Critical Question 2

Heading: What is the relationship between physical fitness, training and movement efficiency?

Mar 19-7:45 AM

Syllabus

What is the relationship between physical fitness, training and movement efficiency?

Students learn about:	Students learn to:
• health-related components of physical fitness – cardiorespiratory endurance – muscular strength – muscular endurance – flexibility – body composition	• analyse the relationship between physical fitness and movement efficiency. Students should consider the question 'to what degree is fitness a predictor of performance?'
• skill-related components of physical fitness – power – speed – agility – coordination – balance – reaction time	• measure and analyse a range of both health-related and skill-related components of physical fitness • think critically about the purpose and benefits of testing physical fitness
• aerobic and anaerobic training – FITT principle	• design an aerobic training session based on the FITT principle • compare the relative importance of aerobic and anaerobic training for different sports, eg gymnastics versus soccer
• immediate physiological responses to training – heart rate – ventilation rate – stroke volume – cardiac output – lactate levels.	• examine the reasons for the changing patterns of respiration and heart rate during and after submaximal physical activity.

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Heading: Health Related Components of Fitness

Health Related Components are related to our personal health and can reduce the event of lifestyle diseases occurring such as heart disease, obesity, and diabetes. The health related components are:-

- Cardio-respiratory **E**ndurance
- Muscular **S**trength
- Muscular **E**ndurance
- **F**lexibility
- **B**ody Composition

Acronym - BEEFS

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Cardio-Respiratory Endurance (stamina) - the ability of the heart and lungs to deliver oxygen to the muscles over a sustained period of time without excessive fatigue.

Sports - Cross Country, Triathlon, Cycling.

Tests - Beep Test, 12 Minute run

Muscular Endurance - the ability of a group of muscles to repeatedly exert force against a resistance.

Sports - Rowing, Swimming, running, Cycling

Test - Push up test, pull up test, sit up test

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Flexibility - The range of motion that a joint or group of joints can produce. Flexibility helps movement efficiency as it allows the body to perform better, with better technique while moving.

Sports - Gymnastics, Diving, Dancing

Tests - Sit and reach test, Back scratch test

Muscular Strength - the ability to exert force to overcome a resistance. Muscular strength relates to movement efficiency because a greater strength means less "effort" is needed in order to produce particular movements

Sports - Weightlifting, Wrestling, Shot put

Tests - 1 rep max test, Hand grip test (Dynamometer)

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Body Composition - is used to describe the percentages of fat, bone, water and muscle in human bodies. Body composition relates to movement efficiency, but is generally quite specific to the sport (eg low body fat= greater performance in long distance races)

Sports - Varies for body compositions

Tests - Body Mass Index, Skinfold test, Hydrostatic underwater weighing,

ACE Body Fat % Chart		
Description	**Women**	**Men**
Essential fat	10-13%	2-5%
Athletes	14–20%	6-13%
Fitness	21–24%	14–17%
Average	25–31%	18–24%
Obese	32%+	25%+

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Revision Question

Describe the flow of blood through the body?

Everyone start at the same place:

Deoxygenated blood enters the right atrium via the .....

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Heading: Skill Related Components of Fitness

Skill Related Components are recognised as being less necessary for everyday health, however, they often provide an advantage in sports. The skill related components are:-

- Power
- Agility
- Coordination
- Balance
- Reaction Time
- Speed

Acronym: RSPCA B

Like we did for Health related components of fitness. (for each)

- Define
- Sports
- Tests

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Video Overview of The Components of Fitness

https://www.youtube.com/watch?v=xkJeE6-lHoQ

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Heading: Aerobic and Anaerobic Training

Training programs aim to develop a range of fitness and skill components. To develop an effective training program it is necessary to identify the correct energy pathway.

An **energy pathway** is a system that converts nutrients to energy for exercise.

If we perform short sharp movements as in jumping and lifting, the body uses the **anaerobic** pathway to supply energy (Lactic and Alactacid systems). **Anaerobic** means 'in the absence of oxygen'. This system focuses on strength, power, speed, muscular endurance etc.

If movements are sustained and of moderate intensity, the **aerobic** pathway supplies the bulk of the energy needs. **Aerobic** means 'with oxygen" and focuses on developing the athlete's ability to absorb, transport, and use oxygen for energy production. (Think cardiorespiratory endurance)

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Heading: FITT Principle

A framework for developing physical training programs for fitness and conditioning

- F – Frequency
- I – Intensity
- T – Time
- T - Type

https://www.youtube.com/watch?v=JjVsTG5_jU0

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Sub: Frequency

This refers to **how many times per week we train.**

- Low/moderate exercise - 5 days per week
- Intense exercise 3 times per week
- Weight loss - 6 sessions per week
- Strength - 2 to 3 per week with rest days

Sub: Intensity

How hard a person exercises during a session.Need a balance between Overload and Overtraining.

- Heart rate
- Weight of weights
- Number of reps
- Speed of completion

For Aerobic Threshold

- Maximum Heart Rate is 220-age.
- Beginning Threshold is 50% - 70% of MHR
- Optimum Threshold is 75% of MHR.

Anaerobic Threshold is 85% - 90% of MHR.

- Lactic acid build-up

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Sub: Time

Concerned with the length of time the exercise lasts for.

- Beginners should aim for between 20 and 30 minutes.
- Well established programs should have sessions lasting around 45 minutes to 1 hour
- Resistance training – between 45-60 minutes

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Sub: Type

This means the type of exercise you do. The type of training should suit an individual's needs and abilities.

Aerobic

- Must be continuous in nature
- Constantly in the Aerobic Training Zone
- Walking, Jogging, Cycling, Rowing, Swimming, Game based conditioning

Anaerobic

- Short interval training
- Sprints

Resistance training

- Free weights, weight machines, resistance bands, body weight.

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Question - Design a training plan with the 'FITT' Principle for Cardio-Vascular improvement?

Frequency - 3 to 5 times per week
Intensity - 60% to 80% of MHR
Type - Aerobic (Swimming, Cycling, Running)
Time - 20-60 mins

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Heading: Immediate physiological responses to training

Video

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Heading: Immediate physiological responses to training

Physical activity demands oxygen delivery along with the removal of carbon dioxide and lactic acid. The immediate changes help to achieve a higher delivery of oxygen, faster removal of carbon dioxide and conversion of pyruvic acid to lactate.

- Heart Rate
- Ventilation Rate
- Stroke Volume
- Cardiac Output
- Lactate Levels

Acronym: HSC LV

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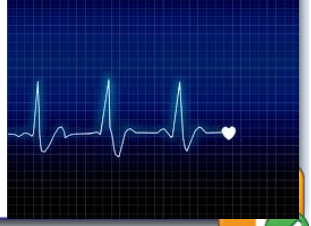
Heading: Immediate physiological responses to training

Sub: Heart rate

Is the time your heart beats per minute

- As exercise increases so does the working heart rate. The maximum heart rate is 220 minus your age.
- HR increases in response to exercise because the body detects an increase in carbon dioxide in the blood. This increase in carbon dioxide indicates that the body requires more oxygen, which results in your body increasing its heart rate
- When you finish exercise, your heart rates drops very rapidly, and then more slowly until back to resting heart rate.



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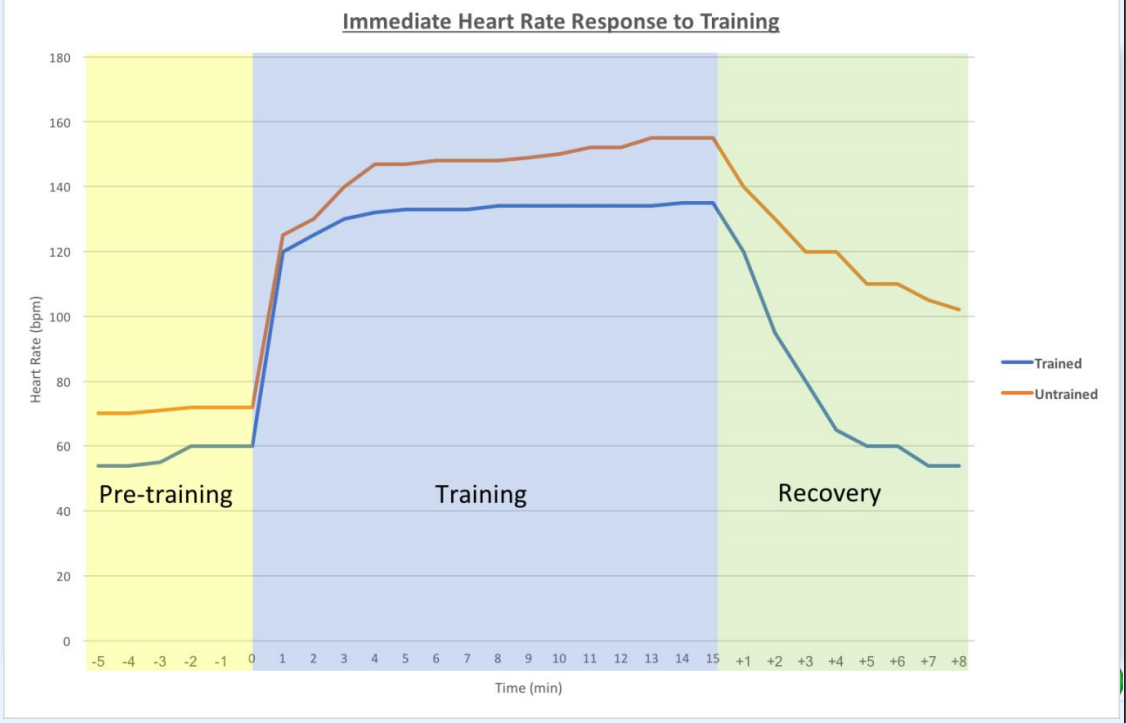
Heading: Immediate physiological responses to training



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Sub: Ventilation Rate

Is the total volume of oxygen breathed into the lungs per minute.

- At the start of a training session there is a rapid increase in ventilation rate. By increasing your respiratory rate your body increases the amount of CO2 removed, while at the same time increasing the amount of oxygen inspired.
- After ceasing exercise ventilation rate declines rapidly as the muscles have less need for oxygen.
- Ventilation rate will remain elevated until waste products have been removed.

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Sub: Stroke Volume

Is the amount of blood pumped out of the left ventricle during a contraction.

- At the start of a training session stroke volume increases gradually as heart rate increases.
- The reason for stroke volume increase during training or exercise is threefold. Firstly there is an increase in blood returning to the heart, which results in greater filling of the heart increasing the stroke volume.
- Secondly, the body has a higher demand for oxygen and therefore the heart contracts more forcefully during exercise.
- Thirdly, there is less resistance to the blood moving out of the ventricle due to vasodilation (widening) of the blood vessels

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Sub: Cardiac Output

Is the total amount of blood pumped out of the heart each minute. The formula for calculating cardiac output is:

Cardiac Output = Stroke Volume x Heart Rate

- This is expressed in litres per minute. When training, cardiac output increases as a result of the stroke volume and heart rate increases. Untrained people are able to increase their cardiac output to approximately 21 litres per minute while elite endurance athletes to approximately 35 litres per minute.

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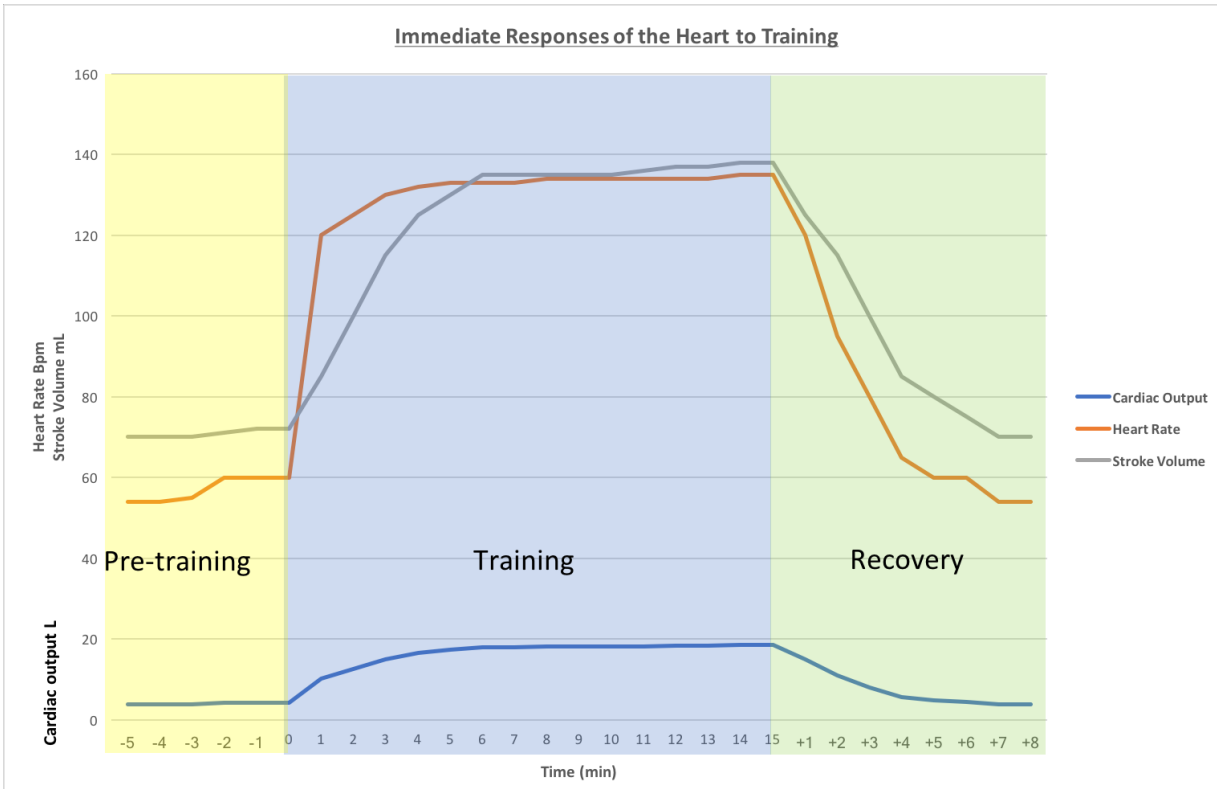
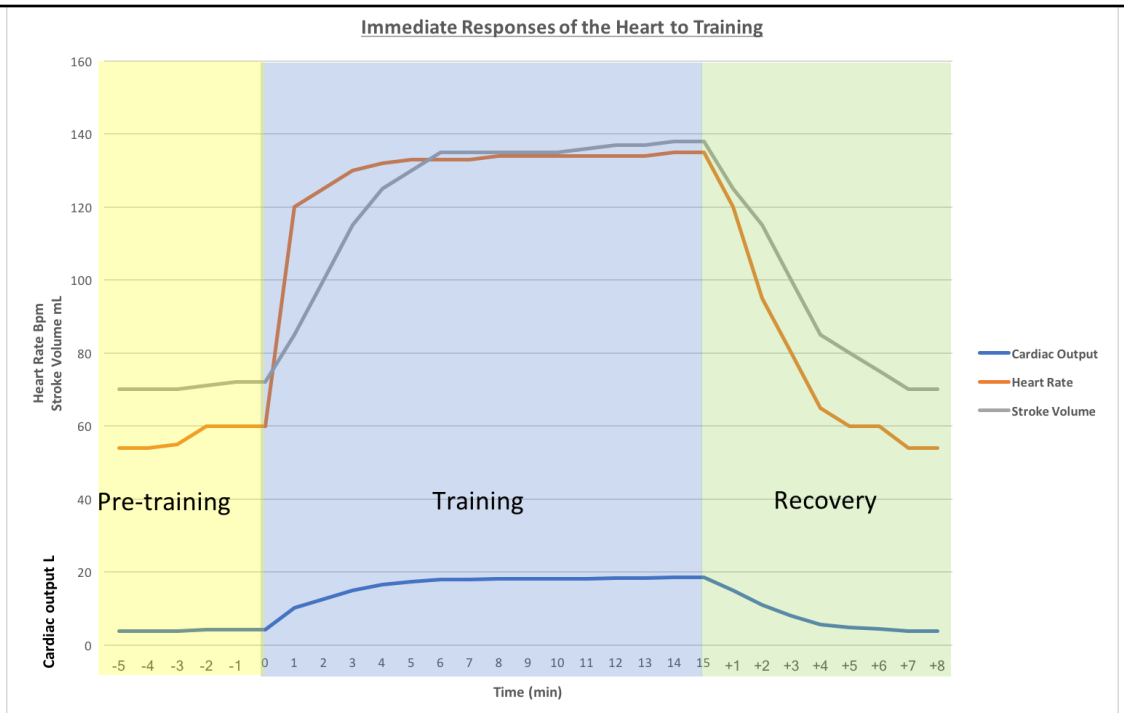
What is the graph showing us?



May 7-9:59 AM



This graph depicts the immediate physiological responses of the heart to training. It is clear that there is a rise in SV and HR, which in turn causes an increase in CO. It is SV that increases first and then HR, making SV responsible for the initial rise in CO and then increases in HR responsible for further increases. Both HR and SV slowly return to resting levels after training, which naturally brings CO to resting levels also.

May 7-9:59 AM

Sub: Lactate Levels

Is the amount of lactic acid found in the muscles and blood stream during intense anaerobic activity. Lactate leveles rise in proportion to exercise intensity.

- During light to moderate exercise lactate levels remain relatively low.
- As exercise intensity increases lactic acid starts to build up in the body. The rise in lactate levels is caused by using the lactic acid energy system. The more the body relies on this system, the more lactate is produced, causing the rise in lactate levels in the blood.
- Oxygen is required to remove lactic acid from the body.

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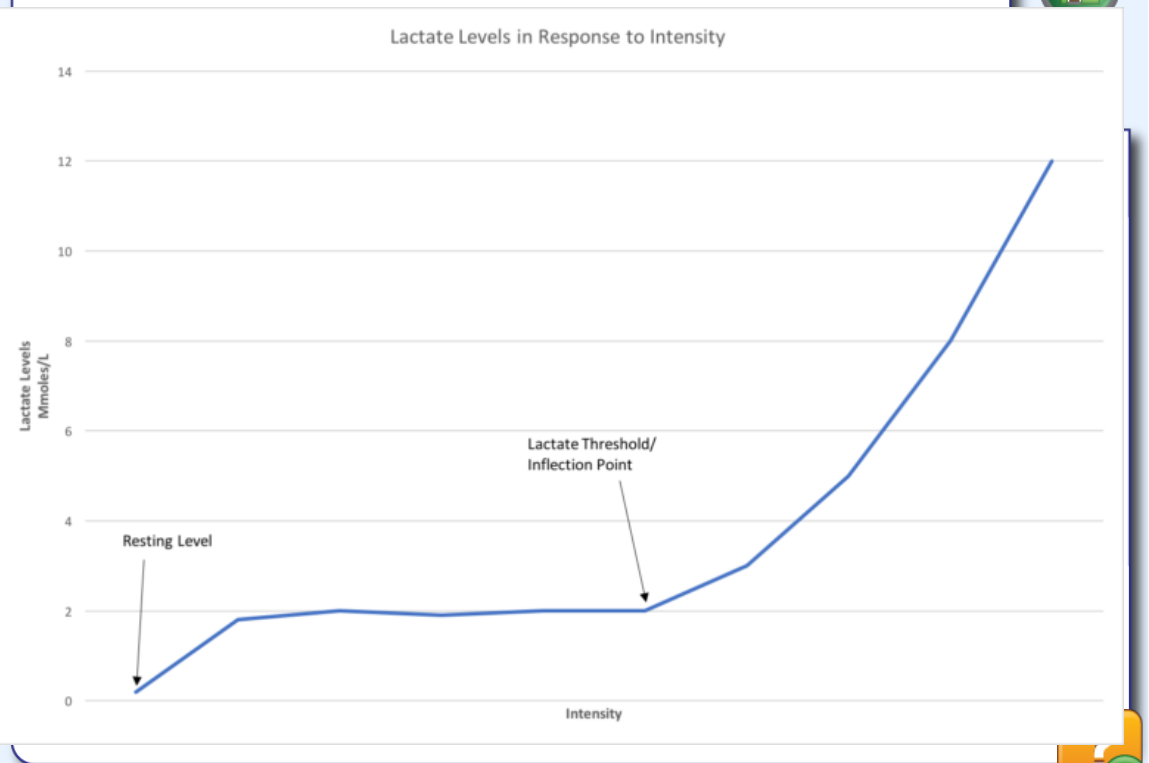
Sub: Lactate Levels



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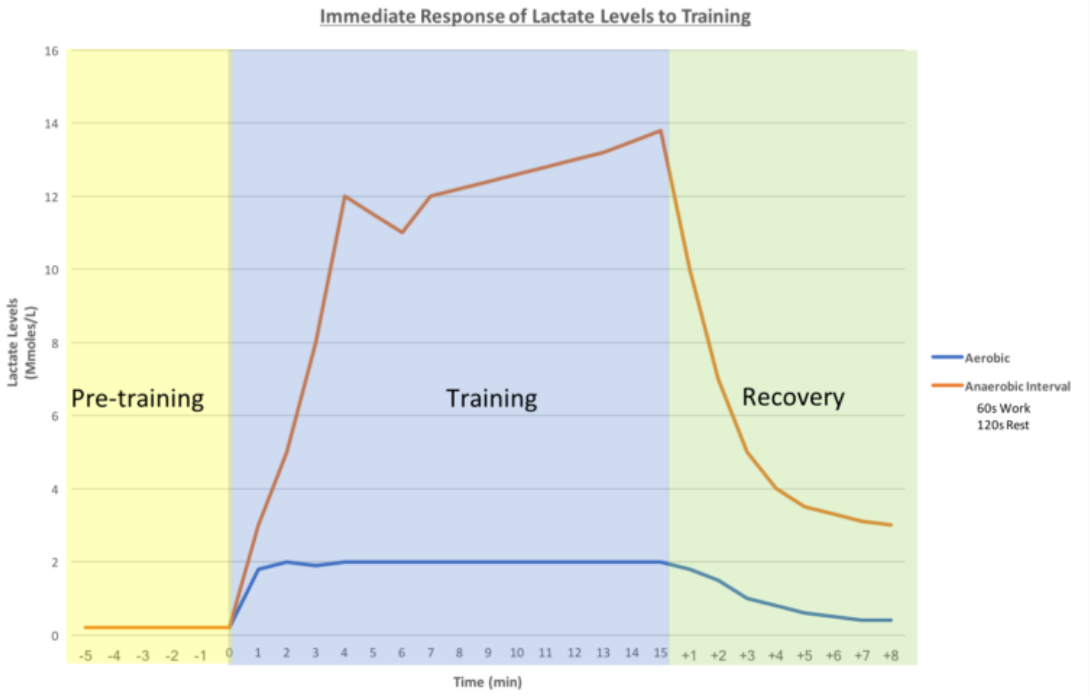
Sub: Lactate Levels



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Sub: In Summary

- The eleven components of fitness are health related (necessary for the efficient functioning of the body) and skill-related (of importance to movement performance).
- There are five health-related components of fitness: cardiorespiratory endurance, muscular strength, muscular endurance, flexibility and body composition.
- There are six skill-related components of fitness: power, speed, agility, coordination, balance and reaction time.
- There is a clear relationship between physical fitness, health and performance.
- The FITT principle can be applied to any exercise program based on improving aerobic fitness. It is based on the frequency, intensity, time and type of exercise.
- The body demonstrates five immediate physiological responses to exercise. These are changes to heart rate, ventilation rate, stroke volume, cardiac output and lactate levels. These changes occur to allow the working muscles to receive an increased supply of oxygen and nutrients and to remove wastes, such as carbon dioxide and water.

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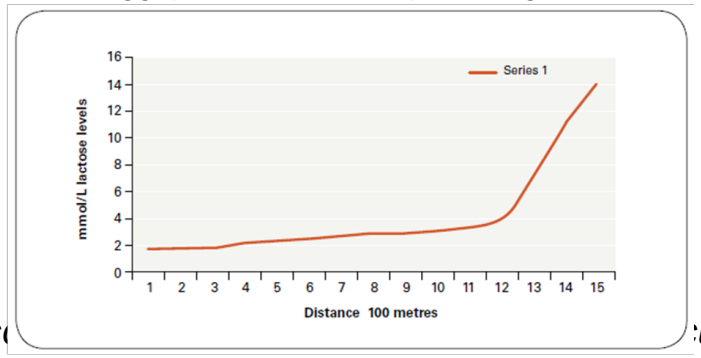
Sub: Question Time

1 – What are the reasons for the changing patterns of respiration and heart rate during and after submaximal physical activity?

2 – The following graph shows the lactate response during a 1500-metre race.
a Identify the stage of the race that corresponds with the runner's anaerobic threshold.
b Explain why there was an increase in lactate levels towards the end of the race.
c Discuss the type of recovery strategy you would recommend to assist the removal of lactic acid. 2 – The following graph shows the lactate response during a 1500-metre race.



Desc ur during a 20-minute continuous aerobic training session. 6 marks

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Sub: Question Time

The following components have been identified as being important for tennis performance. Outline one test for each component that you would recommend be included in a tennis player's fitness-testing schedule.

a aerobic fitness
b agility
c flexibility
d power
e coordination. (5 marks)

Describe the physiological responses that occur during a 20-minute continuous aerobic training session. 6 marks

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Attachments

x2q02tr.webloc

x2q02t.webloc

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