

CHAPTER 7: 2.2.1 Preparation and training methods

Question - text book page 96

Using the information in Table 7.8, suggest reasons why the predicted $\dot{V}O_{2max}$ for females is lower than that of males.

Answer:

- Males tend to have larger $\dot{V}O_{2max}$ values even when the values are expressed relative to body size.
- This difference is due at least in part to the fact that women generally have more body fat, which consumes virtually no oxygen.
- And smaller hearts which can't pump as much blood per unit time.

Question - text book page 97

Distinguish between the terms validity and reliability.

Answer:

- Validity asks the question does the test measure what it aims to measure?
- Reliability is built around the accuracy of the test results, and whether the results of a test would be accurately repeated.

Questions - text book page 98

1) Distinguish between the physical components of fitness and the skill components of fitness.

Answer:

- **Physical fitness components** are anatomically and physiologically based.
- So focus on the health-related aspects of fitness.
- To assess a person's performance capacities including strength, body composition, flexibility, speed, aerobic endurance and muscular endurance.
- **Skill components of fitness** are skill-related, which means they allow an individual to perform an activity.
- And consist of the neuromuscular components of fitness including balance, reaction time, power, coordination and agility.

2) What is the difference between muscular endurance and strength?

Answer:

- Muscular endurance is the ability of a muscle or muscle group to sustain repeated contractions over time sufficient enough to cause muscular fatigue.
- Strength is the maximum force exerted by a specific muscle or muscle group during a single maximal contraction or one repetition maximum (1RM).

3) Define what is meant by aerobic endurance (see page 99).

Answer:

- Aerobic endurance is the ability to provide and sustain total body activity aerobically.

Exam style questions - text book page 101 - 102

1) a) Define the term functional thresholds.

2 marks

Answer:

- Functional thresholds represent physiological points that occur resulting from increasing intensity of exercise.
- For example, the point at lactic acid starts to accumulate in the muscles.

b) Using figure 7.6 on page 90 name the two threshold points that occur on this graph.

2 marks

Answer:

- Lactate or anaerobic threshold at 8 seconds into exercise.
- Aerobic threshold at 45 seconds into exercise.

2) a) Distinguish between continuous training and interval training giving examples for each training method.

4 marks

Answer:

- Continuous training consists of 'Long Slow' training - i.e low intensity and long duration.
- With even pace/tempo/work intensity at around 60-70% of maximum heart rate.
- This would be an aerobic workout.

- Interval training consists of bouts of training.
- Which are repeated with gaps in between (the rest relief periods).
- Usually the exercise is intense within each bout.
- And the number of repetitions of the bouts will determine the outcome.
- The best example of this is weight training.
- Or sprint training.
- Which are usually anaerobic in nature.

b) Continuous training is one of the least used methods of training by top performers. Suggest how this training method can benefit a performer.

2 marks

Answer:

- Continuous training consists of 'Long Slow' training - i.e low intensity and long duration.
- With even pace/tempo/work intensity at around 60-70% of maximum heart rate.
- This would be an aerobic workout.
- Which builds aerobic benefits such as an improved CVR (cardiovascular response) - see answer to Chapter 5 question 2.
- Suitable for technique training.
- Suitable for recovery sessions.

3) Fartlek training is a type of training that is used to develop aerobic capacity. What does the term fartlek mean? Illustrate your answer by outlining the training principles used to create a typical fartlek training session.

3 marks

Answer:

- Fartlek means 'speed play'.
- Whereby pace is varied from sprinting to jogging.
- In a combined form of continuous and interval training.
- Normally performed in the countryside over a variety of terrains.
- For 45 minutes or longer.

- 4) a) Plyometric training is a type of power training, which involves performing exercises with maximum power and speed. Describe the main concepts of plyometric training, illustrating your answer with an example of an exercise. Identify the type of sports performer who would most benefit from this training method. 6 marks

Answer:

- Plyometric training involves **eccentric-to-concentric** actions.
- Performed at **100% effort**.
- Designed to improve **elastic strength**.
- Using the **stretch reflex** to facilitate recruitment of motor units.

Example of a plyometric exercise:

- **Plyometric bounding** to develop knee extensor strength:
 - A person goes from standing upright position to a deep squat position (eccentric contraction).
 - Then performs a two-footed jump, performed quickly to activate the stretch reflex (concentric contraction).
 - **In time** with the concentric phase of the jump.
 - The person lands in a squat position and repeats the cycle for a pre-determined number of repetitions.

Type of sports performer who would most benefit from this training method:

- Explosive power athletes such as basketball players, sprinters, jumpers.

- b) Discuss the advantages and disadvantages of plyometric training. 4 marks

Answer:

Advantages:

- **Maximises muscle development** by improving power/elastic strength.
- Can be very **sport specific**. For example, take-off as when jumping and bounding in events such as triple jumping.

Disadvantages:

- Can cause chronic repetitive **trauma injuries** such as Achilles tendinosis and shin splints.
- Can cause **acute injuries** such as sudden ruptures of muscle, tendons and ligaments.
- To vulnerable **knee** and **ankle** joints.

- c) Why does muscle soreness (DOMS) often occur following a plyometric training session and how could muscle soreness be reduced? 4 marks

Answer:

2 marks for 2 of:

- **Eccentric action** is the primary initiator of DOMS.
- And is associated with **damage to muscle tissue** and its **cell membrane** (micro tears).
- And **inflammatory** reactions within the muscles.

2 marks for 2 of:

How muscle soreness can be reduced:

- Within the training session, **start** training at a low intensity.
- And **gradually increase** workload to the exhaustive high intensity, eccentric action exercise.
- Use of a thorough **cool-down**.
- Adequate **rest intervals** between plyometric training sessions.
- Use if **ice baths** immediately after the training session.

- 5) a) Define 'one rep max' (1RM) and explain how it can be used to measure training intensity. 3 marks

Answer:

Definition of 'one repetition maximum':

- One repetition maximum is the maximum force exerted by a specific muscle or muscle group during a single maximal muscle contraction.

How can it be used to measure training intensity?

- One repetition maximum can also be used as an upper limit, in order to determine the desired 'load' for an exercise (as a percentage of the 1RM).

5) b) Suggest three ways in which you could increase workload during a weight training session. 3 marks

Answer:

3 marks for 3 of:

- Increase number of **repetitions**.
- Increase the number of **sets**.
- Reduce the **rest relief** between sets.
- Increase the **weights** being used.

6) a) Describe a valid and reliable field test used to estimate a person's $\dot{V}O_{2max}$. 3 marks

Answer:

Note that this question is asking for a predicted $\dot{V}O_{2max}$ test of which there are many possible answers, such as the Queen's College Step test, PWC-170 test, Multi-Stage Shuttle Run test and the Yo-Yo Intermittent test.

- **Multi-stage Shuttle Run test:**
- Subject runs for 10 metres in time with an increasingly rapid timed bleep, until subject can no longer maintain pace.

b) Give one advantage and one disadvantage for the test you have selected. 2 marks

Answer:

Advantage

1 mark for 1 of:

- Large groups can take part at any one time.
- Everyone can run.
- A cheap resource.

Disadvantage

- Need for measured runs between bleeps with slick turns.
- Relies on subject's motivation.

c) Why are submaximal tests often favoured over maximal tests? 2 marks

Answer:

- There is less stress on the performer.
- Providing the submaximal test is both valid and reliable, data can be extrapolated to estimate maximal capacities.

d) Explain why fitness testing is necessary for both coach and the athlete. 4 marks

Answer:

- Fitness testing is a valuable tool that a coach and athlete can use in the **planning** of a training programme.
- Since fitness testing provides an **objective measure** about the individual's current state of fitness or health.
- Fitness testing can highlight **strengths** and **weaknesses** of the athlete.
- Fitness testing can **motivate** the athlete as he or she strives to reach his or hers best test scores.

7) The aim of Cooper's 12-minute run or walk test is to run as far as possible in 12 minutes.

a) What aspect of physical fitness does the 12-minute run or walk measure? 1 mark

Answer:

- Cardio-respiratory endurance: ($\dot{V}O_{2max}$) or stamina.

b) Briefly outline the strengths and limitations of this maximal test as a test for aerobic capacity. 4 marks

Answer:

Strengths:

- Easy to administer and can involve many participants.
- Cheap to administer – only needs tape measure to mark out running surface, a stopwatch to time the 12 minutes and a table to convert distance achieved to a predicted $\dot{V}O_{2max}$ value.

Limitations:

- Difficulty in ensuring the subject is **exerting** maximum effort.
- Dependent on level of **motivation** (arousal levels).

- 7) c) Identify some of the external variables that could influence the validity and reliability of this test if the test was performed outdoors on a school field. 3 marks

Answer:

External variables which may affect the results of the test:

- Effect of **audience** or peers.
- **Footwear** - running spikes would give a better grip than flat training shoes.
- **Clothing** - excess weight might be carried during the 12 minute run.
- **Weather conditions** - a major variable which could affect motivation or pace. Wind and rain can be big demotivators.

- 8) Explain, using examples, why the Illinois agility run test may be of more value to a games player than a 30 metre sprint test. 4 marks

Answer:

- The Illinois agility run test is a flat-out sprint during which the performer has to weave around a series of cones.
- This action requires **change of direction** and **position** very similar to the agility required in many games such as rugby and hockey when dodging a player or creating a dummy move is an important agility skill.
- On the other hand a 30 metre sprint is a **linear** flat out sprint test that is less sport specific.

- 9) Name tests that can be used to measure the following different types of strength: strength endurance, explosive or elastic strength, and dynamic strength. 3 marks

Answer:

- **Strength endurance:** NCF Abdominal Curl Conditioning test.
- **Explosive or elastic strength:** Vertical jump test or Sergeant jump.
- **Dynamic strength:** Hand grip dynamometer test.

- 10) The table below gives a summary of resistance strength training guidelines for an aerobic athlete. Complete the table below by filling in the guidelines for an anaerobic athlete. 5 marks

Answer:

in table:

	Aerobic athlete	Anaerobic athlete
repetitions	10+ reps	<i>1 - 10 reps</i>
number of sets	3-5 sets	<i>3-6 sets of 1-8 reps</i>
rest relief	1:2 (30-60 secs)	<i>1:3 (2-5 mins)</i>
intensity	low to moderate (50-70% of 1RM)	<i>high (70-95 of 1RM)</i>
frequency	3-5 per week	<i>3 per week</i>
specificity	aerobic system	<i>ATP/PC, Lactic Acid system.</i>

11) Briefly describe the following strength training methods: multi-gym, weights, plyometrics, and circuit training. 8 marks

Answer:

Multi-gym

- Resistance machines on which **multiple exercises** can be performed.
- In which slotted weights are moved by levers.

Weights

- Free weights, such as barbells, dumbbells and discs.
- Require more control and stability than multi-gyms.

Plyometrics

- Plyometrics is a form of exercise that involves rapid and repeated stretching and contracting of the muscles involving **eccentric-to-concentric** actions at 100%.
- For example, repeated jumping from a height, followed by a rapid secondary jump.
- In order to utilise the stretch reflex.

Circuit training

- Involves a **variety of exercises** prepared at different stations that stress different body parts.
- Performer moves one station to the next, with minimum rest period between each station.

12) a) Briefly describe the Repeat Anaerobic Sprint test (RAST) and identify the fitness components it measures. 4 marks

Answer:

- 6 x 35 metre sprints with 10 seconds recovery between each sprint.
- Measures speed/power and speed endurance.

- **Power output** for each sprint is found using the following equations:

- $Velocity = Distance \div Time$
- $Acceleration = Velocity \div Time$
- $Force = Weight \times Acceleration$
- $Power = Force \times Velocity$

Or

- $Power = Weight \times Distance^2 \div Time^3$

b) How are maximum power, minimum power, average power and fatigue index calculated? 4 marks

Answer:

- *Maximum power* - the highest power value.
- *Minimum power* - the lowest power value.
- *Average power* - sum of all six values $\div 6$
- *Fatigue Index* - (maximum power - minimum power) \div Total time for the 6 sprints

c) Identify a target group who would benefit from using this test as part of their training programme. 1 mark

Answer:

- This test is suitable for sprint and endurance athletes and players of endurance sports such as football, rugby and netball.

- 13) How can an understanding of the components of fitness assist a sport's performer to achieve a level of fitness required for his or her individual sport. 12 marks for AS and 15 marks for A level

Answer:

Note that A Level candidates will be expected to give greater depth of understanding and application of concepts.

- Fitness is the ability to meet the demands of the environment.
- And consists of **physical fitness** (also known as health-related fitness) and **skill-related fitness**.
- Physical fitness stresses a person's physical performance capacities, such as $\dot{V}O_{2max}$.
- Physical fitness involves six main components: strength, flexibility, speed, body composition, aerobic endurance and muscular endurance.

- Skill-related fitness is based on the neuromuscular components of fitness.
- Skill-related fitness involves five main components: balance, agility, coordination, reaction time and power.
- Improvements in performance are generally the result of higher levels of fitness combined with technique.
- Each exercise in training will aim to develop a particular component of fitness. For example, when distance or duration is extended the exercise becomes endurance based.

- Therefore, different sports have different demands on fitness.
- For example, the fitness of a distance runner is very different to the fitness of a shot putter.
- The **distance runners** need stamina or **aerobic endurance**.
- To ensure sufficient oxygen is taken in and transported to large active muscle groups.
- Hence aerobic training leads to a strong cardio-respiratory system.

- On the other hand, the fitness components for **shot putting** are speed and strength combined to create power, agility, flexibility, balance and coordination.
- **Good flexibility** is needed when moving the shoulder joint of the throwing arm through its wide range of motion.
- And great **balance, agility and coordination** enable the shot putter to rotate or glide across the circle to achieve optimal performance.
- **Power and reaction time** are crucial fitness components in sprinting and combat sports such as judo.
- And so play significant roles within the training programme, such as block starts for sprinters.

- Muscular endurance requires the body to produce energy under aerobic and anaerobic conditions.
- Relevant in events such as rowing, boxing, 800/1500 metre racing and most team sports.
- Some sports require a multitude of fitness components.
- For example, successful **elite gymnasts** go through intense training programmes to fulfil the many fitness components required for Olympic gymnastics.
- Namely agility, strength, cardiovascular endurance, speed, power, ideal body composition, muscular endurance, flexibility and balance to ensure their safety and optimal performance.
- Without these fitness components, gymnasts will most likely struggle whilst executing routine gymnastic moves.
- Hence, it is necessary for the coach and performer to understand and recognise the **components of fitness** that are **specific** to the performer's needs.
- And how to incorporate and develop them within the training programme.