

2021 ASSESSMENT REPORT

SPT315118 – SPORT SCIENCE

This section will be comprised of **General Comments** - regarding the paper as a whole, followed by specific Examiner's Comments - with regard to each Section of the paper, followed by **Solutions** for each Section.

General Comments

The Marking Panel considered the 2021 paper to be a fair paper allowing students the opportunity to demonstrate their knowledge and understanding of the course content and achieve a performance in line with their internal ratings; had they revised appropriately and were versed in the specific knowledge of how to complete an exam. Such knowledge can be gained by familiarising themselves with this Report. Those who managed their time effectively seemed to have completed the paper within the time limits.

As is usually the case, many of the same recurring issues were evident in relation to students' lack of experience and/or unfamiliarity with exam technique. Throughout all sections of the paper, several matters of concern were raised by Markers, where many students lost marks due some simple mistakes that those with more experience tend not to make. This is invariably why those studying the course in year 12 do better, on average, than those in year 11.

Such mistakes included:

- Not reading the question fully and understanding exactly what it is asking (such as in Question 3 d) where many students did not circle all four options and only did two
- Not understanding the difference in the requirements of the respective clue words, such as list, outline, explain, etc
- Not providing examples, or providing examples not relevant to the question (particularly evident in CDL's where, for example, the sub routines for a netball shot are cited in a question about tennis)
- Not justifying their responses when asked to
- Not referring to the data, or using the relevant units in the answers given to Criterion 5, data questions
- An inability to effectively manage their time, especially when the time allocation for the booklets varies from 30 to 45 to 60 minutes.

Familiarity with these issues will help teachers and students alike to address them throughout the year so that such recurrences can be avoided in the future.

It was pleasing to note that the number of students writing in pencil is gradually declining and it can only be hoped this downward trend continues.

As the trend towards the increasing use of student laptops in schools continues, the amount of practice that students have with handwriting for periods of time more than three hours is greatly diminishing.

This continues to present a challenge for Markers, as the legibility of students' handwriting can be a concern. This concern becomes even more exacerbated when students have multiple exams on the one day, as was the case for many in 2021, who also had their Biology exam in the morning prior to their Sport Science exam. Without any diagnosed justification for such poor handwriting, students are running the risk that their marks will be negatively affected if the Marker cannot clearly read the writing in front of them. It is strongly recommended that in preparation for the exam, students spend more time practicing their handwriting, hopefully while doing previous exams, for durations up to as long as their exams will be.

Another recurring issue noted by several Markers is where students take a “stab in the dark” by providing more answers than are asked for in a question; in the hope that the correct answer is contained somewhere within their writings. Students should be aware that if, for example, two pieces of information are asked for, and they give four, ***the Marker will mark the first two and disregard the last two, even if the first two are incorrect and the last two are correct!*** This was even noted in Section D this year, where some students answered all three questions and only two had to be answered, as was clearly stated multiple times throughout the booklet.

Students aiming to achieve at the higher levels should ensure the language they use is of a more technical and specialized nature and is relevant to the question at hand. In addition, students are reminded that there is a limited range of universally known and accepted abbreviations and acronyms suitable for exam use in Sport Science; many of which only have relevance when related to a specific context (eg: ATP, VO₂ Max, LIP, EPOC, DOMS, etc). As can be seen, most of these abbreviations occur in the Exercise Physiology Section of the exam. As a result, many acronyms and abbreviations developed by individuals or classes to assist in learning and recall, particularly in the Skill and Psychology sections, may not be suitable and may cause marks to be deducted if they are unknown to the Marker (e.g., HIPS; VAMP).

Given the name of the subject is Sport Science, it would also be reasonably expected that students would have a reasonable level of general knowledge regarding a range of common sports. Some answers suggest that this is not always the case and many terms which are out of place for a given sport are used. It is strongly recommended that teachers and students alike try to consider a wider range of sports throughout the year so they are better equipped to provide meaningful answers to the range of sports that may be presented to them in the exam.

The Criterion which continues to consistently cause the biggest challenge for students to gain a “C” standard in is Criterion 6, Cross-Discipline Links (CDL's). Most students understood the concept that they must only complete two out of the three questions in this section. The number of students who did not attempt either of the questions was exceptionally low, and it seemed that a greater number of students did attempt to answer both links in both questions, which is pleasing to see. However, given that 4 out of the 7.5 marks for each link are allocated to the relevance and application of the theory to the specifics of the question - the sport, the athlete, the situation, etc, which includes the use of examples, many students continue to score quite poorly on each link. Consequently, when students provide little more than vague or general theory with little relevance to the scenario, their mark for that link is usually no more than 3-3.5 out of the 7.5 marks on offer. It does seem that some students enter the exam with the specific plan of only doing the minimal work required on this criterion.

ALL students should be encouraged to ensure they leave enough time to complete this section to a satisfactory standard. Some, it seems, enter the exam with 'pre-prepared, generic links' - for their two preferred core unit links (often Phys – Psych and Psych – Skill). While such a method can be effective for students with a stronger knowledge and understanding to adapt and adjust these links to the specifics of the question, it seems to catch out those who lack that ability, especially when they cannot adjust the link to work with the scenario, or their knowledge of the required sports is limited. This was a particular problem in the Roger Federer question. Such a result should prompt those students with aspirations to perform well at this level to familiarise themselves more with the actual criterion standards and make greater use of the exemplars for each question provided in previous years' solutions. Invariably, students who write good quality CDL's also do well on other criteria, as they need the breadth and depth of knowledge to provide detailed answers in the first place.

Section A – Exercise Physiology A/B

Question 1 - Criterion 1

- a) Well answered - nearly all students correctly identified the aerobic system.
- b) Many students didn't receive full marks for this question. The stronger responses referred to three main processes of resynthesising ATP through the Aerobic system. Unfortunately, many students were too brief in their explanations, referred to ATP splitting or the ATP-PC System instead of the breakdown of carbohydrates using the aerobic system through glycolysis, Krebs Cycle and Electron Transport System for ATP resynthesis.
- c) Generally, well answered as there are a variety of characteristics which could have been referred to relating to the ATP-PC System and the Lactic Acid System. Weaker responses included the aerobic system or referred to the "anaerobic system".
- d) Generally, well answered, and stronger responses provided greater depth of theory with their understanding of "hitting the wall". Most students correctly referred to glycogen sparing as a chronic training adaptation being a method to delay "hitting the wall" or the use of dietary supplements during the run or CHO loading prior to competing.

Question 2 - Criterion 1

- a) A variety of definitions were used to clearly explain the concept of oxygen deficit. Overall, students demonstrated a good understanding of this concept and provided clear examples of when an oxygen deficit can occur.
- b) Better answers were able to show a greater understanding of the concepts of VO_2 and Steady State and relate these together with how they impacted an athlete's O_2 Deficit. This answer required both knowledge of these two concepts and application with relating the concepts to how conditioned athletes are more likely to have smaller oxygen deficits.
- c) Many students didn't receive full marks for their understanding of the term LIP, as it is the last point/highest intensity of exercise where lactate production and clearance are equal. Many unfortunately stated it was the point where lactate starts to accumulate. Better answers clearly demonstrated this accurate understanding of the LIP and were able to be more comprehensive in their answers by providing a reason for the difference.

Question 3 - Criterion 1

- a) Most students were able to make the correct calculation using the required equation. Better responses correctly rounded answers to two decimal places and provided the correct units.
- b) Overall, this question was not well understood in terms of the intent of the question. Better responses identified that the differences between the two subjects could be related to the various factors affecting VO_2^{Max} , for example, aerobic fitness being the most obvious reason.
- c) Most students could identify the difference at rest for heart rate and stroke volume between the two candidates. Stronger answers were able to explain their reasons by showing a clear understanding of what these terms are and what their chronic adaptations are referring to - cardiac hypertrophy of the left ventricle. Many students needed to provide greater detail with respect to their explanations.
- d) Some students needed to read the question more carefully as some only circled two answers rather than the required four.
- e) Generally, well answered, better answers referred to anaerobic muscular adaptations and not acute/aerobic or cardiovascular and provided more detail.

Question 4 - Criterion 2

- a) Well answered with nearly all students being able to provide two reasons why a warmup should be performed.
- b) Well answered although some student answers were a little too brief with their example not being explicit.
- c) Better answers included greater detail to highlight a better understanding of the reason stated for a cool down.
- d) Most students understood the concept of progressive overload although some explanations were brief. It was important that students provided clear examples which identified this concept rather than being too general or too brief. It was important that the examples were “progressive” and thus didn't have unrealistic rates of improvement.

Question 5 - Criterion 2

- a) Overall, well answered and students generally had a good understanding of the three phases. The better answers were able to correctly name the three phases and included more detail. In doing so they referred to the main focus as outlined in the solutions and were quite specific.
- b) Well answered. Most students had a clear understanding that tapering requires a reduction in workload. Better answers provided clear changes of how this can occur through reducing volume, intensity and/or duration of training.
- c) Students had a good understanding that the training principle of variety aids motivation. The better answers were able to explain how it also provides physiological benefits with respect to a player's training schedule and provide clear examples. As this was a three-mark question, often greater detail was needed compared to what students provided.

Question 6 - Criterion 2

- a) Unfortunately, a few students missed the word “exercise”.
- b) This question was not well answered with many students not referring to either the Alactacid Oxygen Debt or the Lacatacid Oxygen Debt. Students also didn't include the re-saturation of haemoglobin and myoglobin stores. Some students mixed up the theory or even referred to irrelevant terms such as oxygen deficit or steady state.
- c) (second b)) Generally well answered. The better answers were able to correctly identify appropriate water-based strategies such as Cold Water Immersion (CWI) and outline when they can be used, a concept overlooked by other students.
- d) This question was worth 4 marks thus greater detail and theory inclusion relating to both glycogen and protein were needed. Unfortunately, many students didn't address these elements in their answers or to the expected level of detail. Better answers were able to outline how and when athletes should consume High and Low GI foods and protein after exercise.
- e) Most students answered the question correctly.

Question 7 - Criterion 5

Overall, students demonstrated a good level of understanding of this question and what the data indicated. Students comprehended the table correctly and were able to answer accordingly. In most cases, the students incorporated the correct data and units to support their explanation.

- a) Nearly all students knew the correct test and most students supported their answer with some relevant data.
- b) A majority of students were able to rank the data in the correct order from lowest to highest flexibility with the correct figures and units. Only a few students answered this question in the incorrect order i.e., from highest to lowest instead from lowest to highest which resulted in a reduction of marks.
- c) Most students detected the anomaly and better answers were able to clearly identify why the plank score was an anomaly by referring to the other scores being the lowest of all the groups or below the mean and the plank being the highest score of all the groups or 40sec above the mean.
- d) Unfortunately, many students were unable to identify the positive correlation that existed between the MFT and Squat scores. The weaker responses just said the “good” MFT scores resulted in “good” squat scores. The stronger responses support their understanding of the relationship with correct and clear data with descriptive words. Unfortunately, many students just listed data without providing any explanation/meaning to what the data meant with respect to the relationship.
- e) Most students correctly identified either Subject Number 3 or 5 as being the “best” candidate to be selected as a rower. Better answers were able to support their answers with correct and relevant data referring to all scores being above the minimum standards for subject 3 and for subject 5 referred to their high scores which related to rowing and performed above the mean scores except for the sit and reach which was only 1cm below the minimum standard.

Section B – Skill Acquisition

Question 8 - Criterion 3

- a) This question was answered well.
- b) Many students only scored 2 out of 4 for this question as they could really only apply Selective Attention to this scenario and were less clear about Orienting as a concept.
- c) Answered well.
- d) Many students mistakenly wrote that because it was indoors without weather influencing play, it was closed. Perhaps teachers should be aware of this interpretation and really focus on the external pacing and unpredictable decision-making in their teaching of this concept. There were too many answers like this for it to be student error. The best answers spoke of the continuum and that volleyball was closer to the open end but had an element of closed when serving. This was not necessary for full marks, just noted as most correct.
- e) While not the correct response, Hick's Law, stimulus- response compatibility and choice reaction-time were given some credit if they were justified and applied to the scenario.

Question 9 - Criterion 3

- a) This was answered well overall.
- b) Many students spent too much line space and time describing the three stages of learning. The question specifically asks for the coach's role in each stage. It seems questionable as to why coaches would want to take an autonomous athlete backwards; other than to teach a new skill, or revise technique after injury. Many students said the coach would take KB back from the autonomous stage into the cognitive or associative stage, without providing any context or justification.
- c) Many students could provide a definition, however, the better answers referred to executing the skills in difficult weather, unfamiliar stadiums, pressure situations and that KB was able to do this because she had rehearsed in a variety of conditions and situations.
- d) There were many other General Motion and Force concepts also applied in this scenario. There was a lot of reference to the shape of the implement rather than its flight path (the shape is standard for all throwers). Similarly, a heavier javelin will not travel as far (again in Olympic competition the weight is standard for all throwers in the same category).
- e) If spin was discussed it had to be applied to the javelin. Unfortunately, some students had learned that backspin will mean an objects' flight path will be altered and it will drop short. Imparting backspin to a javelin is not an appropriate concept.
- f) The descriptions for subroutines were often vague and confusing, such as: "subroutines are a skill broken down into smaller steps"; "A subroutine is the whole action broken into parts"; "subroutines are the motor skills broken down to be able to perfect each of the subroutines".
- g) Better answers were clearer in the description: "A motor skill can be broken down into smaller component or parts, these parts are called subroutines".

Question 10 - Criterion 3

- a) The best answers were those that answered the actual question. Instead of generic descriptions of massed and distributed practise they stated why distributed was better for the beginner. In answering this question, the focus really needed to be why distributed practise was best. However, many said why massed was not great and therefore distributed had to be better but didn't say why it was.
- b) There was a lot of unnecessary reference to team sport and decision-making when it didn't apply to the scenario for a taekwondo player.
- c) Several students didn't read the questions correctly and when they saw the "two (2)" in the question, they wrote about two types (KP/KR) of feedback. Unfortunately, this is a great example of marks lost due to rushing and not carefully reading the question.
- d) Well answered.
- e) Many students mentioned their fast movement time or response time which was accepted. However, simply writing the two types of anticipation was not, as this was only considered as one factor. Unfortunately, agility is a fitness component and relevant in Section A of the exam. Students need to try and use the relevant terms from the core unit they are in.
- f) Unfortunately, some students got their anatomical LEFT and RIGHT confused, causing a loss of marks.
- g) Answered well by most students.

Question 11 - Criterion 5

This question was generally answered quite well by many students. It is important to look at the marks allocated and spend time accordingly. Some students wrote more for Part b) worth 2 Marks in comparison to Part d) worth 4 Marks.

Students need to try to ensure numbers included in answers are legible and could not be confused for an alternate number. E.g., 3 and 5 were often scribbled similarly.

Students should also try to use terms which are consistent with the question. Where it asked for "Approach Speed" many students write about the *highest/lowest* when it is more logical to say *fastest/slowest* when discussing time.

- a) Generally answered well although some students forgot the clarifying statement about the data.
- b) Answered well by most students.
- c) Students had difficulty with this application question. The anatomical "term" threw many but was not a focus rather than the application of biomechanics. Examples of movements described included: extension, abduction, flexion, rotation. There was some excellent application of biomechanics also rewarded: Linear and angular motion, streamlining, air resistance and drag, CoG shifting.
- d) Many students only included two jumpers in their justification. Or they included ALL jumpers and all data. A variety of combinations were accepted:

- 3, 4, 5 as they achieved the furthest distance
- 3, 5 and 1 the two best compared with the smallest distance
- 1, 2 and 4 the three that achieved the least distance
- 1, 2 and 3 the two least distance compared with the best.

Section C – Sport Psychology

Question 12 Criterion 4

- This was generally understood and answered quite well. Some students confused self-confidence in a general sense with self-efficacy in a specific sense. Others related their example to an individual player rather than to the Team. Better answers created a link between the action and how it enhanced the Team's self-confidence.
- Better answers were able to identify specific traits that were taught. Others gave examples which indicated the trait in question. A number of students confused the required traits with the antecedents needed for the development of self-efficacy.
- Not answered as well as expected. Many did not recognise winning the 23 matches as an outcome goal, or simply didn't answer that part of the question. Many others either mixed up the examples of performance and process goals or struggled to demonstrate a clear understanding of what a process goal was.
- Better answers gave a particular goal and explained how it was both specific and measurable. Others gave separate goals for each which was not required.
- Better answers were able to ensure the strategies mentioned were ones relevant to once AT the venue and not before arriving (such as sleep and checking you had your equipment). They also were successful in relating how the strategy was able to assist in player preparation.

Question 13 Criterion 4

- Many students did not attempt this question. Many attempted to answer the question by only explaining what each concept was but could not relate it to how the specific athlete satisfied these needs. Some students confused the notion of "autonomy" with being "autonomous" from a skills perspective, which relates more to competence as it is achieving mastery of the skill.
- Generally answered well with most students being able to identify the primary differences between intrinsic and extrinsic. Better answers explained the differences in more detail as well as giving relevant examples of each.
- Mostly well answered, although many students were referring to antecedents for self-efficacy or listing types of motivation rather than specific techniques.
- Mostly well answered, with better examples being much more specific to the qualities of explosive power and speed rather than generic cue words. The starter's instructions of ready, set, go were not considered as cue words.
- Better answers addressed the actual question requirements of giving an example of each of the guidelines in action. Others simply listed them or listed and explained what they meant without the use of an example. Many students also incorrectly considered a single guideline, such as identify both positive and negative aspects as two separate guidelines.

Question 14 Criterion 4

- a) Most students could explain the difference between the two types of anxiety and give examples of symptoms. However, some students gave physiological or behavioural symptoms rather than the cognitive ones which were required.
- b) Most students demonstrated a sound understanding of the basic concept of the Inverted-U Hypothesis. Better responses applied its impacts to Ash Barty with regard to her as a younger player as required by the question.
- c) Answered well.
- d) Answered well, although a few students could not remember the correct terms or used abbreviations.
- e) Not answered as well as it could have been. Too many students simply stated that mental rehearsal (MR) was a form of visualisation, or just seeing something in their mind's eye, rather than relating it to being in relation to a specific skill or movement. In addition, a number of students confused types of MR with the guidelines that were required. Many students who did mention the guidelines simply listed them rather than relating how they could improve the quality of the MR.

Question 15 Criterion 5

- a) Mostly answered well, although the better answers gave the data for the Crows from both sides to justify why they should use the left side more. They also compared the left side value to the Lions to justify why their choice was the Crows.
- b) Mostly well answered although some students misread the data and gave values for shots on goals or expected not actual scores.
- c) Well answered.
- d) Well answered.
- e) Mostly well answered although some students gave details for the location of the shot, instead of the distance and/or direction as required. Better answers stated how much better or worse the Crows were on each aspect in reference to the respective %'s.

Cross Discipline Links (CDL)

General Comments on CDL

Students still seem to make common errors which are mentioned in previous Examiner's Reports. These errors include:

- Only attempting one link per question (approximately 40 candidates) – limiting themselves to a maximum of 7.5 marks out of a total possible 15.
- Rewriting stimulus material which wastes time.
- Telling a 'story' without any real conceptual knowledge.
- Providing many definitions without relating to the question.

- A majority of students appeared to go into the exam with pre prepared links that did not fit the question. i.e. – Roger Federer was coming back from injury and many students chose to talk about recovery strategies rather than considerations of his injury. Some training theory didn't/wouldn't apply to Roger or tennis such as suggesting that 20km Fartlek training and plyometrics would be appropriate after two knee operations.
- A majority of answers were not structured well or structured incorrectly, missing paragraphs and jumping from one link to the next. Many students omitted an initial linking sentence for an easy loss of 0.5; this also makes the job of the Marker so much harder.
- Some answers stated many elements in their theory rather than anything specific.
- Answering all 3 questions (approximately 6 candidates).
- Using the incorrect core area (e.g. Addressing Psychology when the question asked for Skill Acquisition and Physiology (approximately 20 candidates).
- Using links from within the same core (Intrarelationshi ps) as opposed to the required links between cores (Interrelationshi ps) – approximately 15 candidates.

Positive observations included:

- There appeared to be fewer incidences of using the incorrect core area which was pleasing.
- There also appeared to be fewer Intrarelationshi p links made than in previous years.
- The question structure meant that students did not have to worry about the direction of the link and all questions were positive and thus simplified how students could address the questions.

Better responses:

- Are well set out, typically following the recommended structure
- Apply the concepts and reflect the depth of understanding required.
- Can readily adapt to the question
- Provide concise and efficient responses with good spacing and the use of appropriate, specialised terminology. Clearly prepared well.
- Refer to the question details throughout including background theory, or as a combination of theory and examples blended into one.
- The best answers had a clear, logical structure and explained within the application how theory inter- related and not just happened 'side by side'.
- Related their response to the scenario set out in the question.
- Used examples to show deeper understanding
- Comprehensively demonstrated how the core areas affect one another.

SPT315118 - SPORT SCIENCE

2021 SOLUTIONS

Solutions

Section A – Exercise Physiology

Question 1 (Criterion 1)

Endurance athletes usually work at a sub-maximal intensity and require energy over an extended period of time. Occasionally they may have to increase their intensity of effort to increase their speed or to work up a gradient.

- a) **Identify the energy system used predominantly by endurance athletes during an event.** (1 mark)

Aerobic or Oxygen System/Aerobic Glycolysis/Oxidated system

- b) **Briefly describe how ATP is resynthesised by using carbohydrates as a fuel in the energy system used predominantly in endurance events.** (2 marks)

Glycogen/carbohydrates is broken down in the presence of oxygen. Produces small amount of energy and pyruvic acid. Pyruvic acid passes into Krebs's cycle and combines with O_2 to produce CO_2 and small amount of energy. Hydrogen ions pass into electron transport system and produce H_2O , heat and large amounts of energy.

OR

- **Glycolysis: The breakdown of Glycogen to Pyruvic Acid**
- **Krebs Cycle:** Pyruvic acid passes into Krebs's cycle and combines with O_2 to produce CO_2
- **Electron Transport Chain/Electron Transport System:** Hydrogen ions pass into electron transport system and produce H_2O and ATP

- c) **Which energy systems may be called on to assist an endurance athlete when they are working above a sub-maximal intensity? Identify one characteristic of each of these systems.** (2 marks)

ATP- PC System/Phosphocreatine System. Any one of:

- anaerobic
- limited capacity (8 -12s)
- immediately available
- fuel is creatine phosphate, etc.

Lactic Acid System/Anaerobic Glycolysis. Any one of:

- anaerobic

-
- capacity up to about 2 minutes immediately available
 - fuel is glycogen
 - by-product lactic acid, etc
 - **Anaerobic System is not accepted.**
-

- d) Endurance athletes may 'hit the wall.' What is meant by this term and what **is one way they could delay or avoid reaching this point?** (2 marks)

Athlete has exhausted glycogen/carbohydrates and must rely on fats. Using fat requires more oxygen or Using (oxidation) fat is slower compared to glycogen.

Any one of the following:

- Could increase glycogen/carbohydrates stores prior to the race
 - could slow pace earlier in the race
 - could replace glycogen/carbohydrates throughout the race
 - could improve aerobic capacity to better use fats as a fuel and/or improve glycogen sparing
-

Question 2 (Criterion 1)

- a) **Define oxygen deficit and provide an example of when it is likely to occur.** (2 marks)

It is the shortfall in oxygen needed to work aerobically at a given intensity. Other definitions could be provided i.e. The amount of energy which has been supplied by anaerobic systems in the early minutes at the start of exercise due to insufficient oxygen uptake/consumption.

Any one of:

- likely to occur at the commencement of activity prior to achieving steady state oxygen consumption
 - during an activity when intensity increases, and a new steady state is yet to be established
 - the athlete has exceeded their LIP
 - reached their VO_2 Max
-

- b) **Well conditioned athletes are more likely to experience a smaller oxygen deficit than less conditioned athletes at the same exercise intensity. Explain this by using the concepts of aerobic steady state and oxygen uptake (VO_2).** (3 marks)

Conditioned athletes are able to consume more oxygen and thus reach a steady state earlier.

They have a higher VO_2 , i.e., the volume of oxygen consumed and utilized by the body to produce energy than less conditioned athletes. The point at which energy demand is met primarily aerobically and have less reliance on anaerobic energy systems when intensity increases. Thus, have a smaller O_2 deficit.

- c) **Define Lactate Inflection Point (LIP). Discuss the likely difference in LIP for a well-conditioned endurance athlete compared to a less conditioned athlete and provide a reason for this difference.** (3 marks)

LIP is the highest intensity of exercise where there is a balance between lactate accumulation and lactate removal, where an athlete can achieve a steady state. Beyond this point, there will be a rapid accumulation of lactic acid. LIP is NOT the point where LA starts to accumulate exponentially; this occurs ONCE you cross the LIP.

Conditioned athletes will have a higher LIP than less conditioned athletes because: Any one of the following:

- Higher Aerobic capacity/fitness from exercising just below and above their LIP
- greater buffering capacity to clear lactate
- Higher VO_2 which enables them to be able to supply greater amounts of oxygen and thus work aerobically at higher intensities
- Any chronic cardiorespiratory aerobic adaptation outlined
- Conditioned endurance athlete will be able to exercise at higher intensities for longer durations

Question 3 (Criterion 1)

A regular gym attendee (A) encouraged a friend (B) to begin training with them as a means to improve their general physical condition, including their aerobic capacity.

- a) **Use the following information to calculate the relative VO_2 Max. of each of A and B. Use the correct units.** (2 marks)

A. Absolute VO_2 Max. = 3.8 L/min Weight = 70 Kg

i. Relative VO_2 Max = 54.29 ml/kg/min or 54.3 ml/kg/min

B. Absolute VO_2 Max. = 2.8 L/min Weight = 72 Kg

i. Relative VO_2 Max = 38.89 ml/kg/min or 38.9 ml/kg/min

-
- b) **Part (b) Identify two differences between the two subjects which may explain their different VO_2 Max. results.** (1 mark)

Any two of the following for $\frac{1}{2}$ mark each:

- Aerobic fitness /any cardiovascular chronic aerobic adaptations: Athlete A being a regular gym attendee has a greater aerobic level of fitness.
- Gender: Males have higher Oxygen Uptakes compared to females Age: Younger and older people have lower Oxygen uptakes.
- Genetics – explanation due to heredity i.e., Body composition, fibre type distribution
- Size – the heavier the person the smaller the relative VO_2 Max.

- c) What would you expect to be the difference, at rest, between the subjects' heart rates and stroke volumes. Provide reasons for these differences. (3 marks)

"A" would have a lower RHR and a greater SV than B.

With training and improved condition, the left ventricle would increase in volume/size i.e., cardiac hypertrophy through aerobic training. These changes increase the volume of blood that can be pumped with each contraction; hence the heart does not have to beat as often to pump the required blood volume at rest.

-
- d) If subject B decided to include two muscular endurance resistance training sessions/week to further enhance their aerobic capacity which muscular adaptations would they be training to achieve. (2 marks)

- Increased muscle capillary density (correct) or Decreased muscle capillary density
- Decreased myoglobin concentration or Increased myoglobin concentration (correct)
- Increased oxidation of fats (correct) or Decreased oxidation of fats
- Increased use of anaerobic glycolysis or Decreased use of anaerobic glycolysis (correct)

-
- e) If subject B included some strength training into their schedule briefly outline two chronic muscular adaptations they could expect. (2 marks)

Any two of the following for 1 mark each.

- Muscle hypertrophy: increased muscle fibre diameter in particular of fast twitch fibres
 - which increases speed and force of contraction
 - increased stores of ATP and CP
 - increased Stores of glycogen
 - increased glycolytic capacity
 - Increase strength in amount of connective tissue
 - Increase numbers of muscle capillaries
 - Increased muscle capillary density
-

Question 4 (Criterion 2)

Melbourne AFLW player, Daisy Pearce, continues to be a dominant player in the competition, even since returning from giving birth to twins. Her performances in 2021 have been as good as ever and she attributes this to ensuring she was as thorough as possible in her physical preparation.

- a) **Identify two reasons why Daisy would warm up thoroughly before training and competition. (1 mark)**

Any two of the following for ½ mark each.

• Prepare the body for competition or conditioning exercise • Reduce the possibility of joint or muscle injury or soreness • Increase muscle temperature • Improve activation of energy systems • Decrease O₂ deficit at commencement of training	• Increased blood flow to the working muscles • Increased muscle fibre recruitment • Increased range of motion • Activate neural pathways • Any Acute training effects
--	--

- b) **Provide one practical example of how conditioning and skill development could be combined in a training session. (1 mark)**

Drill sessions involve the execution of skills and whole-body movement. End to end, circle drills or circuit training involving jogging, agility, sprinting, kicking, handballing, tackling etc. Also, could include modified game situations.

- c) **Briefly outline two reasons why Daisy should cool down following training and competition. (2 marks)**

Any two of the following for 1 mark each:

- Cooling down will assist the heart to circulate blood to avoid venous pooling.
- Heart rate would decrease more slowly and enhance recovery by increasing O₂ available to increase the removal of lactic acid and other waste products.
- Students may also include stretching benefits i.e., return muscles to the pre-exercise length or to increase flexibility. Realigns muscle fibres
- To aid in the return of the body to its pre-exercise condition faster
- To reduce the impacts of DOM's by stretching
- To reduce the risk of injury (if explained)

- d) Define the training principal of progressive overload and demonstrate, with an example, how Daisy could have applied this principal to her training. (3 marks)

Progressive overload explanation:

- is the gradual increase in training load and/or intensity as physiological capacity responds to training in order to maintain stress on the body's systems to encourage continued adaptation.

OR

- is exercising at an intensity/workload greater than your existing level / capacity

Any example involving increases in load or intensity.

- For example, in the gym, Daisy increases her bench press load from 20kg to 22Kg, or, in a pressure drill, Daisy has to now make 4 repeated efforts, not 3 etc.

Question 5 (Criterion 2)

The postponement of the Tokyo Olympic Games has severely impacted the training programs of athletes around the world. In fact, a number have retired, explaining that it will be too difficult to prepare as they would wish to.

- a) Briefly discuss the focus of each of the three main components of an athlete's training year. (3 marks)

- Transition/Off Season
 - The off-season period should be both a psychological and physical break from the sport in which you have been competing and should be devoted to remaining reasonably active.
- Preparatory/Pre-Season
 - Emphasis is placed on developing general fitness as a solid base before there is a shift in training towards more specific game-related fitness work
- Competitive/In-Season
 - The emphasis is on maintaining pre-season fitness and recovering following competition

-
- b) What changes to an athlete's training program would usually occur in a successful taper? (2 marks)

Training loads would decrease/incorporate more recovery time.

This may be a reduction in - an outline/application of at least 2 of the following:

- Volume; Duration; Frequency; Intensity
-

- c) Discuss the training principle of variety and how it may apply to athletes preparing for the Tokyo Olympic Games. Provide an example of cross training which demonstrates this principle in action. (3 marks)

Variety relates to varying the training program to help maintain motivation whilst still addressing the specific conditioning needs of an athlete.

Provision of a physiological benefit i.e., incorporate a variety of energy systems/fitness components or to reduce reaching a plateau or to reduce overuse injuries, etc

Along with a suitable example i.e.

- An endurance athlete may choose to run, cycle and swim for extended periods. OR
- A power athlete may do resistance training, Pilates and a track sprint session, etc.

Question 6 (Criterion 2)

European soccer teams are often playing in multiple competitions in the one season. They may often have to play three games in one week. Their players have to be able to recover quickly in order to maintain their quality of play within this schedule.

- a) At half time in a match, players can at least recover partially through the process of EPOC. What does this acronym stand for? (1 mark)

Excess Post-Exercise Oxygen Consumption.

- b) Much of EPOC is involved with oxygen debt. Identify and discuss the purpose of each of the two components of oxygen debt (2 marks)

- Alactacid O₂ Debt or Alactic O₂ Debt or fast/rapid recovery stage
 - replenish stored ATP & CP, re-saturate haemoglobin and myoglobin with O₂
- Lactacid O₂ Debt or Lactic acid debt or slow recovery phase
 - oxidise accumulated lactic acid, replenish glycogen stores

- c) To assist recovery players will often use water-based strategies. Name TWO of these strategies and, for one of these, outline when it is best used. (2 marks)

1/2 mark for any two of the following methods and further 1 mark for correct use – i.e., after exercise.

- Cold Water Immersion (CWI) - Primarily used post training sessions, training in the heat or during the acute phases of muscle injury, soreness or bruising i.e., for contact sports. To reduce blood flow to the muscles.
- Contrast Water therapy (CWT) Primarily used post training session to reduce venous pooling

- Hot-water immersion (HWI) Primarily following high intensity training and/or competition. Can be used for heat acclimatisation. Can be used to promote blood flow to muscles.
- Low intensity pool session: Usually when athletes are injured or suffering ongoing soreness.

-
- d) Following training and matches, each of which take about 90 minutes, a major focus for players will be their nutritional intake. Write a team guide for this aspect of recovery which addresses the consumption of carbohydrates and protein and the restoration of muscle glycogen. Consider any required time frames in your guide. (4 marks)

It can take up to 48 hours to completely re-stock glycogen stores. Most will be replenished in 5-10 hours. To assist this process, consider the following in the first hour after exercise:

- Consume some high GI foods - immediately following exercise
- Consume low GI carbohydrates - within an hour
- Consume protein within an hour
- Consuming protein with CHO - enhances glycogen storage
- Avoid consuming any fat as it slows glycogen restoration

-
- e) What does DOMS stand for? Provide ONE action a player can take to avoid or minimise it. (1 mark)

Delayed Onset Muscle Soreness.

½ mark for any one of the following:

- Warm up
 - establish appropriate training loads – progressive overload
 - don't overload too quickly
 - active recovery
 - stretching
 - CWI or contrast or HWT
 - non-load bearing exercise
 - Massage
 - Exercise the same activity at a reduced intensity
-

Question 7 (Criterion 5)

Six teenage rowers (S1 – 6) undergo five field tests to determine their physiological condition after 16 weeks of training prior to their first regatta. They will be compared with each other and against an accepted minimum standard for each test to be selected in a crew of four.

- a) In which test did all subjects exceed the minimum standard? (1 mark)

Plank - Data needed e.g., Minimum standard is 1min 30sec and all subjects exceeded this.

- b) Rank the subjects from lowest to highest for their flexibility. Include data in your answer. (2 marks)

S6 lowest with 14cm, then S2 & S5 with 19cm; S1=25cm; S3 = 27cm; S3 = 27cm and highest is S4 with 31 cm. All data needed and correct order for full marks.

- c) What is the obvious anomaly in the results for S6 when compared to the minimum standards? Include data in your answer. (2 marks)

S6 was the worst performer against the minimum standard for four of the tests but in the plank, they exceeded the minimum standard by 40 sec or got the highest score of 2m 10 sec, more than any other subject.

- d) Describe the relationship between the results for the multistage fitness test and the 20RM squats. Include data for three subjects in your answer. (3 Marks)

There is a direct relationship. The ranking for the MSFT is the same as for the squats. OR the greater the performance in MSFT greater the performance in squats.

Positive correlation i.e., as the MFT scores improve so to do the subjects Squat scores.

The highest MFT score is S5 with 14.2 + the highest Squat of 19kg, The S2 has the second highest MFT of 13.4 + and the second highest squat of 17kg, S3 has the third highest MFT of 12.6 + the third highest Squat of 16kg, (others relating to: S4-11.8 + 15kg, S1- 10.7 + 14kg, S6 lowest for both scores of level 9.5 + 12kg) *could also refer to the rank of each performer on each test.*

- e) If selecting the crew which rower do you consider should be the first selected? Justify your answer by including data in your answer. (2 Marks)

S3. The only one to exceed the minimum standard on each test and the only one ranked in the top three for each test. Best performances were 1st, 63cm box jump and 2nd, 27cm for flexibility and 1m 50s for plank. *Other data may be acceptable.*

OR

S5. The best CVE as seen in MSFT with the highest score of 14.2 and best in Squat Test 19kg, 2nd in Box jump 60cm and sit and reach 19cm and third highest in Plank 1m45.

Solutions

Section B – Skill Acquisition

Question 8 (Criterion 3)

Volleyball is always a spectacular and popular sport at the Olympic Games. It is fast, presents lots of information to the players, involves a projectile and requires players to have good balance.

- a) **Identify two cues available to the players to help them plan their response as the ball crosses the net onto their side of the court.** (1 mark)

Any two for ½ mark each: Speed of ball, ball's angle of flight, ball's direction, position of own players, position of opponents, sound of the ball on contact, etc.

- b) **Define orienting and selective attention and use an example from the image above to demonstrate their use in volleyball.** (4 marks)

Orienting – knowing where in the environment to focus your attention and look for important information.

Selective Attention – knowing what to focus your attention on (Relevant cues).

Orient to the player (9) striking the ball. Selectively attend to its speed and direction, whilst blocking out noise.

- c) **Identify TWO things player Number 8 is doing to improve her stability.** (1 Mark)

Any two for ½ mark each: Lowering her centre of gravity, broadening her base of support and positioning her centre of gravity within her base of support.

- d) **Is volleyball played in a closed or open environment? Justify your answer.** (2 Marks)

Open. Towards the Open end of the continuum

The environment (players and ball) dictates the timing and execution (externally paced) of skills and the environment is unpredictable. Except for the serve, which is closed, the player has full control of this.

- e) **A ball often changes direction by deflecting off a player or the net. Name and explain the concept that leads to players often not reacting quickly enough to this change.** (2 Marks)

Psychological refractory period.

There is a delay in reacting to a second stimulus (change of direction) presented soon after the presentation of an initial stimulus (original direction) because we can only process one stimulus at a time.

Question 9 (Criterion 3)

Australian World Champion Javelin thrower, Kelsey-Lee Barber, is consistently performing at the elite level in this throwing event. She is considered a strong Olympic medal chance in 2021.

- a) Javelin throwing has both fine and gross skill elements. Demonstrate your understanding of these skill classifications by identifying an aspect of throwing the javelin that is fine and one that is gross. (1 Mark)

Fine – hand position on grip.

Gross – weight transfer onto front foot. Etc.

- b) Kelsey-Lee has spent many years learning and refining her throw. Identify the three stages of learning and, for each, provide a practical example of how her coach may have applied them to Kelsey-Lee's skill development. (3 Marks)

- Cognitive – understanding the skill, make many errors, high reliance on feedback – coach corrects order of the subroutines after each throw.
- Associative – practising the skill to establish feeling timing and sequencing of sub-routines – coach has her repeatedly practising her run up.
- Autonomous – skill performed without thought on individual components and repeats skill consistently – coach has taught her to pick up wind changes and modifies direction of throw.

- c) What is schema? Explain how it could apply to throwing the javelin. (2 Marks)

The rules/guidelines that enable change in skill execution to match environmental change. We learn these general rules and store them in LTM. Wind blowing across from the right may need a run-up that takes the athlete to the right of centre.

- d) There are a number of factors which influence projectile motion. Identify three and explain how changes in each could have a positive and/or negative influence on how far the javelin can be thrown. (3 Marks)

Any three of the following for 1 mark each (½ mark for the factor and ½ mark for the influence):

- Angle of release – if the angle is too great the javelin will go too high and lose distance. Too acute and it will go too low and lose distance.
- Velocity of release – if the velocity is too slow distance will be compromised.
- Height of release – if the height is too high it will be difficult to sequence sub-routines correctly. Too low and the upper arm will not be used fully. Force and distance lost in each situation.
- Shape – the more aerodynamic the further it should travel.
- Air resistance – the less drag the further it should travel.
- Spin – Little application to javelin but may impact javelin curving left or right in flight.

- e) **What is a sub-routine? Discuss why it is important for Kelsey-Lee and her coach to have a good understanding of the sub-routines necessary to throw a javelin.** (3 Marks)

A sub-component of a skill. Sub-routines are joined together to form a skill. Sub-routines need to be sequenced in the correct order and executed with the correct timing. This knowledge enables informed change able to be made when problems occur and/or when seeking increased distance.

Question 10 (Criterion 3)

Taekwondo is a highly physical and technical combative sport. Points are awarded for accurate contact with different parts of an opponent's body. Avoiding contact is as important as making contact.

- a) **When learning the necessary skills of taekwondo practice is essential. Outline two reasons why distributed practice may better suit a beginner in this sport than massed practice?** (2 Marks)

Massed practice entails practicing a skill consistently and continuously without breaks until the skill has been learned. It is fatiguing and may decrease motivation and is not as appropriate for beginners.

Distributed practice consists of short, frequent practice sessions interspersed with intervals to recover and receive feedback.

- b) **Once an athlete has acquired the necessary skills to compete explain how their competitive performance could be improved through varied practice.** (2 Marks)

Varied practice encourages problem solving and development of game sense through the use of various situations athletes may encounter in competition. Skills are practiced in an open environment and schema can be developed.

- c) **Identify two main roles of feedback. For one, briefly discuss how it could be applied to a taekwondo athlete.** (2 Marks)

Any two of the following for 1 mark each:

- Motivation – improving consistency of foot strikes confirms quality of training. (KR)
 - Reinforcement – winning more matches reinforces skill set.
 - Regulate or change performance during the activity - KP about balance enables athlete to make changes whilst competing.
 - Improve future performance – external KP provides guidance for necessary change.
-

- d) What is short term memory? In providing feedback to athletes why should a coach avoid providing them with too much information? (2 Marks)

STM is limited capacity memory (5 – 9 items) which can be retained for about 60s. Too much information will overload the athlete and much of the feedback will not be attended to.

- e) Elite taekwondo athletes kick and punch with great speed. Identify two factors that will influence their opponent's ability to avoid contact. (1 Mark)

Any two of the following for ½ mark each: Reaction time, age, gender, movement time, psychological refractory period, orienting, selective attention, schema, anticipation, presence or absence of warning signals, experience, fatigue, sensory (visual) acuity, etc.

- f) Using two anatomical terms to describe movement, how did athlete 1 move his left leg to its position and how did he bend his right leg. (2 Marks)

Left leg was abducted, or left hip was flexed, and left knee extended.

Right leg flexed at the knee.

- g) Discuss two benefits of the athlete's coach using video analysis following competition to review the performance with the athlete. (2 Marks)

Recorded vision is a constant record and can be replayed, it can be played in slow motion, be paused, can be watched by the athlete, the athlete can match the feel of their performance with actual movements and the vision can be analysed within motion analysis software, etc.

Question 11 (Criterion 5)

Long jump is an athletic event in which participants become a projectile.

Figure 1: Components of long jump.



Source: <https://www.aths.coach/resources/long-jump-the-technical-model>

Table 1: Average performance data for five competent long jumpers.

Jumper	Approach speed (metres/second)	Angle of take-off (Degrees)	Height of centre of gravity during flight (metres)	Distance jumped (metres)
1	7.5	27.8	1.37	7.58
2	8.2	25.0	1.39	7.83
3	9.6	22.1	1.36	8.30
4	8.7	23.6	1.38	8.15
5	9.6	22.4	1.35	8.28

a) Explain the impact of approach speed on distance jumped for Jumpers 2 and 4. Include data in your answer. (2 Marks)

- J2 ran at 8.2m/s and jumped 7.83m. J4 ran at 8.7m/s and jumped 8.15m.
- For these jumpers increased approach speed resulted in greater distance jumped.

b) What effect does approach speed have on angle of take-off? Include data in your answer. (2 Marks)

- The faster the approach speed the more acute the angle of take-off.
- Expect at least two pieces of data to illustrate this.

E.g., Athlete 3 & 5 had fastest approach speed @ 9.6m/s – their angle of take-off were 22.1 and 22.4 degrees respectively. The slowest approach was by Athlete 1 who approached at 7.5m/s and their angle was much greater at 27.8 degrees.

c) Describe what the jumper (Figure 1) is doing during the landing phase to increase distance jumped. Use the appropriate anatomical term for the movement you have described. (2 Marks)

- The jumper elevates both legs to increase the time in the flight stage before landing.
- Flexion at the hips. May use a different anatomical movement.

d) With reference to three jumpers which two components of the jump appear to be most important to maximise distance jumped? Include data in your answer. (4 Marks)

- Approach speed and angle of take-off.
- Jumpers 3, 5 and 4 jumped the furthest. They had the three fastest times at 9.6m/s, 9.6m/s and 8.7m/s respectively. They had the three most acute angles of take-off at 22.1, 22.4 and 23.6 degrees. Height of C of G is not of great influence as J4 had a measure of 1.38m, more than J1 and less than J2, and jumped further than each of them.

Solutions

Section C – Sport Psychology

Question 12 (Criterion 4)

The Australian Women's Cricket team, led by Meg Lanning, is now the most successful one day cricket team in history, men or women, after winning 23 matches in succession.

- a) **Define self-confidence and use an example to demonstrate how this definition applies to this Australian team.** (2 Marks)

Self-confidence is a person's general belief in themselves and their abilities.

Any example that confirms the link between skill, training, strategy, etc and performances.

- b) **Identify two self-efficacy traits Meg Lanning may demonstrate to assist her to lead this team.** (1 Marks)

Any two for ½ mark each: Feel confident, apply themselves, are persistent in the face of difficulty and accept challenging tasks.

- c) **What type of goal is winning 23 matches in succession? Provide an example of a team process goal and a team performance goal which would have assisted them to win these matches.** (2 Marks)

Outcome or result goal.

Process – always be at training on time, etc.

Performance – flat, bounced throws from the outfield, etc.

- d) **Each player would have set their own goals in order to contribute to the team's performance. Provide an example of an individual goal which meets the requirements of the S and the M in the SMARTER acronym.** (2 Marks)

Specific and Measurable. For example - Aim to improve running speed between the wickets when batting by 10 %.

- e) **Briefly discuss how the team may apply three pre-competition strategies at the venue to assist players to be as prepared as they can for each match.** (3 Marks)

A discussion of how any three of the following apply for 1 mark each: Arrival time, who to report to, physical preparation, mental preparation, dressing for the contest, team meetings/individual interaction with coach, who to spend time with and final personal preparation.

Question 13 (Criterion 4)

100 metre sprinter, Rohan Browning, has recently qualified for the 2021 Olympic Games. Although running well he had been struggling to run the time he needed to qualify.

- a) **Sprinting is an individual sport. Briefly discuss how Browning's Self Determination needs of competence and autonomy are satisfied.** (2 Marks)

Competence – as an individual sport only RB could control outcomes and deliver quality performance. His competence is obvious.

Autonomy – he wishes to be (and be seen to be) totally responsible for his life as an athlete and coping well with that and his whole life.

- b) **Discuss the differences between extrinsic and intrinsic motivation and provide one example of each that Browning may experience in his sport.** (3 Marks)

Motivation which is derived *internally* or intrinsically. Intrinsic motivation is usually in the form of satisfaction from doing something well, feeling proud about what you have achieved and enjoying the activity for what it is. E.g., PB, improved start, good training set, etc.

Motivation which is driven *externally* or extrinsically. Extrinsic motivation is usually in the form of reward or recognition for performance. E.g., money, a trophy, a medal or TV interview.

- c) **When Rohan Browning was struggling to achieve his qualification time goal, what were two motivational techniques he may have used?** (1 Mark)

Any two for ½ mark each: Goal setting, motivational music, use of extrinsic rewards, positive self-talk, seeking out different training partners, etc.

- d) **A 100m race is over in about ten seconds. Provide four mood or cue words that may help Browning focus on the necessary effort.** (2 Marks)

Any four for ½ mark each: Any words which convey the feeling of power and speed, such as: jump, fast, push, explode, strong, blast, etc.

- e) **Identify the four necessary aspects of de-briefing. Provide an example for each that Rohan Browning may experience with his coach following a race.** (4 Marks)

- As soon after performance as possible - e.g., Commence during the cool down
- Identify performance factors which were omitted - e.g., "What happened to the 7th shorter stride at the start?"
- Identify positive and negative aspects of performance - e.g., "Start was good but you didn't run through past the finish line."
- Involve the athlete - e.g., "What did you think about the first 30m?"
- All examples are indicative only, not prescriptive.

Question 14 (Criterion 4)

Tennis player Ash Barty went from being one of the best junior tennis players in the world, to a cricketer in the Big Bash, to now being the number one women's tennis player in the world.

- a) **After success as a younger player, Barty has said that she often felt anxious coping with expectation. Define trait anxiety and state anxiety. Provide two examples of cognitive/psychological symptoms Barty may have experienced as a consequence of her anxiety.** (3 Marks)

Trait – anxiety of our personality that is always with you.

State – situational anxiety or the anxiety perceived to be in a situation.

Any two of the following: Indecision, Sense of confusion, Feeling heavy, Negative thoughts, Poor concentration, Irritability, Fear, Forgetfulness, Loss of confidence, Images of failure, Defeatist self-talk, Feeling rushed, Feeling weak, Constant dissatisfaction, Unable to take instructions Thoughts of avoidance, etc.

- b) **Explain the Inverted U hypothesis and discuss how it may have applied to Ash Barty as a younger tennis player.** (3 Marks)

As arousal increases so too will the quality of performance until arousal passes beyond an optimal level. Beyond this optimal range of arousal performance will diminish. If arousal is below optimal performance will be poor.

As a younger player, Barty was one of the world's best juniors. This suggested that she was able to control her arousal levels and usually keep them in the range for optimal performance.

- c) **As a senior tennis player Barty works with a psychologist. Identify four methods they may have identified as a means for her to lower her arousal levels.** (2 Marks)

Any four of the following for ½ mark each: Accept that some tension or anxiety is usual prior to competition, Engage in preferred relaxation technique, Engage in mental rehearsal, Focus on task relevant factors. (If over aroused during performance), Seek out others who are calm, Listen to your favourite music, Engage in a preferred distracting activity, Downplay the importance of the contest and the result (for her coach), Find time for relaxation, Direct athletes' attention to the process required to perform well (from the coach), Present a calm presence themselves. (psychologist or coach), Remind the athlete of their thorough and appropriate preparation, Provide a pre-competition strategy which provides the necessary control and direction to limit anxiety (for the coach), Keep sport in perspective.

- d) Ash Barty's attention needs to shift between different attentional dimensions throughout a match. Identify the most appropriate dimension for her to be in for each of the following situations. (2 marks)

Attentional Dimension

- Focusing on her grip on the racquet **Narrow Internal**
- Tossing the ball and serving **Narrow External**
- Tracking the ball and her opponent's position **Broad External**
- Considering her options to return the ball **Broad Internal**

- e) Define mental rehearsal. Discuss two guidelines Barty can use to improve the quality of her mental rehearsal. (3 Marks)

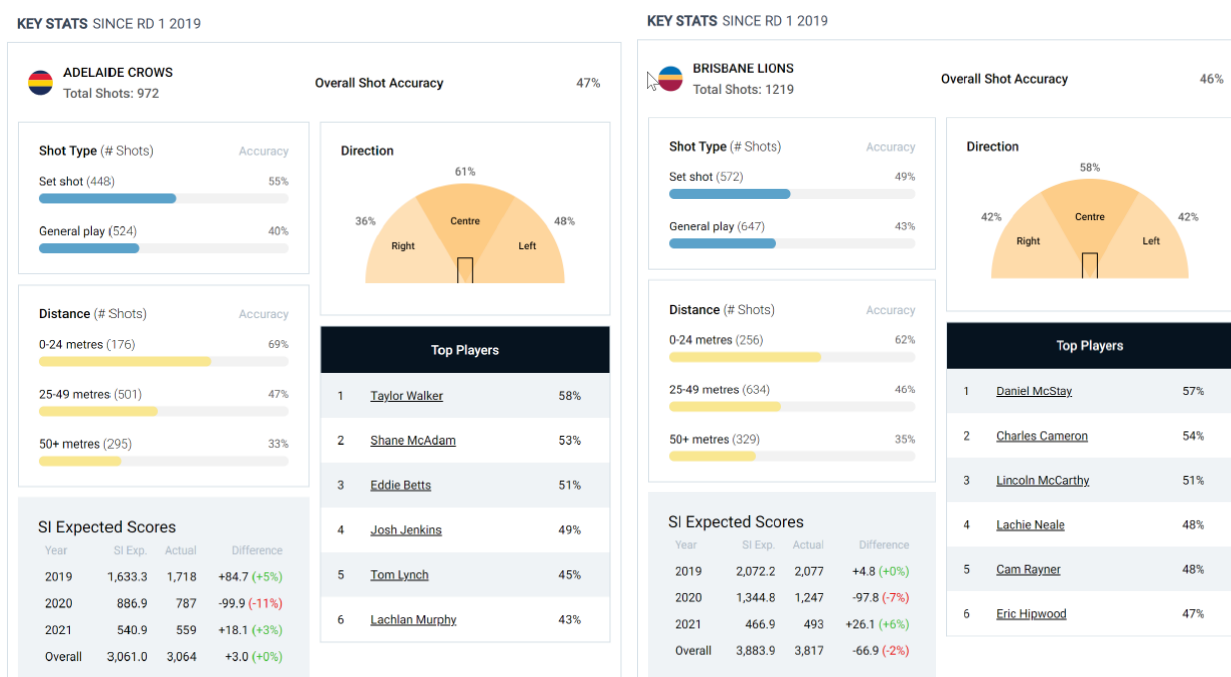
The process of imagining yourself performing a specific movement or skill.

Discuss any two of the following for 1 mark each: Start with a relaxation, Stay alert, Use the present tense, Set realistic goals, Set specific goals, Use all of your senses, Visualise from the inside out and the outside in, Visualise at the correct speed, Practice regularly and Enjoy it.

Question 15 (Criterion 5)

The AFL is now a sporting organisation which includes the provision and analysis of a significant amount of data related to Key Performance Indicators for goal scoring.

Table 1: Comparative performance data for the Adelaide Crows and the Brisbane Lions since 2019.



Note: SI is the data provider.

Source: <https://www.statsinsider.com.au/afl/shot-charting>

- a) Which team should attack more from the left than the right? Include data to support your answer. (2 Marks)

Adelaide. From the left they score at 48% but from the right only 36%. Brisbane were the same from both sides 42%.

- b) In 2019 which team achieved the highest total score? Include data to support your answer. (2 Marks)

Brisbane. 2077 to 1718 for Adelaide.

- c) In 2020 both teams scored less than expected. What was this amount for each team? (2 Marks)

Adelaide 787; Brisbane 1247.

- d) Of the least accurate players for each team which would you prefer to kick at goal? Include data in your answer. (1 Mark)

Eric Hipwood. He shot with 47% accuracy compared to Lachlan Murphy whose shot at 43%.

- e) With reference to Shot Type and Distance describe the best way for the Adelaide Crows to score goals. Are they better or worse than the Brisbane Lions with these methods? Include data to support your answer. (3 Marks)

Set shot (55%) is better than General play (40%) and the best distance is from 0 – 24m (69%) compared to 47% and 33% respectively for 25-49m and 50+m.

They are better than Brisbane who only achieve 49% for set shots and 62% from 0 – 24m.

Solutions

Section D – Cross Disciplinary Links

It should be noted that the following exemplars represent the upper level for each rating and are meant to act as a guide for students who aspire to achieve at the respective rating levels.

Question 16 (Criterion 6)

Tennis player, Roger Federer, has recently returned to playing competitively following a disrupted 2020. This included surgery on both of his knees followed by a long period of rehabilitation. Use two cross discipline links between Sport Psychology and Exercise Physiology that indicate how Federer has been able to recover and return to competition relatively quickly. (15 Marks)

- The two core units are: **Exercise Physiology – Sport Psychology**
- Links must be made from a *positive* perspective, for example, what Psychological strategies did RF use and how did these positively impact on his Physiology during and/or after a disrupted year?

- Links can go in either direction.
- 2 Links are to be completed, worth 7.5 marks each, according to the CDL Marking Guide.
- Examples of possible links could include:
 - RF was motivated to undertake effective recovery (considering he had had major knee surgery)
 - Goal setting enabled RF to periodise and plan his return to the circuit using effective rehabilitation.
 - RF was motivated to utilise effective training principles in his rehabilitation.
 - RF's self-confidence was enhanced by his careful planning and periodisation of his 'year'.

The main “pre-prepared” links revolved around recovery strategies and **motivation, goal setting and the training year or training session.**

Exemplars

“C” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “C” rating.

Goal Setting – Training Principles

RF will use goal setting to govern how he uses training principles.

SMARTER Goal setting is used by athletes to guide training and give them a direction to aim for. Short- and long-term goals will provide stepping stones of achievement and increased motivation.

Training Principles are the basic rules which govern why we train the way we do. They include principles such as specificity, progressive overload and intensity.

By following training principles, RF will be able to maximise the time he spends training for his comeback. Pairing this with effective goal setting which is realistic and measurable will allow him to gain full benefits from his efforts. He will measure his intensity (or level of effort) of training so that he knows he has reached a goal which has been set by his coach.

“B” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “B” rating

The utilisation of training principles and goal setting enabled RF to plan his comeback.

Training principles are those rules which govern what we should do in our training to obtain the outcomes we want to achieve. Training principles that RF would need to use in his comeback would include specificity and progressive overload.

Goal setting gives us aims or targets which help us to remain motivated and striving to improve. RF would need to set goals which are both short term and long term.

His short-term goals provide steppingstones on the way towards the longer-term goal which would be to be able to compete again on the Pro circuit.

RF would use short term goals such as to be able to strengthen his knees and lower legs gradually after his surgery. This would involve progressively or gradually overloading the body so that he can heal without doing too much. He may begin by walking, progressing through to a half squat then finally moving to a lightweight leg press. These exercises would need to be closely monitored to ensure he is meeting goal standards he has set which are both realistic and achievable without overloading his body. RF would use the principle of specificity to target the physiological systems and training adaptations required to be able to play tennis at this level.

“A” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “A” rating.

Thorough goal setting enabled RF to utilise training principles to maximise his rehabilitation

RF would use goal setting to motivate himself and provide him with direction and aims in his comeback. He would set both short and long term ‘staircase’ goals and would also need to focus on his process and performance goals to return to the high standard of play he is used to producing.

RF would need to utilise training principles to guide his progress and ensure he is training for and obtaining the correct outcomes for tennis. Without following training principles RF’s training may be wasted. He would utilise many training principles including variety and individuality as well as progressive overload.

RF would set a short-term goal to be able to move around the court. He would start by walking, with the progressively overloading goal to be able to run and perform with agility as he would need to when he makes his comeback (his long-term goal). RF would use the variety principle to help maintain motivation. Process goals which focus on his action of serving will need to be set so that he will be able to return to serving at a standard which is high enough to be competitive (he will use the individuality principle to achieve this – specific to his own strengths and weaknesses). Performance goals such as returning to a specific % of first serves in will provide a motivation for him to achieve success and a principle which can be worked on progressively. He would ideally like to increase his serve speed and accuracy until he finds a trade-off between the two. He may set a performance goal to be at a standard which is similar to where he was at prior to his surgery.

Question 17 (Criterion 6)

Australian basketballer, Patrick (Paddy) Mills, has maintained a long and successful (15 Marks) career with the San Antonio Spurs in the NBA, the world’s strongest basketball league. Use two cross discipline links between Sport Psychology and Skill Acquisition that have assisted Mills maintain his very high playing standard.

- The two core units are: Sport Psychology – Skill Acquisition
- Links must be *positive* in nature – what Psychological strategies did PM utilise to maintain his high playing standard.
- Links can go in either direction.
- 2 Links are to be completed, worth 7.5 marks each, according to the CDL Marking Guide.
- Examples of possible links could include:
 - The use of feedback enabled the employment of effective goal setting.
 - Effective arousal control enabled the ability to selectively attend.

- Effective use of goal setting enabled the development of skilled output.
- The development of schema helped develop self-confidence and self-efficacy.
- Well-developed schema helped PM achieve 'flow state'.
- High levels of motivation allowed PM to undertake effective practice.
- The ability to effectively shift between attentional styles ensured PM was able to selectively attend.

Exemplars

"C" Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a "C" rating.

Selective Attention - Arousal Control

Paddy Mills (PM) is an elite level basketballer who can control his levels of arousal to improve his selective attention.

When he feels he is over aroused, PM can calm himself down by listening to chilled music or focusing on his breathing. Arousal looks at whether an athlete is over, under or optimally aroused according to their performance level.

Selective attention is the ability to focus on the right information in the environment, ignoring the 'noise'. Noise would include crowd sledging and all the distractions that come with a basketball game such as music and opposition players and crowds. Relevant cues for PM would include the ball, his teammates, and the opposition.

PM can stay in the optimal arousal zone by using personal strategies to increase or decrease levels so that he can selectively attend to important cues. His ability to maintain optimally aroused, focus on the relevant information and sift out the irrelevant makes him a valuable player.

"B" Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a "B" rating.

PM's arousal control enables him to selectively attend more effectively.

PM is an experienced player who is well aware of how to control his arousal levels both before and during a game. He is calm under pressure and is expert at not allowing himself to become over aroused. The Inverted U Hypothesis states that when in optimal arousal, performance is at a maximal level. If an athlete is over or under aroused, performance ultimately suffers.

Selective attention is the ability to focus on all the relevant cues or stimuli and block out all irrelevant 'noise' from the environment. This would be exceptionally important for PM as he plays in front of large crowds with a lot of background noise and many distractions.

PM can block out these irrelevant cues and focus on those which are relevant and important to his game. Selective attention enables PM to be able to see the play better and make more effective decisions based on his prior experience.

Arousal levels need to be at an optimal level if PM is to be able to selectively attend well to the numerous scenarios that he will face during a game. If PM were to be under or over aroused, he may miss important cues and make poorer decisions. PM would be able to effectively control his arousal levels in order for him to maintain pinpoint selective attention he requires to focus on the game.

“A” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “A” rating.

PM's effective methods to control his arousal levels will enable him to be able to selectively **attend to relevant cues and stimuli in the environment more effectively.**

Hardy and Fazey proposed the Inverted U Hypothesis which states that when optimally aroused, an athlete will perform at their best level. If the athlete were to be under or over aroused, their performance will ultimately be negatively affected. PM must develop strategies for ensuring he is optimally aroused at all times during his performances. He will have the knowledge and ability to use music which could raise or lower his arousal and know when he needs to do this. Controlled breathing, a vigorous warm up, a pep talk from the coach or a team mate or yoga may be other strategies he could use to alter his arousal level.

Selective attention is the ability to focus on all relevant information and ignore all irrelevant information or 'noise' in the environment. This would be exceptionally important for PM as he will encounter constant distractions whilst playing from the opposition, the sound effects / music and the crowd. PM needs to be able to block out these irrelevant cues and focus on the relevant ones such as where his teammates are as compared to the opposition and where he is on the court in regard to the hoops. His decision making will be largely affected by his ability to read the important information without being overloaded by the unimportant.

PM's ability to control his arousal levels will enable him to be more effective at selectively attending. If he can remain in the optimal zone, he will become less flustered or overloaded by the distractions and more able to immerse himself in the task at hand. Optimal arousal will aid him to concentrate on the relevant cues, making his choices of whether to pass the ball on or go for a shot himself more measured. PM's selective attention abilities are a result of past performance play and the development of schema where he can adapt his play to the environment. For him to be able to do this, he must be able to look for those important cues and to do this effectively, he should be in his optimal arousal zone.

Question 18 (Criterion 6)

No matter which sport they compete in, athletes will always try to gain an advantage over their opponents by improving their physical condition and their skill execution. (15 Marks)

Select an athlete or team, specify their sport and use two cross discipline links between Exercise Physiology and Skill Acquisition to demonstrate how they can improve their performance.

My sport is: _____ My athlete and/or team is: _____

You may wish to consider a specific scenario: e.g.- lead up to a major match/competition; during pre-season; returning to team after being dropped/injured etc.

- The two core units are: Exercise Physiology – Skill Acquisition
- Links must be POSITIVE in nature – improving and gaining an advantage / improve performance.
- Links can go in either direction. i.e., from Exercise Physiology to Skill Acquisition OR from Skill Acquisition to Exercise Physiology.
- 2 Links are to be completed, worth 7.5 marks each, according to the CDL Marking Guide.
- Examples of possible links could include:
- A bioM analysis ensured the athlete/team utilised the most effective training methods
- Ability to delay fatigue by increasing LIP allowed the athlete/team to utilise their IP system effectively
- Developing the correct fitness components allowed the athlete/team to undertake the best practice types
- Effective recovery enabled the athlete to be able to undertake appropriate practice
- By utilising effective feedback, appropriate training methods could be undertaken
- By developing their LIP, an athlete can delay fatigue and be able to selectively attend more effectively for longer.
- Chronic muscular adaptations enable the athlete to be able to decrease their movement and therefore response time.
- Within a training session, the athlete can work on embedding their skills into their muscle memory.

Exemplars

Connor McGregor (CM) is a dominant figure in Mixed Martial Arts (MMA) with multiple titles to his name. In 2017, he entered the boxing ring with champion boxer Floyd Mayweather.

“C” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “C” rating.

LIP – Whole massed practice.

Beyond the LIP there is an accumulation of lactate in the blood. LIP is affected by the type of training and how hard they train. Exceeding the LIP causes fatigue.

Whole massed practice (WMP) is practising the skill until it is learnt. WMP is highly fatiguing. It is suited to older more experienced athletes.

Because CM has a high LIP from MMA he can use WMP to learn the skills of boxing without getting too fatigued. He will need to train at high intensity to increase his LIP over mass training periods to replicate match conditions.

“B” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “B” rating.

CM's LIP means he can use WMP to learn new skills.

Once you pass your LIP there is a rise in lactate in the blood that cannot be removed at the same rate that it is produced which results in fatigue. Athletes can train to increase their LIP to 90% of their maximum heart rate. They can use interval and continuous training to increase their LIP.

Whole massed practice is not appropriate for beginners as it is complicated and decreases motivation. It is learning the new skill consistently without breaks. WMP is better for older and more competent athletes.

CM would have a high LIP due to the intensity of his MMA training, which means he can use WMP without feeling the fatigued. Because CM is older and experienced, WMP is better for him to use to learn new skills as his accumulation of lactate is delayed because of his high LIP. If CM reaches LIP he can take a buffering supplement so he can learn the new skills continuously.

“A” Standard

The following is an example of a link that could have been made. If two links of a similar standard were written, the student would have received a “A” rating.

Connor McGregor's (CM) high lactate inflection point (LIP) would allow him to utilise whole massed practice to learn the new skills of boxing.

Once the LIP is exceeded there is an accumulation of lactate in the blood (4mmols), that can no longer be removed from the body at the same rate it is produced, which results in fatigue. Factors that affect LIP include fitness, environmental, nutritional status, genetics, types of training and intensity. LIP is often considered a better indicator of fitness than VO_2 max.

Whole massed practice (WMP) is practicing continuously without breaks until the skill is learnt and is necessary for improvement. WMP is complex and suited to more competent athletes and is a fatiguing type of practice.

As CM is already an elite MMA fighter, he would have a high LIP, meaning he can focus his training on skill acquisition for boxing rather than fitness. CM's high LIP means he can train for longer duration before fatigue affects his training, which allows him to utilise WMP and learn boxing skills in their entirety. CM's LIP also means he can train at the high intensity needed for boxing and his high LIP will allow him to train at 90% of his maximum heart rate. Because WMP is fatiguing it is better suited to elite athletes like CM, as he is already able remove the accumulation of lactate for a longer duration than the average person before fatigue becomes a factor.
