Exercise walk-through

3.1
Acute responses, fatigue and recovery

International Baccalaureate · IB Diploma · Sports, Exercise and Health Science · HL

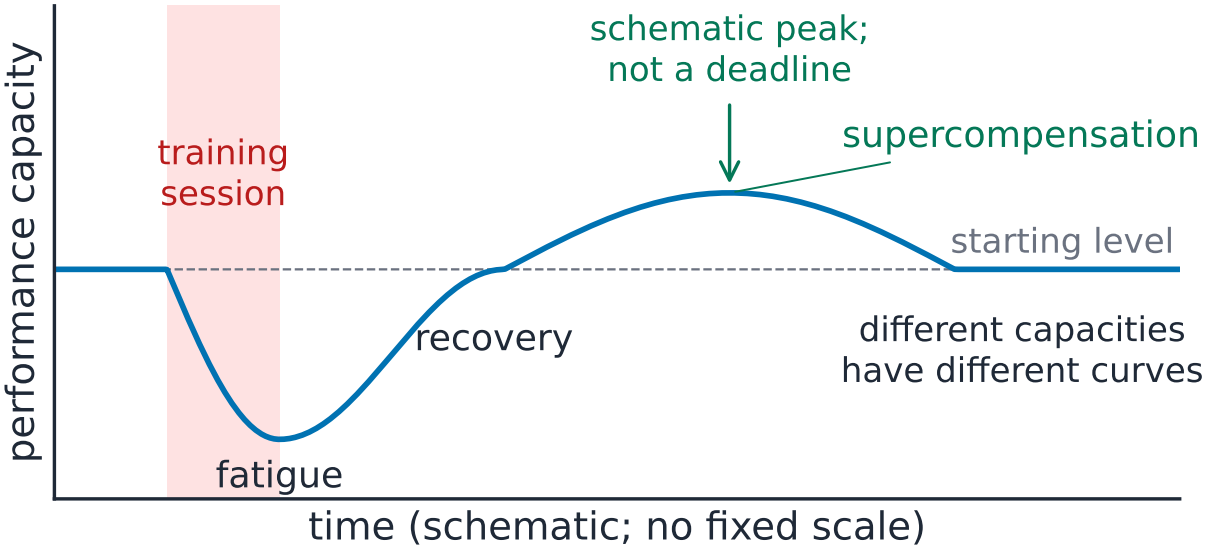
Symptoms versus performance

1. **Given.** Invented soreness scores out of 10: comparison 5, intervention 3. Both groups remain 8% below baseline task performance.
2. **Symptoms** Difference $= 5 - 3 = 2$ scale points.
3. **Performance** Neither group has returned to its baseline.
4. **Evidence** Need allocation, sample size, controls and uncertainty.

Decision

Reduced soreness is not proof of complete **recovery**.

Supercompensation



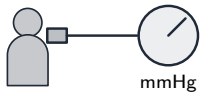
A model curve is not an individual training timetable.

Overtraining

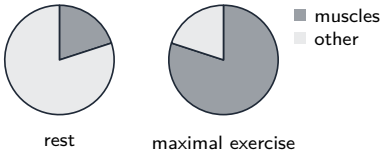
Concept	Interpretation
Functional overreaching	Short-term reduction with **recovery**
Maladaptive underperformance	Review load, health and recovery context
Session RPE	A monitoring proxy, not an injury threshold

Exercises 2.1·2.2

2.1 State what happens to systolic and diastolic blood pressure during a steady run. [2]

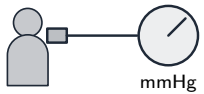


2.2 Explain how blood flow is redistributed during exercise. [3]



Exercises 2.1·2.2

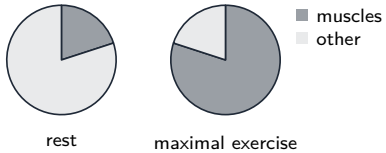
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2.1

systolic pressure rises; diastolic pressure stays about the same (or falls slightly)

2.2 Explain how blood flow is redistributed during exercise. [3]



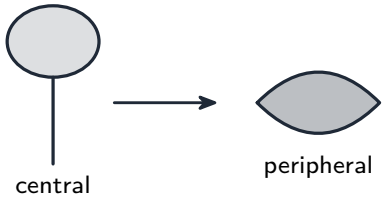
2.2

arterioles supplying working muscles dilate (vasodilation); arterioles supplying the gut and kidneys constrict (vasoconstriction); so a much larger share of a larger cardiac output goes to the muscles, up to about 80%

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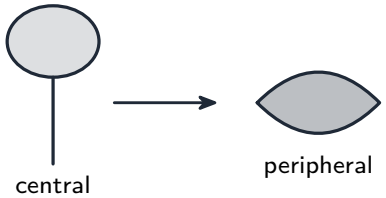
Exercise 2.3

2.3 Distinguish between central and peripheral fatigue, giving **one** cause of each. [3]



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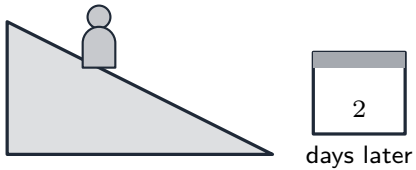


2.3

central fatigue starts in the brain and spinal cord: less drive to the muscles, e.g. low motivation, changes in brain chemicals, high core temperature; peripheral fatigue happens in the muscle itself; e.g. phosphocreatine or glycogen depletion, build-up of H^+ or phosphate

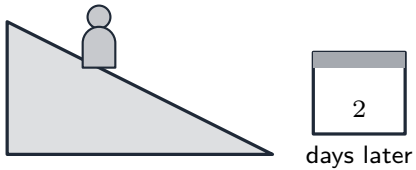
Exercise 2.4

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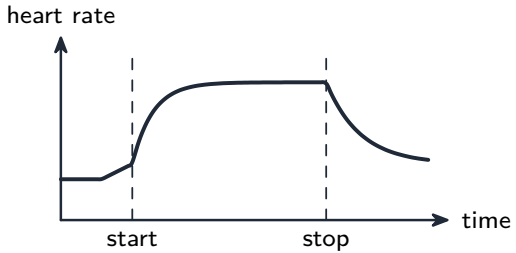
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downhill running uses many eccentric contractions of the quadriceps; these cause small tears in muscle fibres and connective tissue; inflammation follows and soreness (DOMS) peaks about 24–72 hours later

Exercise 3.1 (a)

3.1 The graph shows a student's heart rate before, during and after a 10-minute run at a steady pace.

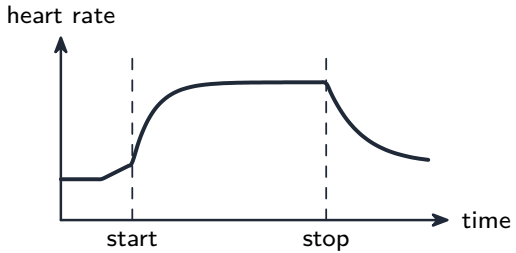
(a) Describe the changes in heart rate from before the run until the end of the run. [3]



Exercise 3.1 (a)

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(a) Describe the changes in heart rate from before the run until the end of the run. [3]



(a) heart rate rises slightly before the start (anticipatory rise); it rises quickly in the first minutes; then it levels off at a steady state

Exercise 3.1 (b)

3.1 The graph shows a student's heart rate before, during and after a 10-minute run at a steady pace.

(b) State what happens to heart rate when the run stops. [1]

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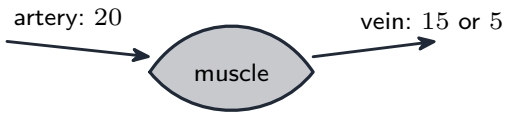
(b) State what happens to heart rate when the run stops. [1]

(b) it falls quickly at first and then more slowly back towards resting level

Exercise 3.2 (a)

3.2 Arterial blood holds about 20 ml O_2 per 100 ml. Venous blood leaving a muscle holds 15 ml O_2 per 100 ml at rest and 5 ml O_2 per 100 ml in hard exercise.

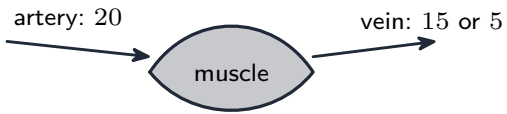
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(a) rest: $20 - 15 = \mathbf{5}$ ml per 100 ml; exercise: $20 - 5 = \mathbf{15}$ ml per 100 ml

Exercise 3.2 (b)

3.2 Arterial blood holds about 20 ml O_2 per 100 ml. Venous blood leaving a muscle holds 15 ml O_2 per 100 ml at rest and 5 ml O_2 per 100 ml in hard exercise.

(b) Explain why the difference increases in exercise. [3]

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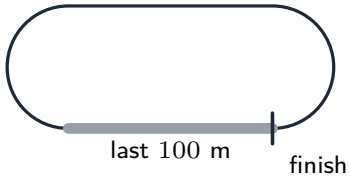
(b) Explain why the difference increases in exercise. [3]

(b) working muscles use more oxygen, so the oxygen level in the muscle falls and the gradient rises; higher temperature, CO_2 and acidity make haemoglobin release more oxygen (Bohr shift); more capillaries open, giving more surface area and slower flow past the fibres

Exercise 3.3

3.3 A 400 m runner slows down sharply in the last 100 m.

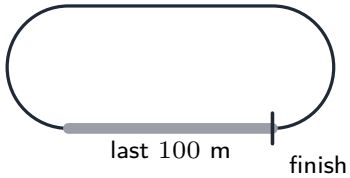
Explain **two** causes of peripheral fatigue in this race. [4]



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Explain **two** causes of peripheral fatigue in this race. [4]



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any two causes, each [2]: H^+ builds up from anaerobic glycolysis, lowering pH, which slows enzymes and interferes with calcium and the contraction process; phosphocreatine runs out, so ATP cannot be resynthesized fast enough; inorganic phosphate builds up, which reduces the force of cross-bridges

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Evaluate cold-water immersion and sleep as recovery strategies for the team. [6]



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award up to [6]: cold-water immersion: reduces perceived soreness and swelling, and feels good, so useful between close matches; but evidence for faster recovery of performance is mixed, and regular use may reduce strength and muscle gains from training; sleep: needed for muscle repair, hormone release and mental recovery; poor sleep lowers performance

and raises injury and illness risk; conclusion: prioritize sleep for everyone, use cold water selectively in congested match periods