2018 VCE Physical Education examination report

General comments

The 2018 Physical Education examination gave students the opportunity to show their understanding of the key knowledge and key skills. There were four extended-response questions on this examination (Questions 4, 7b., 9 and 11d.) and most students handled them much better than the short-answer questions.

Students who were able to answer the question in relation to the command word given (i.e. 'describe', 'outline', 'critique', etc.) scored highly. This was particularly evident in Question 1b., where the students who described a plyometric exercise received full marks compared to students who only listed the name of the exercise or justified why it should be included in a training program.

Students should be encouraged to read the stem of the question and link their response back to the example. It is important that students demonstrate the ability to apply their knowledge to a given scenario rather than provide generic answers. Further to this, students need to be vigilant with words such as 'psychological' and 'physiological' as well as interpreting whether the question was asking about 'pre' or 'post' fitness testing (i.e. Question 11b. asked for reasons to undertake the initial testing and therefore pre-testing). When answering a question that asks students to critique something (for example, Question 11a.), students should ensure that they cover the positives and areas for improvement, and offer any recommendations.

The new areas of the study design for 2018 were handled well by the majority of students, in particular the questions relating to biomechanical principles (Questions 1d., 9, 10a. and 10b.). An exception to this was Question 11d., where many students could not make a biomechanical link to improved results of force production.

An area for improvement for students is their understanding of sociocultural factors. Many students incorrectly listed geographical location as a sociocultural factor. Geographical location may be discussed in the context of cultural beliefs or socio-economic status, but is not in itself a sociocultural factor.

Students who were able to draw on practical experiences that supported the theoretical content of physical education demonstrated a more comprehensive understanding of key concepts in the examination.

Where the question asks students to use relevant data, students should make reference to quantitative data that supports their answer to receive full marks as opposed to alluding to 'a change in data'.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	1	93	1	5	
2	84	6	1	8	
3	1	4	49	46	Aerobic power refers to the rate of energy production, not the capacity (total amount) of the system.
4	4	2	7	86	
5	7	1	4	87	
6	27	11	8	54	
7	6	12	80	1	
8	2	17	2	79	
9	18	69	4	8	
10	4	90	5	1	
11	0	8	11	81	
12	55	3	36	6	Massed practice involves fewer sessions that are longer in duration.
13	40	20	4	36	Muscular power is the most important fitness component to perform twists and flips in aerial skiing.
14	5	4	18	73	
15	7	5	85	2	

Section B

Question 1a.

Marks	0	1	2	3	Average
%	18	13	34	35	**1.9**

Any of the following tests was acceptable:

- Semo agility test
- Illinois agility test
- 505 agility test.

Students then had to link the test back to European handball from the data given.

The following is an example of a possible response.

This test incorporates very similar movements to those in European handball, shuffling sideways (when defending), sprinting forward and running backwards on defence.

Question 1b.

Marks	0	1	2	Average
%	46	22	32	**0.9**

- bounds (move from one leg to another over a distance)
- depth jumps (step off a box and quick, explosive jump up)
- squat jumps (squat down and jump explosively)
- box jumps (jumping explosively on a box and stepping or jumping off)
- quick stepping through a ladder with very fast movements
- skipping (jumping quickly with a rope)
- hurdle jumping (jumping or bounding over low or high hurdles).

Students who did not describe the activity did not receive any marks.

Question 1ci.

Marks	0	1	Average
%	46	54	**0.6**

- increased motor unit recruitment or synchronisation/firing rates
- increased muscle fibre size (hypertrophy, size of myofibrils)
- increase in PC, ATP or glycogen stores
- increased glycolytic enzymes
- increase in ATPase and creatine kinase enzymes
- increase in tolerance of metabolic by-products (hydrogen ions, inorganic phosphates)
- increased neuromuscular functioning
- increased contractile proteins

Question 1cii.

Marks	0	1	Average
%	54	46	**0.5**

- an increase in muscle fibre size or motor unit recruitment or will enable the athlete to have a greater amount of muscle to contract
- an increase in PC/ATP/glycogen storage will allow for a longer explosive effort that could result in an extended effort
- increase rate of ATP release from glycogen
- increase turnover of ATP or the breakdown and resynthesis of the ATP-PC system
- increased ability to continue working at high intensities

Students received a mark only if their outline matched the adaptation they identified in Question 1ci.

Question 1d.

Marks	0	1	2	Average
%	61	23	15	**0.6**

When doing an overhand throw, the athlete is increasing their resistance arm. An increase in resistance arm length increases the range of motion and speed with which the ball is thrown.

Students who linked this back to force production were not awarded marks.

Question 2

Marks	0	1	2	Average
%	20	38	42	**1.2**

There is a linear relationship between ventilation and oxygen consumption – as one increases so does the other until it reaches threshold. This is due to the increase in oxygen demand once exercise begins.

Question 3a.

Marks	0	1	2	3	4	Average
%	15	11	20	28	25	**2.4**

One of the following:

- Subjects 1 and 3 are most likely completing aerobic training. Subject 1's resting heart rate decreased from 60 to 55 bpm and Subject 3's sub-maximal heart rate decreased from 130 to 125 bpm, demonstrating chronic adaptations that are aerobic to the cardiovascular system.
- Subjects 1 and 3 completed continuous training. The a-vO_2 difference for Subjects 1 and 3 both had improvements after training (from 12 to 16 and from 16 to 18 mL of O_2/100 mL of blood) in comparison to Subject 2, whose a-vO_2 difference did not change. a-vO_2 difference is an aerobic chronic adaptation.

Question 3b.

Marks	0	1	2	3	Average
%	26	26	32	16	**1.4**

The increase in a-vO_2 difference means that the athlete can utilise more oxygen in the muscle for ATP production, which enables the athlete to work at a higher intensity aerobically for longer.

Question 3c.

Marks	0	1	2	3	4	Average
%	26	20	30	18	6	**1.6**

As Subject 3 shows a higher level of aerobic training adaptations at the beginning of the program (16 a-vO_2 difference) compared to Subject 1 (12 a-vO_2 difference), Subject 3 would need to work at a higher intensity during the training to make improvements. For example, Subject 3 could have worked at 85% intensity while Subject 1 could have worked at 70% intensity. Due to the principle of diminishing returns, an athlete who is fitter would need to train at higher intensity for longer (at or above relative LIP).

Question 4

Marks	0	1	2	3	4	5	6	Average
%	15	9	14	16	20	18	8	3.1

The following is an example of a possible response.

ATP-CP is an anaerobic energy system that does not require oxygen and is fuelled by creatine phosphate, compared to the aerobic system, which requires oxygen and is fuelled by carbohydrates and fats (glycogen for a 5000 m event). The ATP-CP system supports explosive movements in an event such as shot put due to the very fast rate of ATP production. In comparison, the aerobic system is suited to events such as the 5000 m as this system supplies most of the ATP after approximately 50 seconds as shown in the graph. In the aerobic system the rate of ATP production is much slower. The supply of ATP produced in the ATP-CP system is limited when compared to the aerobic system; however, this system recovers in approximately 3–5 minutes with a rest or passive recovery. The aerobic system benefits from an active recovery that allows the removal of waste products and assists in returning the body to pre-exercise conditions. Athletes involved in events such as the 100 m, shot put, long jump and pole vault would benefit from a rest recovery (passive) in between attempts to recover their ATP-CP (70% in 30 seconds and 97% in three minutes) stores to maximise their performance.

Students who wrote in general about energy system interplay rather than focusing on comparing the rate, fuels and recovery for the ATP-CP and aerobic systems did not receive high marks.

Question 5a.

Marks	0	1	Average
%	67	33	0.4

- activity analysis
- games analysis

Question 5b.

Marks	0	1	2	3	Average
%	19	29	35	16	1.5

- aerobic power is average, so it needs to be improved
- anaerobic capacity was considered poor and would need to be improved
- flexibility is rated as fair and would need to improve

(Aerobic power and anaerobic capacity are the correct terminology from the glossary in the advice to teachers.)

All three fitness components needed to be identified and justified for full marks.

Question 5c.

Marks	0	1	Average
%	36	64	0.7

Jalena could use a training diary/log, phone app, smart watch or heart rate monitor to monitor her training.

Students who listed rather than outlined their answer did not receive the mark.

Question 5d.

Marks	0	1	2	Average
%	53	28	19	**0.7**

A run that resembles a work-to-rest ratio of 1 to 1 where Jelena could run for one minute, rest for one minute, with the overall session going for 20 minutes

The maximum work interval acceptable is 5 minutes to make it suitable for lacrosse. The W:R ratio range for long interval training is 1:1–5:1.

Question 5e.

Marks	0	1	2	3	Average
%	21	40	35	4	**1.3**

The training program is suitable for the development of muscular endurance in lacrosse as the exercises target muscle groups (both upper and lower body) needed for lacrosse, and the time frame of two minutes per exercise is appropriate for developing muscular endurance. Depth jumps for two minutes could lead to injury, depending on the level of prior training Jelena has undertaken, so a possible change could be to doing squats only. Another upper body exercise could be included as lacrosse requires the use of the stick and good upper body strength/power.

Question 5f.

Marks	0	1	Average
%	49	51	**0.5**

- reassess goals, i.e. set achievable goals, add a reward
- psychological techniques such as playing energising music during workout
- variety in her training for motivation

Question 5g.

Marks	0	1	2	Average
%	15	32	53	**1.4**

- carbohydrates within the first 30 minutes will restore muscle glycogen quicker, enabling a faster recovery to her pre-training state and meaning that she will be able to train again sooner
- combining consumption of carbohydrates with protein after training to not only use proteins to repair muscle micro tears but meaning carbohydrates are better absorbed when refuelling, meaning Jelena can return to optimal levels more quickly
- protein ingestion: Jelena could ingest protein (like chicken or steak) to aid muscle recovery and micro tears to maximise her performance in the next session

Some students confused nutritional strategies with hydration strategies.

Question 6a.

Marks	0	1	2	Average
%	25	33	42	**1.2**

The constraint described is a task constraint. Reducing the size of the playing area will improve performance in one of the following ways:

- more skill practice opportunities

- skill execution is more difficult
- more representative practice opportunities (more pressure)
- easier for the defensive team as you can shut them down
- harder for the attacking team.

Question 6b.

Marks	0	1	2	3	Average
%	12	29	43	16	**1.6**

Open skill	Closed skill
environmental unpredictability, i.e. the ball is moving, hitting on first touch, weather, crowd involvement	predictable environment – ball is stationary, i.e. corner, free kick or penalty
externally paced – defenders around you, can't decide when to kick	internally paced – individual determines when to kick it. Internally paced
inter-trial variability – situation changes when playing in a game	limited inter-trial variability – in a free kick

A common error was students describing the receiver and not the kicker. Students did not have to give examples from both open and closed skills to receive full marks.

Question 6c.

Marks	0	1	2	3	Average
%	21	32	33	14	**1.4**

- As heart rate increases so does blood lactate. As the player goes from a small area to the larger area there is an increase in blood lactate from 3.9 to 4.6 mmol/L, demonstrating that the player is working at a higher intensity. With the increase in metabolic by-products there is greater fatigue for the larger playing areas due to an increase in the anaerobic energy system usage.
- PC depletion would be another factor that would have an impact on both sizes of soccer fields but will most likely affect the larger-sized soccer field more as players will utilise the anaerobic glycolysis system more, which is shown through the rate of perceived exertion. Three minutes is not enough time to fully replenish the ATP-PC system during recovery between games.

Students need to understand fatiguing factors specific to each of the energy systems, in particular the relationship between fuel depletion in the aerobic system and the duration of the event. Many students suggested that glycogen depletion would be a fatiguing factor in the small-sided soccer game; however, the game duration was only five minutes, so fuel depletion was not an appropriate response for this scenario.

Question 7a.

Marks	0	1	2	Average
%	37	45	18	**0.8**

Blood lactate is being removed at the same rate as it is being produced as Hayley has reached a steady state. As Hayley is working aerobically/sub-maximally, there is adequate O_2 available for oxidisation.

Question 7b.

Marks	0	1	2	3	4	5	Average
%	20	24	27	20	8	1	**1.8**

The Cooper 12-minute run is a suitable test for the under-18 football team because it mimics the physiological movements of football (i.e. running). It is also a recognised test to predict aerobic power, and the coach can use it to compare his team to norms. The test can be conducted on the group all at once, allowing for motivation and support from teammates (psychological perspective). Additionally, from a sociocultural perspective, the test is a field test, meaning that is it more accessible in terms of resources (cost) and facilities.

Question 7ci.

Marks	0	1	2	Average
%	14	12	74	**1.6**

Suitable training methods include:

- long interval training
- intermediate interval training
- continuous training
- fartlek training
- HIIT (high-intensity interval training).

Question 7cii.

Marks	0	1	2	3	Average
%	38	15	21	26	**1.4**

Student responses needed to include the following.

- Specificity/type: running
- Intensity: 70–85% maximum heart rate
- Duration: 20 minutes plus

Students could only receive marks if their design related to the training method listed in Question 7ci. For example, Hayley should complete a 20-minute continuous run at 80% max. HR.

Question 8a.

Marks	0	1	Average
%	25	75	**0.8**

Cognitive

Question 8b.

Marks	0	1	2	Average
%	23	21	56	**1.4**

- working towards a target (goal-setting), improving intrinsic motivation, improving self-efficacy and hence improving performance

- positive self-talk – increase his confidence, which can help him ski faster to contradict him constantly doubting himself

Students needed to apply the best psychological strategy to the scenario in the question. Many students just listed a psychological strategy.

Question 8c.

Marks	0	1	2	Average
%	77	8	15	0.4

One of:
- family
- peers
- community
- gender
- socio-economic status
- cultural beliefs/traditions

The following is a possible response for peers.

Taufatofua's peers might have believed that skiing is not a sport played by Tongan men, therefore they might have picked on him as he was growing up for trying the sport. This might have meant that Taufatofua did not train as often as he could have so he could spend time with his friends.

Geographical location is not a sociocultural factor but can contribute to other factors such as cultural beliefs or socio-economic status. For example:

- cultural beliefs/traditions – skiing is not part of the cultural traditions or background of the country/community where he grew up, less exposure to the activity at an early age when best age to learn skills therefore, no access to facilities, equipment, etc., to learn skills
- socio-economic status – it would have required a large income or funding to access facilities, equipment and environment to train and improve skills

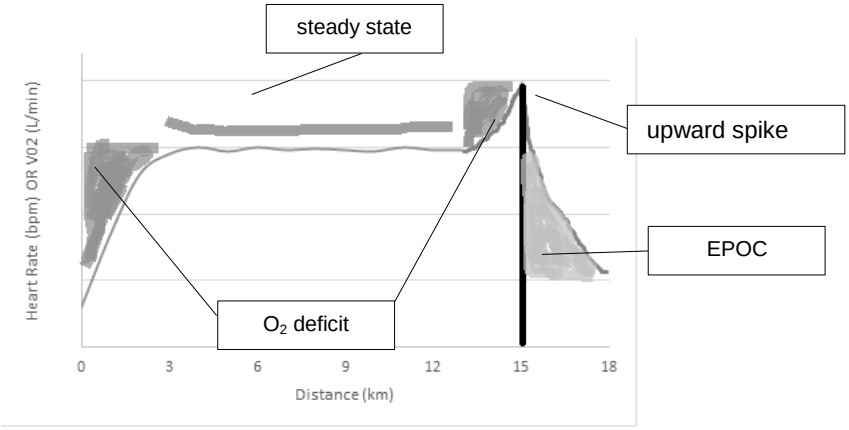
Question 8d.

Marks	0	1	2	3	Average
%	56	27	13	4	0.7

- Due to the accumulation of metabolic by-products: continuous nature of the event, no time to allow for the breakdown and/or removal of the accumulating metabolic by-products (ADP, Pi, hydrogen ions). These metabolic by-products start to have an inhibitory effect on muscular contraction as the contribution from the aerobic system increases, and the aerobic system has the slowest rate of ATP resynthesis, resulting in a lower average speed.
- Thermoregulation could have an impact on Taufatofua's ability to maintain the same speed as the redirection of blood flow away from working muscles means that there is less oxygen for ATP resynthesis, resulting in a lowering of average speed.

Question 8e.

Marks	0	1	2	3	4	Average
%	25	35	27	6	6	1.4



This was a challenging question for students; in particular, many students did not include the increase in HR over the last 1.5 km of the race, when Taufatofua's speed increased.

Question 8f.

Marks	0	1	2	Average
%	51	34	15	0.7

- restoring PC stores – passive rest allows for restoration of PC assisted by oxygen consumption
- an increase in heart rate assists with more oxygen to be distributed to assist with the removal of metabolic by-products
- an increase in heart rate assists the body to return to pre-exercise body temperature more quickly
- restoration of oxygen to myoglobin
- increase in heart rate also creates a venous pump to increase in venous return

No marks were awarded for the increase in venous return alone or the reduction of DOMS because the question asked what is occurring during recovery, not what is the end result of EPOC.

Question 9

Marks	0	1	2	3	4	5	6	Average
%	15	13	18	19	18	12	5	2.7

All three energy systems contribute to ATP resynthesis in both events at all times. The rate of energy release in the 1.4 km event is higher due to a higher contribution from the anaerobic energy systems, which produce energy at the faster rate when compared to the aerobic system. The rate of energy release in the 15 km event is lower due to the higher contribution from the aerobic energy systems, which produce energy at a slower rate compared to the anaerobic systems. This results in the long event having an average speed of 27 km/h compared to the short event at 33 km/h.

Question 10a.

Marks	0	1	2	Average
%	16	20	65	**1.5**

- weight (mass × gravity)
- friction: ground, drag, air/wind resistance

Air/wind was not awarded a mark on its own; the word 'resistance' was needed.

Question 10b.

Marks	0	1	2	Average
%	61	24	15	**0.6**

Acceleration is equal to the net force divided by mass. For acceleration to be greater when the net force is equal, the mass of the object must be different. Therefore, the rider behind must have a greater mass than the rider at the front.

Question 10c.

Marks	0	1	2	Average
%	54	18	28	**0.8**

- visual
- auditory
- proprioceptive
- touch

Through proprioception of body position on the bike, effective and efficient body positions for cornering or on a downhill section for best aerodynamic position

Question 10d.

Marks	0	1	2	Average
%	22	51	27	**1.1**

Water/fluid sweated out of the body onto the skin's surface uses evaporative cooling to keep the body temperature of an athlete as close to 37 °C as possible. Blood flow is redirected to the skin's surface, which is cooled by the moisture on the skin, and the comparably lower air temperature cools the blood, which returns to the rest of the body to maintain regular temperatures. This negatively affects performance as blood flow has to be redirected away from working muscles, which decreases the available oxygen for energy production.

Question 11a.

Marks	0	1	2	3	4	Average
%	37	28	22	11	2	**1.2**

Students needed to give positives of the program, areas of improvement and a suggestion to improve the program.

Scott's program is specific to whole body strength. The intensity for the development of strength in the program is correct, and four sessions per week with an upper body/lower body split and a rest day demonstrates a correct frequency to create change but not too much to potentially injure. The program should improve Scott's strength.

The program is likely to maintain and possibly improve Scott's anaerobic capacity. However, the W:R ratio given for the rowing set is incorrect for the development of anaerobic capacity. Scott should be completing short to intermediate interval training instead, with a W:R ratio greater than 1:2.

Question 11b.

Marks	0	1	2	Average
%	37	35	28	**0.9**

Physiological purpose: strengths and weaknesses or establish a baseline

Psychological purpose: motivation

Question 11c.

Marks	0	1	2	Average
%	43	16	41	**1**

The reliability of the fitness tests undertaken can be ensured by having the same:

- time of day
- equipment
- location
- order of tests
- environmental conditions
- lead up/daily routine
- nutritional/hydration state
- activity level during the day.

Question 11d.

Marks	0	1	2	3	4	5	6	7	8	Average
%	15	7	19	21	18	11	7	2	0	**3**

Students struggled to discuss the link between improvement of force production and a biomechanical principle.

The following is an example of a possible response.

Both Scott and Renee improved their 1RM lifts over the program; the differences are the relative improvements for each of them. Renee increased her results by a minimum of 20% in all lifts and as much as 60% in the deadlift. Scott improved incrementally, with results ranging between 1 and 3.5%.

The differences can be explained through three contributing factors:

- their skill acquisition stage of learning: Renee is a cognitive learner and will make skill competency progress like technique in the initial part of the program. This development has a significant neural adaptation component and as such Renee will make large initial progress. Scott is an associative or possibly even an autonomous learner so he will be making dramatically less progress in this area as it has already occurred for him
- both Scott and Renee will have developed muscular anaerobic adaptations such as an increase in muscular hypertrophy or ATPase, which will enable a more forceful contraction by the working muscles. Again, as Renee is inexperienced, she has more scope for improvement than Scott. This is best explained by the principle of diminishing returns

- biomechanically: with Renee improving her technique she will execute the lifts with less error and therefore not lose force production as a result of poor summation of momentum or balance with the load.