

Sports, exercise and health science
Higher level
Paper 3

Wednesday 31 October 2018 (morning)

Candidate session number

1 hour 15 minutes

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Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions from two of the options.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.

Option	Questions
Option A — Optimizing physiological performance	1 – 4
Option B — Psychology of sport	5 – 8
Option C — Physical activity and health	9 – 12
Option D — Nutrition for sport, exercise and health	13 – 17

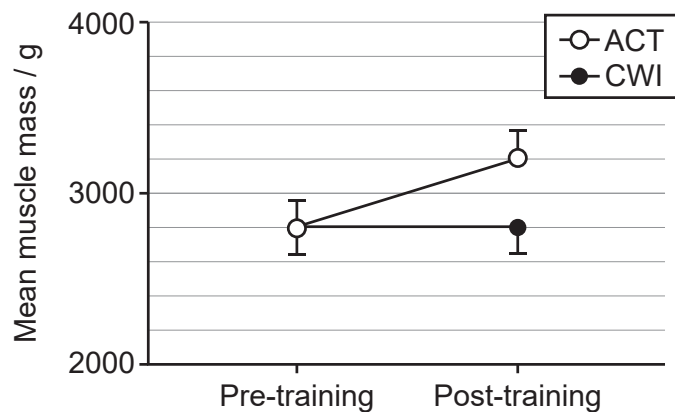


Option A — Optimizing physiological performance

1. A study compared the effects of two recovery techniques on quadriceps muscle mass over a 12-week strength training programme. Twenty-one participants were randomly assigned to one of two groups:

- Active recovery (ACT) –○–
- Cold water immersion (CWI) –●–.

The CWI group laid in cold water for 10 minutes immediately after exercise, whereas the ACT group rode for 10 minutes at low intensity on an exercise bike. The results are shown in the graph.



[Source: Roberts, L. A., *et al.* 2015. Post-exercise cold water immersion attenuates acute anabolic signalling and long-term adaptations in muscle to strength training. *J Physiol*, **593**: 4285-4301. doi:10.1113/JP270570]

- (a) State the mean muscle mass of the active recovery (ACT) group post-training programme.

[1]

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- (b) Calculate the difference in mean muscle mass for the active recovery (ACT) group pre-training and post-training programme.

[2]

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(Option A continues on the following page)



(Option A, question 1 continued)

- (c) Using the data, deduce the relative effectiveness of the recovery techniques. [2]

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2. (a) Define *overreaching*. [1]

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- (b) Define *overtraining*. [1]

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- (c) Discuss indicators of overtraining in an athlete. [3]

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(Option A continues on the following page)



(Option A, question 2 continued)

- (d) Discuss how training should be organised in the preparation phase of a sprinter training for the 2019 World Championships. [4]

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3. (a) (i) Define *active recovery*. [1]

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- (ii) Outline the benefits of active recovery. [2]

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- (b) (i) State **one** of the principal means by which the body maintains core temperature in cold environments. [1]

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(Option A continues on the following page)



(Option A, question 3 continued)

- (ii) Evaluate the use of cryotherapy for recovery in sport.

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4. (a) Distinguish between the physiological effects of exercising at sea level with the effects of exercise at altitude within 24 hours of arrival.

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- (b) Explain **two** long-term adaptations resulting from altitude training.

[2]

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End of Option A



Option B — Psychology of sport

5. A study assessed the effectiveness of imagery during a six-week training programme. The muscle strength of the participants was measured while doing a single one-arm curl in a one-repetition maximum test (1RM) at the start of the study and was repeated at the end of the training period. The participants were randomly assigned to one of three groups for the training period:

- Physical practice group (completed bicep curls at a machine twice per week)
- Imagery group (imagined completion of bicep curls at a machine twice per week)
- Control group (read a body-building book).

The table shows the mean results and standard deviation (SD) of the 1RM test of strength for each group at the start and end of the training programme.

Group	Start of study		End of study	
	Mean (kg)	SD	Mean (kg)	SD
Physical practice	32.21	18.73	38.33	19.64
Imagery	24.38	16.52	30.26	18.03
Control	26.99	18.56	27.90	18.46

[Source: From Table 1, 'The effect of PETTLEP imagery on strength performance' by Caroline J. Wright & Dave Smith
International Journal of Sport and Exercise Psychology Vol 7:1 pp. 18-31 (2009),
 copyright © International Society of Sport Psychology, reprinted by permission of Taylor & Francis Ltd,
<http://www.tandfonline.com> on behalf of International Society of Sport Psychology.]

- (a) Identify the group that had the lowest end of study mean 1RM score.

[1]

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- (b) Calculate the difference between the start of study and end of study mean 1RM scores for the physical practice group.

[2]

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(Option B continues on the following page)



(Option B, question 5 continued)

- (c) Using the data and theoretical knowledge, comment on the effectiveness of imagery on sport performance. [3]

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- 6.** (a) Define *motivation*. [1]

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- (b) Discuss possible impacts of extrinsic rewards on intrinsic motivation in sport. [3]

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- 7.** (a) State an example of a performance goal in sport. [1]

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(Option B continues on the following page)



(Option B, question 7 continued)

- (b) Distinguish between cognitive and somatic anxiety.

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- (c) Outline **two** relaxation techniques used to reduce anxiety.

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8. (a) Distinguish between talent identification and multidimensional talent identification and development.

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- (b) Explain the evolution of talent for athlete development.

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(Option B continues on the following page)



(Option B, question 8 continued)

- (c) Discuss the impact of motivation on the planning and evaluation of self-regulated learning in athletes.

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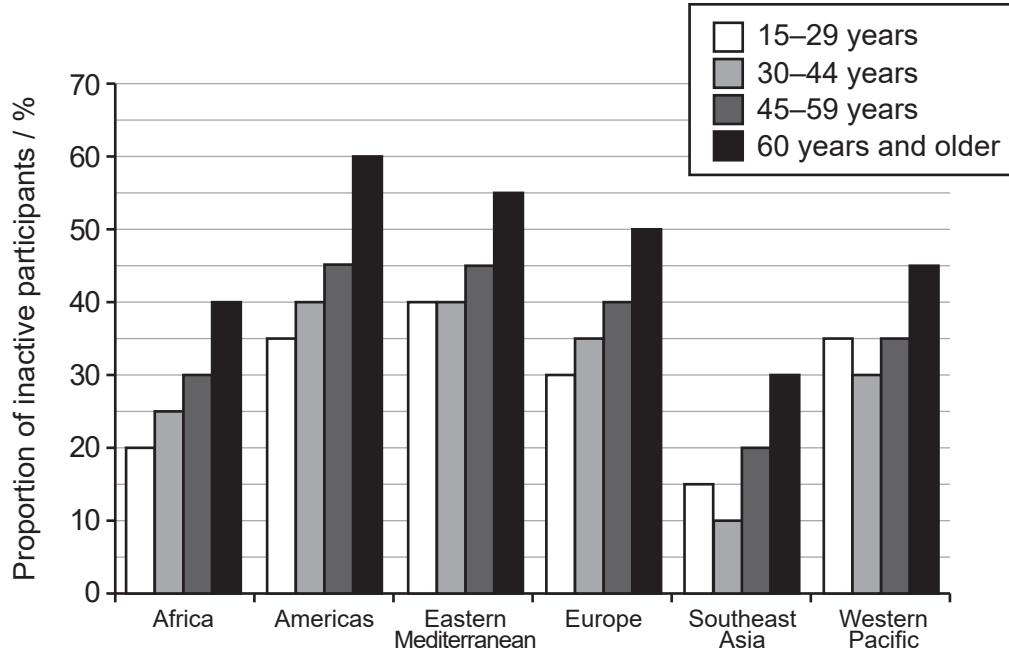
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End of Option B



Option C — Physical activity and health

9. A study collected data on the number of people who did not participate in any physical exercise from 122 countries. The proportion of inactive people in each of four age groups was calculated according to their geographic region.



[Source: reprinted from *The Lancet*, Volume **380**, no. 9838, Pedro C. Hallal, Lars Bo Andersen, Fiona C. Bull, Regina Guthold, William Haskell, Ulf Elkelund, *et al.*, Global physical activity levels: surveillance progress, pitfalls, and prospects, pp. 247–257, July 21, 2012. Copyright (2012), with permission from Elsevier.]

- (a) (i) State the region with the lowest proportion of inactivity in 15–29 year olds.

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- (ii) Calculate the difference in the proportion of inactivity between those aged 60 or older in the Americas and Southeast Asia.

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(Option C continues on the following page)



(Option C, question 9 continued)

- (iii) Compare and contrast the inactivity levels of people in the Americas and the Western Pacific.

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- (b) Define *coronary heart disease*.

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- (c) Discuss how routine physical inactivity can lead to cardiovascular disease.

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- 10.** (a) Define *mood*.

[1]

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(Option C continues on the following page)



(Option C, question 10 continued)

- (b) Discuss the role of exercise in reducing the effects of anxiety and depression. [4]

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11. (a) Outline acute and chronic injuries. [2]

Acute injuries:

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Chronic injuries:

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- (b) Describe **three** common causes of injury to a long distance runner. [3]

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(Option C continues on the following page)



(Option C continued)

12. (a) Identify **two** potential causes of sudden cardiac death in athletes. [2]

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- (b) Explain the role of moderate exercise on mortality. [3]

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End of Option C



Option D — Nutrition for sport, exercise and health

13. A study examined the effect of a carbohydrate periodization strategy on 21 athletes over three weeks. Participants were randomly assigned to one of two groups according to their consumption of carbohydrate:

- Early consumption group (all carbohydrates consumed before 5pm)
- Control group (carbohydrates consumed at all times of the day).

All participants consumed 6 g of carbohydrate per kg of body weight each day during the time of the study. The participants were timed during a 20-kilometre cycle test and a 10-kilometre run at the start and end of the study. The mean times and standard deviation (SD) for the tests are shown in the table.

Group	Cycling test (minutes)		Running test (minutes)	
	Start of study	End of study	Start of study	End of study
Early consumption	29.49 (1.09)	26.46 (2.11)*	40.23 (3.22)	39.80 (3.02)
Control	30.12 (1.55)	30.01 (2.01)	41.26 (2.13)	41.24 (2.43)

* Statistically significant difference between the start and end of study ($p < 0.05$).

[Source: Adapted from Marquet, L., *et al.*, Enhanced Endurance Performance by Periodization of Carbohydrate Intake: “Sleep Low” Strategy, *Medicine & Science in Sports & Exercise*: April 2016, Vol. **48**, no. 4, pp 663–672, American College of Sports Medicine, www.acsm.org.]

- (a) State the standard deviation for the cycling test in the control group at start of study. [1]

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- (b) Calculate the difference in mean cycling time between the start and end of study for the early consumption group. [2]

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(Option D continues on the following page)



(Option D, question 13 continued)

- (c) Using the data, deduce the effect of carbohydrate periodization on mean cycling and running performance. [3]

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14. (a) List **two** enzymes that are responsible for the digestion of proteins from the mouth to the small intestine. [1]

1.

2.

- (b) Describe the function of enzymes in macronutrient digestion. [3]

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15. (a) List **two** foods with a low glycemic index. [2]

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(Option D continues on the following page)



(Option D, question 15 continued)

- (b) Suggest the use of low and high glycemic index (GI) foods for consumption by a triathlete before and during a race.

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- 16.** (a) Outline causes of hypoglycemia.

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- (b) Explain the transportation of glucose across the cell membrane during physical activity.

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(Option D continues on the following page)



(Option D continued)

17. Analyse the role of antioxidants for combating the effects of free radicals.

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End of Option D



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