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.
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
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 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 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
Integrity

• 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 – 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 20 mins, 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.