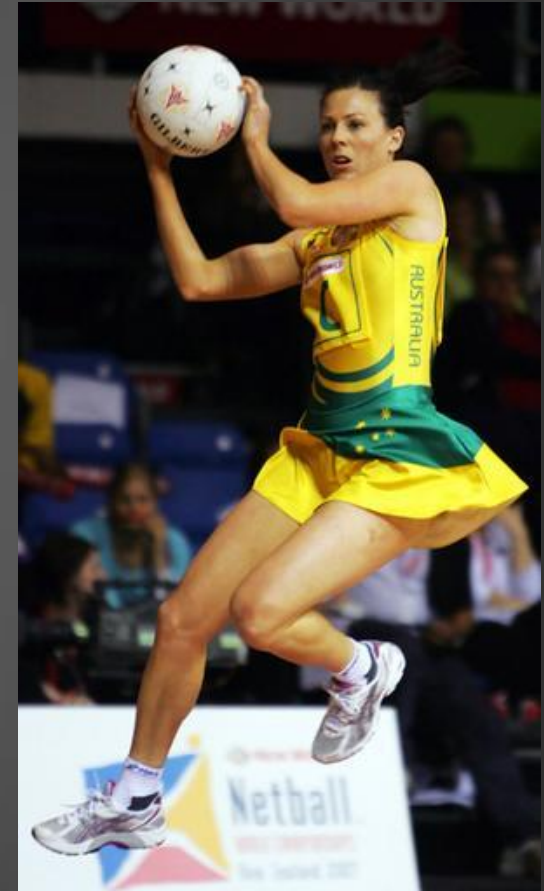
- Aerobic Capacity
- Anaerobic Capacity
- Muscular Strength
- Muscular Endurance
- Flexibility
- Body Composition
- Speed
- Muscular Power
- Agility
- Coordination
- Balance
- Reaction Time

Fitness Testing

- Fitness testing is used for a variety of reasons, these could include:
 - Athlete Identification – testing individuals to ascertain their potential ability in any given activity.
 - Identifying Strengths & Weaknesses – testing individuals to ascertain the areas they need to improve most in fitness components relevant to their particular sport.
 - Monitoring Progress – by testing athletes at regular intervals with specific and consistent tests they can ascertain if training programs are working
- There is a wide range of fitness tests available to test the various fitness components, each test must be specific, valid and reliable.
- Read pgs. 184-186 of textbook.

Sport Analysis - Netball

- What fitness components are the most important in the sport of netball?
 - Aerobic Capacity
 - Extended period of game time
 - Speed
 - Short sharp bursts needed
 - Agility
 - Dodging and weaving required
 - Coordination
 - Ability to move both body and ball in small spaces and quickly



Sport Analysis - Football

- What fitness components are the most important in the sport of football?
 - Aerobic Capacity
 - Extended period of game time
 - Anaerobic Capacity
 - Repeat efforts at near maximal exertion
 - Agility
 - Dodging and weaving required
 - Coordination
 - Ability to move both body and ball in small spaces and quickly
 - Muscular Power
 - Numerous movements require explosive bursts



Training

- The purpose of training is to gain benefits in specific areas to benefit performance in a particular sport.
- These areas could include improvements in both skills and fitness components, often coaches will try and develop training drills that benefit both.
- What are some examples?



Training Principles

- Specificity
 - Training must match closely what occurs in game situations.
- Intensity
 - Intensity is the exertion level at which training is performed, it is controlled by duration, frequency and overload.
- Duration
 - The length of training, the length of particular drills within a training session and the length of rest periods all change training intensity.
- Frequency
 - Frequency refers to the number of training sessions used per week in a particular training schedule.

Training Principles

- Progressive Overload
 - This is one of the most important aspect of developing training programs. To improve fitness levels training levels must be progressively increased (overloading).
- Variety
 - Variety is aimed at maintaining motivation of athletes, this helps to increase overall results of training programs.
- Diminishing Returns/Reversibility
 - As an individual's fitness level increases, the rate of improvement decreases. If training ceases, the gains made are reversed quicker than they were gained, this is known as training reversibility.

Types of Training

- Continuous Training
 - Long, slow, distance training. Minimum of 20 mins duration at sub-maximal intensity
- Interval Training
 - Uses work-rest ratio of a sport to mimic intensity in training
- Resistance Training
 - Exercising muscle groups against a resistance (weight training)
- Flexibility Training
 - Aims at improving flexibility by using stretching or plyometrics
- Circuit Training
 - Involves working at a number of activity stations in succession.
- Fartlek Training
 - Fartlek is a variation of continuous training, by varying levels of exertion different benefits can be achieved.
- Speed Training
 - Aimed at improving speed by using short bursts in training

Assignment - Ways to Improve Fitness

- Read assignment (any questions?)
- Read pgs. 280-281 of text book
- Text book can also be used to find more information on training principles and types of training to help in the development of your training program

Fitness Components

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Aerobic Capacity

- The circulatory and respiratory systems work to deliver oxygen to the working muscles of the body. The ability of the body to complete this is related to its aerobic capacity.
- If an athlete is highly trained at performing for long periods of time (usually anything over 2 minutes), then they can efficiently bring oxygen into the body and transport it to the muscles. It can then use that oxygen to produce ATP quickly and efficiently.
- Aerobic capacity is essential in:
 - Most team games
 - Extended athletic events (marathon, triathlons)



Anaerobic Capacity

- Anaerobic capacity refers to the body's ability to produce ATP in the working muscles in the absence of oxygen.
- It is essential in activities that require either of the following:
 - Maximal effort for around 10 seconds OR
 - Near-maximal effort for up to 1 minute
- Anaerobic capacity is essential in:
 - 100m-400m sprints
 - 50m-100m swim
 - Continuous 20m sprints in basketball/netball



Muscular Strength

- Muscular strength refers to an athlete's ability to exert maximal force by contracting against a resistance.
- Muscular Strength is essential in:
 - Weightlifting
 - Wrestling
 - Rugby (scrum)



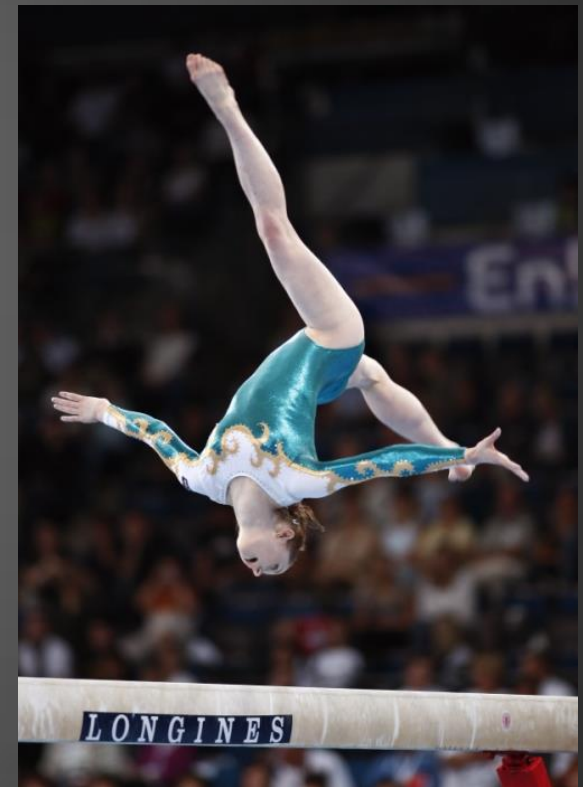
Muscular Endurance

- Muscular Endurance can refer to a group of muscles or a single muscle's ability to perform sustained work.
- It is often controlled by the body's ability to tolerate the presence of lactic acid within the working muscles.
- Muscular Endurance is essential in:
 - Swimming
 - Rowing
 - Cycling
 - Running



Flexibility

- Flexibility refers to the body's ability to achieve an extended range of motion without being impeded.
- Flexibility is essential in:
 - Gymnastics
 - Goalkeeping in hockey or soccer



Body Composition

- Body composition refers to the amount of lean tissue and fat tissue in the body. It also refers to the shape of a particular athlete.
- Body composition is relevant in all sports, although the extent to which it is important varies.



Speed

- Speed can refer to the whole body's ability to move from one point to another. It can also refer to a body part moving quickly.
- Speed is essential in:
 - Sprinting events
 - Javelin/discuss
 - Numerous team games



Muscular Power

- Muscular power refers to the ability to exert maximum muscular contraction instantly in an explosive burst of movement. The two components of power are strength and speed.
- Muscular Power is essential in:
 - Athletic field events (throws and jumps)
 - Tackling in team games
 - Striking actions (spike in volleyball, serve in tennis, golf swing)



Agility

- Agility relates to the ability of an athlete to change direction quickly and with coordination and balance.
- Agility is essential in:
 - All team games to varying degrees



Coordination

- Coordination is the ability to link a series of muscular movements together so that they are controlled and efficient.
- Coordination is essential in almost all sports, but it is essential in:
 - All team games
 - All ball games



Balance

- Balance is the ability of an athlete to maintain control of their body. It can be either stationary (static balance) or moving (dynamic balance).
- Balance is essential in:
 - Gymnastics
 - Running a bend in athletics
 - Fending off a tackle in football



Reaction Time

- Reaction time is the speed at which an individual can react to an outside stimulus.
- Reaction Time is essential in:
 - Any event that involves a starters gun/beep
 - Fielding in cricket



Apply Your Understanding

- Use the textbook to answer the following questions:
 - Pg. 153 – Q. 3, 11
 - Pg. 156 – Q. 6
 - Pg. 158 – Q. 5, 6, 8
 - Pg. 161 – Q. 5, 7
 - Pg. 163 – Q. 7
 - Pg. 165 – Q. 5

Training Principles

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Video – Principles of Training for Fitness

- Watch the video and complete worksheet

Specificity

- This is the most important training principle.
- Training must be relevant and match what you will need to do in competitive/game situations. If it doesn't, then it is most likely a waste of time.
- The training program must match the following:
 - The main energy systems used in the sport
 - The main fitness components used in the sport
 - The main muscle groups used in the actions within the sport
 - The skills performed in the sport

Intensity

- Working at the correct intensity levels is critical to achieving the aims of training program.
- Appropriate timing, exertion level and distance of work should match or overload game conditions.
- To train the main energy system used in a particular sport training levels need to be at the following:
 - ATP-PC energy system – 95-100% of maximum heart rate (MHR)
 - Lactic acid energy system – 85-95% of MHR
 - Aerobic energy system – 70-85% of MHR
- Approximate MHR = $220 - \text{age}$

Duration

- Duration usually refers to the length of one particular training session, but it can also be related to the length of a particular training program.
- The duration of a training session can influence the session's intensity.
- A training session must last for at least 20 minutes of exercise within the required heart rate zone to gain any benefits in fitness.

Frequency

- Frequency refers to the number of training sessions required per week.
- Generally, the minimum number of training sessions required to gain fitness benefits is three. Two training sessions per week should be enough to maintain fitness levels.
 - These numbers vary depending on the fitness components being trained
- Training frequency must also take into consideration rest and recovery as these periods of time are essential to allow changes in fitness to occur.

Progressive Overload

- There can be no improvement in fitness without gradually increasing training levels.
- By increasing training levels, the body is forced to adjust (improve) to perform at these levels.
- Progressive overload is manipulated by the FITT principle:
 - Frequency
 - Intensity
 - Time
 - Type of exercise
- The overload planned in a training program must be gradual and achievable, but also great enough to exhibit improvement.

Variety

- Training can become boring. Variety is essential to maintain motivation and ensure the training program is completed.
- By changes drills and activities there is an increased likelihood that athletes will train at optimal levels.
- It is important not to allow variety to take away from the main aims of the program.
 - Ways to ensure this happens is to keep the variety relevant, i.e. For a long distance runner, cycling or swimming could be introduced to continue to train the aerobic energy system. Even a change in location, such as introducing cross-country running could improve motivation.

Diminishing Returns/Reversibility

- As an individual's fitness level increases, the rate of improvement lessens. This is known as the principle of diminishing returns.
- There will be a certain point at which improvement plateaus and may not increase.
- Reversibility refers to the fact that when training stops the reversal of fitness gains occurs much faster than they were achieved.
- Aerobic gains are also lost much faster than anaerobic gains.

Apply Your Understanding

- Use the textbook to answer the following questions:
 - Pg. 246 – Q. 8, 9, 10, 11, 13
 - Pg. 248 – Q. 8
 - Pg. 251 – Q. 6, 7
 - Pg. 253 – Q. 10

Types of Training

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Continuous Training

- Also known as long, slow distance (LSD) training
- Activity lasts for a minimum of 20mins, without a break
- Sub-maximal intensity (70-85% max HR)
 - Known as the aerobic training zone
- Uses the aerobic energy system
- Used as a base for most athletic events, particularly team sports
- Also used by people wishing to exercise for general health and fitness.



Continuous Training

- Benefits
 - Improved aerobic power and local muscular endurance
 - Raises lactate tolerance (intensity dependant)
 - Reach aerobic steady state faster
 - Accumulate lactic acid more slowly
 - Recover more quickly
 - Less intense training compared to anaerobic methods
 - Improves functioning of heart and Lungs

Interval Training

- Consists of intervals of work followed by intervals of rest or recovery
- By completing a fitness assessment and identifying a work-rest ratio, a highly specific interval training session can be designed
- The rest periods allow the athlete to complete the intervals at a higher intensity than if the work was continuous
- The length of W and R can be altered to train the desired energy system



Interval Training

- Progressive overload variables
 - Distance/duration of work
 - Rate/intensity of work
 - Duration of rest/recovery
 - Type of rest/recovery
 - Number of repetitions
 - Number of sets
 - Frequency of sessions per week
- Benefits
 - Highly structured sessions
 - Each session can be different (variety)
 - Training sessions reflect the demands of the game (using W:R ratios)
 - Minimal equipment
 - Rest/recovery allows more exercise sessions to be performed at a greater intensity
 - It is possible to measure progress
 - Any of the energy systems can be trained

Fartlek Training

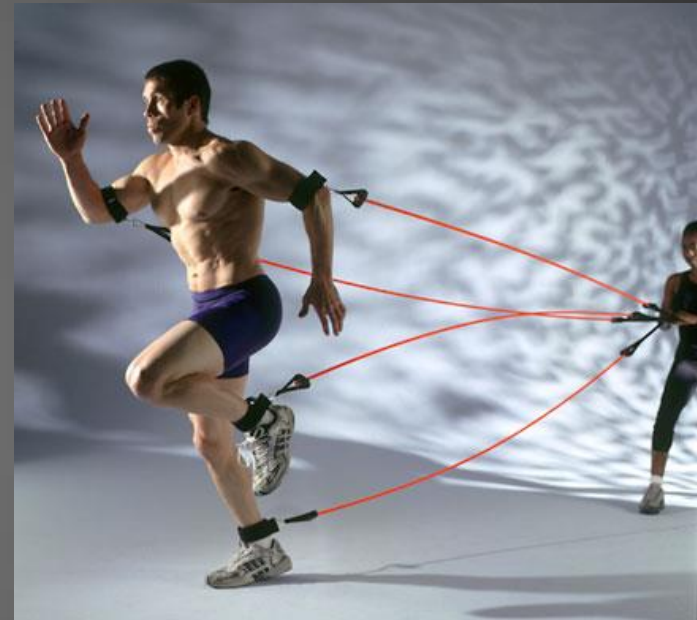
- Also known as 'speed play'
- Combines aerobic activity with short bursts of intense work at regular stages
- Altering the intensity enables the threshold of the aerobic and anaerobic energy systems to be trained
- Progressive overload
 - Increase frequency of short bursts
 - Increase duration of short bursts
 - Increase distance covered
 - Vary the terrain (include hills)
 - Cover same distance in reduced time
- Benefits
 - Aerobic and anaerobic systems trained
 - Although, aerobic still predominant
 - Can be a structured or unstructured training session

Resistance Training

- The most common form is weight training
- Aims to build muscular strength, power and local muscular endurance
- Key terms:
 - Repetition: a single effort of an exercise
 - Set: performing repetitions continuously a certain number of times
 - Repetition maximum (RM): the heaviest load that can be successfully completed in a given number of efforts
 - Resistance: the load (weight) that must be moved

Resistance Training

- Specificity
 - Muscle groups?
 - Speed of movement?
 - Range of motion?
 - Energy systems?
 - Strength, power, endurance?
- Progressive overload
 - Increase sets
 - Increase repetitions
 - Increase load/resistance/weight
 - Decrease rest time
- Benefits
 - Variety of exercises can be incorporated
 - Specific muscles targeted
 - Muscular strength, muscular power and local muscular endurance can be trained by using different methods



Circuit Training

- Performing a number of activity sets in a sequence
- Used to develop strength, aerobic power, local muscular endurance and agility
- Fixed load circuit
 - Set number of repetitions to be completed
- Fixed time circuit
 - Complete as many repetitions as possible in set time
- Individual load circuit
 - Pre-test: max reps in one minute. Then work at 60-75% of this RM

Circuit Training

- Progressive Overload
 - Increase repetitions
 - Increase laps of the circuit
 - Increase resistance/load/weight
 - Changing length and nature of recovery
 - Maintain repetitions, decrease duration
- Benefits
 - Variety
 - Minimal equipment
 - Small or large number of fitness components
 - Tailored to individual or team needs
 - Progress can be monitored
 - Multiple fitness components can be trained in the same session



Flexibility Training

- Aiming to improve range of movement to maximise performance
- Warming up of the muscles is required before flexibility training
- Static (passive) stretching
 - Safe and easy
 - Gradually stretch muscles
 - Particularly effective in a warm-down
- Active (slow) stretching
 - Repeating the static stretch a number of times
- Proprioceptive Neuromuscular Facilitation (PNF)
 - Very effective at improving flexibility
 - Partner provides resistance
 - Isometrically contract against resistance
 - Repeat cycle, gradually increasing range
- Dynamic (ballistic) stretching
 - Move body parts through range of motion
 - Gentle then vigorous
 - Can be dangerous



Plyometric Training

- A form of resistance training to develop power and flexibility
- Aim is to increase muscular power by first stretching a muscle then contracting it in the shortest possible time
- Movements often performed are: leaping, bounding, hopping, skipping, jumping
- Can be dangerous, so must be performed by trained athletes after a proper warm-up
- Commonly used for events like long jump, triple jump, hurdles



Speed Training

- Focus needs to be on technique, strength, power and flexibility. All of these components can be addressed either combined or individually within a speed training regime.
- To improve speed, training requires maximal efforts of less than 10 seconds followed by an appropriate rest period.

