Exercise walk-through

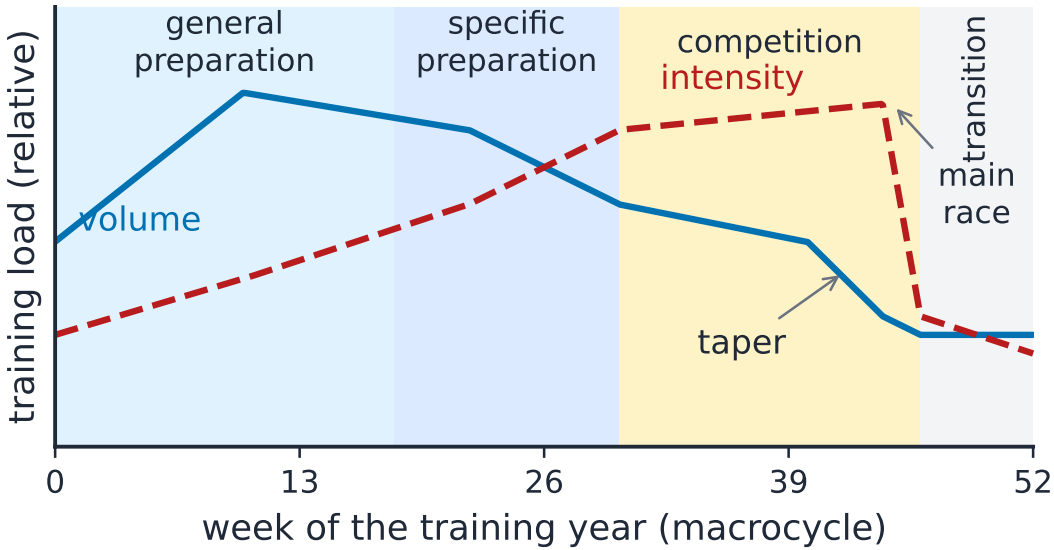
3.2 Training principles and adaptations

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

Principles of training

Principle	Meaning
Specificity	Adaptations match the training
Progressive overload	Load rises gradually
Reversibility	Unused fitness is lost
Individual differences	People respond differently

A periodised year



> Plan load around aims and monitor the response.

Endurance or resistance adaptations

endurance (aerobic) training

more and larger mitochondria
more myoglobin
more capillaries
greater fat use at a given load

resistance and sprint training

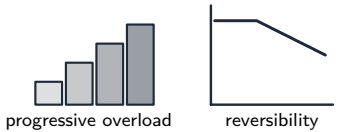
fibre hypertrophy, mainly type II
more PCr and glycolytic capacity
greater strength and power
neural recruitment improves

the stimulus decides the adaptation (specificity)

> Adaptations match the training

Exercises 2.1·2.2

2.1 Define progressive overload and reversibility. [2]

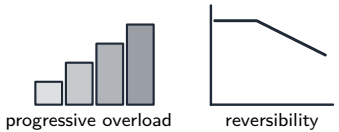


2.2 An 18-year-old has a resting heart rate of 60 beats min^{-1}. Use the Karvonen method to calculate her training heart rate at 70% intensity. [3]



Exercises 2.1·2.2

2.1 Define progressive overload and reversibility. [2]



2.1

progressive overload: gradually increasing the training load so the body keeps adapting; reversibility: fitness gains are lost when training stops or is reduced

2.2 An 18-year-old has a resting heart rate of 60 beats min^{-1}. Use the Karvonen method to calculate her training heart rate at 70% intensity. [3]



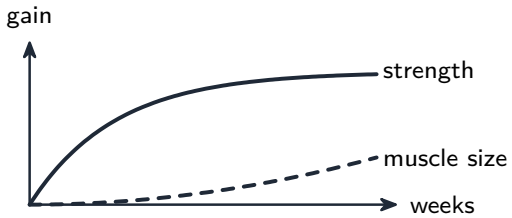
2.2

$\text{HR}_{\text{max}} = 220 - 18 = 202$; $(202 - 60) \times 0.70 + 60 \approx \mathbf{159}$ beats min^{-1}

exercises.lol exercises.com.cn

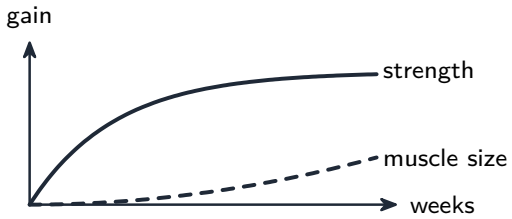
Exercise 2.3

2.3 Explain why most of the strength gained in the first weeks of resistance training is due to neural adaptation. [3]



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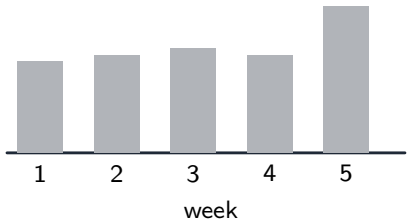


2.3

strength rises before muscles get noticeably bigger; the nervous system learns to recruit more motor units and fire them faster and more together; antagonist muscles relax more, so more force is produced; hypertrophy adds strength only later

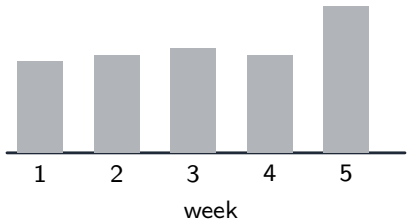
Exercise 2.4

2.4 A player's training load this week is 2400 units. Her average weekly load over the last four weeks is 1600 units. Calculate her acute:chronic workload ratio and comment on it. [3]



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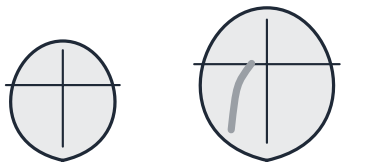
2.4

$2400 \div 1600 = \mathbf{1.5}$; a sudden rise above about 1.3 is linked with a higher injury risk, so the load should be increased more gradually

Exercise 3.1 (a)

3.1 After six months of endurance training, a runner's resting heart rate falls from 72 to 58 beats min^{-1}.

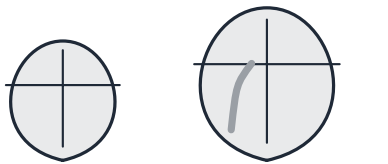
(a) Explain why resting heart rate falls. [2]



Exercise 3.1 (a)

3.1 After six months of endurance training, a runner's resting heart rate falls from 72 to 58 beats min^{-1}.

(a) Explain why resting heart rate falls. [2]



(a) the heart muscle (left ventricle) gets larger and stronger, so stroke volume rises; the same resting cardiac output is reached with fewer beats

Exercise 3.1 (b)

3.1 After six months of endurance training, a runner's resting heart rate falls from 72 to 58 beats min^{-1}.

(b) State **two** other adaptations to endurance training. [2]

Exercise 3.1 (b)

3.1 After six months of endurance training, a runner's resting heart rate falls from 72 to 58 beats min^{-1}.

(b) State **two** other adaptations to endurance training. [2]

(b) any two: more capillaries; more mitochondria; more myoglobin; higher $\dot{V}\text{O}_2\text{max}$; higher lactate threshold; more blood plasma and haemoglobin

Exercise 3.2 (a)

3.2 The diagram shows a swimmer's training year.

(a) Outline the purpose of a taper. [2]

Exercise 3.2 (a)

3.2 The diagram shows a swimmer's training year.

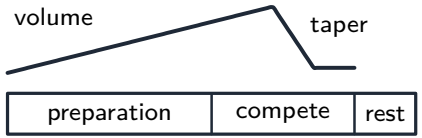
(a) Outline the purpose of a taper. [2]

(a) training volume is reduced before a main competition while intensity is kept; so the body recovers fully and performance peaks on the day

Exercise 3.2 (b)

3.2 The diagram shows a swimmer's training year.

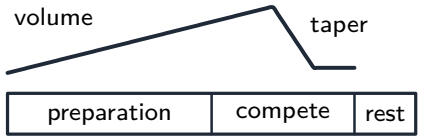
(b) Explain how periodization helps to avoid overtraining. [3]



Exercise 3.2 (b)

3.2 The diagram shows a swimmer's training year.

(b) Explain how periodization helps to avoid overtraining. [3]



(b) it plans hard and easy periods, so load rises gradually; recovery weeks and a transition phase allow adaptation (supercompensation); load can be monitored and adjusted, so fatigue does not build up over many weeks

Exercise 3.3

3.3 A gym plans a programme for adults aged over 70.

Suggest and justify **two** ways the programme should differ from one for young adults. [4]



balance



chair exercises

Exercise 3.3

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balance



chair exercises

3.3

any two, each with a justification: include balance and strength exercises, because falls are a major risk and muscle mass declines with age; include weight-bearing or loading exercise, to slow bone loss; longer warm-up and recovery, lower starting intensity and slower progression, because of a lower HR_{max}, slower recovery and more chronic conditions

Exercise 3.4

3.4 A busy office worker wants to improve $\dot{V}O_2$max and has about 3 hours a week to train.

Evaluate high-intensity interval training (HIIT) and continuous training for this person. [6]



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3.4

award up to [6]: HIIT: short, intense intervals improve $\dot{V}O_2max$ in less total time, so it fits a busy week; but it feels hard, needs good motivation, and has a higher injury risk for untrained people; continuous: easier to start and keep doing, builds an aerobic base and fat use; but needs more time for similar gains; conclusion: a mix, e.g. two short HIIT sessions plus one longer easy session, with gradual progression