YEARS 11&12

SPORT SCIENCE

TEACHING & LEARNING SUPPLEMENT

INDEPENDENT SCHOOLS TASMANIA

TASMANIAN CATHOLIC education office

Tasmanian Government

Teaching and Learning Supplement

SPORT SCIENCE (SPT315118)

ADVICE TO TEACHERS

This document helps to describe the nature and sequence of teaching and learning necessary for students to demonstrate achievement of course outcomes.

It suggests appropriate learning activities to enable students to develop the knowledge and skills identified in the course outcome statements.

Tasks should provide a variety and the mix of tasks should reflect the fact that different types of tasks suit different knowledge and skills, and different learning styles. Tasks do not have to be lengthy to make a decision about student demonstration of achievement of an outcome.

COURSE SPECIFIC ADVICE

This Teaching and Learning Supplement for *Sport Science* Level 3 must be read in conjunction with the *Sport Science* Level 3 course document. It contains advice to assist teachers delivering the course and can be modified as required. This Teaching and Learning Supplement is designed to support teachers new to or returning to teaching this course.

HEALTH AND PHYSICAL EDUCATION SUITE

Level	Sport Group	Recreation Group	Health Group	Outdoor Group
3	Sport Science 15		Health Studies 15	Outdoor Leadership 15
2	Sport Science-Foundation 15 Athlete Development 15 Community Sport and Recreation 15		Personal Health and Wellbeing 15	Outdoor Education 15
1	Fitness Experiences 5 Sport and Recreation Experiences 10		Personal Care 10	Outdoor Experiences 5
Pre	Sport and Recreation for Life 10			

Sport Science is a Level 3 course in the Sport group of the Health and Physical Education (HPE) suite of courses. Sport Science is a rapidly expanding field, which encompasses the physiological, psychological and skill acquisition components involved with planning and analysing human performance.

This course is underpinned by a focus on understanding the world of competitive sport, and is delivered in the context of building moral and professional ethics, exploring the balance required for maximising holistic outcomes for athletes and relating theoretical knowledge and concepts to their application in various performance settings.

Sport Science Level 3 encompasses the individual and collective significance of physiological skill acquisition and psychological components in analysing and improving human sports performance.

The course examines three discipline areas:

> Exercise Physiology, including: the study and preparation of athletes; how to improve their performance under stress in both training and competition; how their bodies produce energy for physical activity; understanding how they recover; the theory behind training programs; and what it means physiologically to be fit.
>
> Skill Acquisition, including motor skills and learning, particularly focussing on: teaching and coaching; the importance of reaction time; and the study of biomechanics, including the use of technology to analyse and improve skill execution.
>
> Sport Psychology examines the mental aspects required for preparing participants for sporting activities. It also considers the cognitive processes that occur and how they impact on sporting performance.

The field of Sport Science requires an understanding of connections and cross-discipline links between various performance components. This integration across related disciplines working in synergy is what enables high-performance athletes to consistently generate, analyse, develop and replicate or build on their peak performances.

SEQUENCE OF CONTENT

There are five (5) units in this course:

Unit 1: Exercise Physiology A
Unit 2: Exercise Physiology B
Unit 3: Skill Acquisition
Unit 4: Sport Psychology
Unit 5: Scientific Investigative Methodologies and Skills

The order for delivery and assessment of Units in this course is not prescribed. Within each Unit, it is recommended that the given sequence of topics/sub-topics is retained.

Cross-Discipline Links

Complex cross-discipline links exist between Exercise Physiology (Units 1 and 2), Skill Acquisition (Unit 3) and Sport Psychology (Unit 4), hence the various units and topics they contain may have more limited meaning if they are treated discretely.

Learners are required to identify and explain links between the topics/sub-topics studied across the Units. For example, there are many links between topics covered in Unit 3 (Skill Acquisition) and those studied in Unit 1 and 2 (Exercise Physiology), and Unit 4 (Sport Psychology). A specific example of this is how an athlete's response time (Skill Acquisition) can be improved through isotonic resistance training (Exercise Physiology).

The study of such cross-discipline links involves applying logical, critical and innovative thinking to a range of problems and ideas, and transferring knowledge and skills, as well as making connections between the three disciplines.

The study of cross-discipline links should be:

1. integrated during the year, and
2. reinforced following the delivery of all the Units.

Timing of the study of cross-discipline links will necessarily vary depending on the provider's choices regarding the sequence of delivery of Units and topics/sub-topics. Cross-discipline links between Units/topics will be identified and discussed as they occur.

It is recommended that Units 1, 2, 3 and 4 are allocated approximately equal delivery time. Unit topics/sub-topics may be delivered as purely theoretical studies or as studies contextualized within practical activities.

TEACHING AND LEARNING

Unit 1
Exercise Physiology A (30 hours)

Exercise physiology is simply an understanding of how the human body responds to exercise. It falls under the umbrella of kinesiology, which is the scientific study of human movement.

Exercise physiology examines how your body's cells and organs, such as your cardiovascular, muscular and respiratory systems, are changed as a result of physical activity and exercise[1].

In Unit 1 the focus is around examining the fundamentals of energy systems, gas transport, and exercise response. The unit also leads into exploring the physical changes which take place when exposed to acute (short) and chronic (long, over time) exercise including some of the intended physiological adaptations which result through regular training. Unit 1 content is designed to scaffold the transition to the content covered in Unit 2.

Whilst incidental mention of related aspects such as thermoregulation, ergogenic aids, body composition, sport training, growth and development, and aging may occur, these can be time consuming. Teachers need to be mindful of managing time carefully and working closely to content described in the course document to avoid Units 1 & 2 extending beyond the design time and subsequently impacting course balance and appropriate attention to other units.

Unit 1 examines key topics including:
- Energy and Energy Systems
- Oxygen Delivery
- Effects of Training

Learners:
- consider the process of providing energy both at rest and during exercise of different intensity levels
- explore a range of factors related to energy systems and their efficiency
- explore the systems responsible for oxygen and chemical transport

Examples of learning activities

Learners:

work in small groups to create a series of flash cards that explain the processes of ATP splitting, storage and transportation

work in small groups to find examples and create their own infographic depicting the contributions of various energy sources to ATP replenishment, this might lead to a whole class share and judging – perhaps using a suitable online forum or space as the vehicle

read a provided resource on the function of the ATP-PC system before some critical thinking and recording of key points, implications and questions that they have; learners then work in pairs to share and develop their notes before some final class discussion, particularly on addressing any unresolved questions - this approach can be repeated for the Lactic and Aerobic systems

reflect on a provided statement, such as, "school cross country races are a way to measure genetic muscle fibre types" before posting a comment in a group online forum; they must then read others' posts, choose and respond to at least 3 peer comments or threads

create a Venn diagram that compares and contrasts the characteristics of fast and slow twitch muscle fibres

[1] 'Exercise Physiology: Definition and Goals', *Study.com*, https://study.com/academy/lesson/exercise-physiology-definition-goals.html (accessed 1 March 2018)

work together in a small group round table ; groups do 3 cycles around where they spend a maximum of 5 minutes on each energy system "brain dump" - each person in the group takes a 1 minute turn to verbally contribute everything they know about 1) ATP-PC, 2) Lactate, and 3) Aerobic systems (teachers may wish to give students notice of this activity so they can prepare or use it as a form of revision or to highlight self-awareness of progress)

following the above activity, work individually to build on the information to create a digital product (Prezi, Sparkol, Sway, etc.) summarizing the key points related to each energy system (teachers should highlight the potential value of this work to anchor future study and as a revision tool for later in the year)

investigate the changes in heart rate from rest to sub-maximal exercise through participation in a game (basketball, netball, soccer or volleyball) and use heart rate monitors, and/or an apps and/or a manual recording of the heart rate to compare the data collected

analyse data to determine the relationship between stroke volume, heart rate and cardiac output at rest, sub-maximal and maximal exercise intensities

work individually on a 10 minute challenge –create a written response to the question "describe how the energy continuum operates during a 20 minute kayak paddle"

interview a coach from a team based sport on ways they consider and address the energy systems in terms of;

- demands of their sport
- placing players in roles, and
- planning and organising their training

provide a short verbal summary which can lead to a whole class discussion around the practical application of sport science, current coaching practice, and the ways training can be improved (this would be a good activity to refer to, and possibly record, and to revisit later in the year, when examining cross discipline links)

work with a partner to devise a definition for 'steady state'

research and report on the significance of VO2 Max and methods for testing it

work in small groups, using some provided examples of past exam questions, to create an exam question that focusses on the Lactate Inflection Point (LIP); each group emails their question to the teacher for use in various ways, such as:

- a "Big LIP Friday"
- revision in-class test lesson
- a weekly homework task,
- peer marking
- in a class forum
- "rate-my-question" or "our shared revision resource bank" etc.

create a table summarising Acute & Chronic Training responses

Unit 2
Exercise Physiology B (30 hours)

During this Unit learners examine the application of key concepts and information from Unit 1 as applied to the sport setting. More specifically the focus is on analysing the physiological basis and appropriateness of various approaches to training and recovery that are commonly used.

This unit explores physiological responses in detail as applied to:

- Training Programs, and
- Recovery.

Learners explore:

- the components of fitness
- the format and breakdown of a typical training session
- fundamental training principles
- common training methods and their physiological basis
- emerging or currently popular methods of training
- periodization and the focus for different phases of the training year
- tapering and peaking for major events
- management of fatigue and recovery
- recovery enhancement strategies
- energy systems during recovery
- nutritional considerations for recovery
- delayed onset muscle soreness.

Examples of learning activities:

Learners:

work individually to compile a list in 5 minutes or less answering "what are components of fitness?" and use this to create a class list by "share one" rotation around the room until everyone is tapped out - teacher/learners attempt to group attributes by colour coding or symbol using categories of 'health related' and 'sport or skill related'

use a JIGSAW model to build understanding of a) Training Principles and b) Methods of Training

write a 1-Minute paper explaining the sequence of a well-designed training session

work in small groups on a range of provided scenarios applying training theory to provided examples; in groups, review, discuss alternatives, identify key components to develop and options to generate the physiological response sought (this may extend to a point where groups or individuals respond to a common scenario and pitch their proposals, or even develop their own scenarios and provide a suitable review comment/ summary; teachers should emphasise the need to *justify* and *explain* as the focus)

complete a workout using an emerging or currently popular method of training the follow this up with a class review of the experience, making particular reference to examining the activity against the work covered in Units 1 & 2. (this could be followed up by a class online forum where alternative methods are compared and discussed)

have 10 minutes to create a dot point periodised year plan for an athlete profile of their choice from 3 provided by the teacher – on completion learners find a partner who tackled the same scenario and do a share, compare and discuss

demonstrate their capacity for on-the-spot decision making and application of topics covered in class via randomly drawn athlete scenarios (this might be varied through several sessions or part of sessions by having small groups or individual challenges/responses) - this format of drawing a scenario and responding, connecting and justifying approaches supported by theory and course work to hypothetical sport situations, has potential and flexibility to be used in many ways - it might grow into a class challenge or a periodic end-of-lesson activity; learning may be supported by peer point allocation (score response out of 10), adding clarifying questions, or giving learners more time to prepare their response

have 15 minutes to create a digital product which demonstrates the key summary points related to Tapering and Peaking

work individually to answer a past exam question under exam conditions, learners then complete a short personal reflection on their experience and rate their own work against the criteria and standard elements, then work with a partner and travel through 3 cycles of pairs to share and compare their responses with 3 other people (the teacher may wish to use some form of whole class summary, feedback or discussion to collate and explore strategies and content that should be in a strong response - this could be a valuable group or exam-style 20-30 minute task to do at regular intervals; publish some exemplar responses in the class forum or in shared revision materials

participate in a small group discussion to examine the benefits of using various recovery strategies; this can be extended by using 3 different athlete profiles and scenarios and having groups devise a suitable recovery regime - as a whole class, groups can then compare their suggestions for each case using physiological justifications, as well as considering good options and recommendations in the short and longer term

take home an exam-style question to prepare an answer for the following situation;

- at the start of the next lesson they have 7 minutes to write a summary of the role of the O2 transport system in recovery (EPOC) and O2 Debt
- learners then leave their work and rotate 4 seats clockwise and mark the work of a classmate – recording the name and mark and leaving the paper unchanged
- they rotate twice more then return to their seats and write a 5 minute reflection on their observations of; i) content they need to revise further, ii) approaches they liked in other's work, and iii) some note-to-self handy revision tips
- the teacher then asks for agreed examples of strong responses, conducts a short whole class discussion on what they had in common and gains permission to place copies of these examples in the class' shared online space

take 15 minutes to find, collate and prepare a 1 minute verbal report on the characteristics of Delayed Onset Muscle Soreness (DOMS) and actions that athletes can take for minimising its impact

work in small groups at regular intervals to build a visual or mind map of Cross Discipline Links (CDLs), identifying connections across and between performance components.

Unit 3
Skill Acquisition (30 hours)

Learners explore the complexities of acquiring and improving skill performance in sport. During the course of the unit they examine a range of areas including motor skills and learning, particularly focussing on: teaching and coaching; the importance of reaction time; and the study of biomechanics, including the use of technology to analyse and improve skill execution.

This unit covers topics including:

- Motor Skills
- Practicing Skills
- Information Processing (Input, Processing, Output, Feedback)
- Reaction Time and Decision Making
- Memory
- Feedback
- Movement Analysis

Examples of learning activities:

Learners:

work with a partner and have 20 minutes to do individual research and 5 minutes to share what they have learned about Fitts and Posner's Stages of Skill Learning; follow up

with a class or small group discussion on how this might be relevant and applied to a range of coaching scenarios

choose a less mainstream sport, such as snowboarding, and as a class breakdown some of the key skills and ways a coach might profile an intermediate athlete by mapping them against a continuum

complete a reading task on the factors impacting skill acquisition, prior to class; commence the class by random group allocation and immediately engaging in small group sharing and collating dot points under categories of age, gender, heredity, motivation, quality of instruction, and other, before collating feedback from the whole class; respond to the following questions;

1. Which of these factors can we influence, and how?
2. What are the implications for sports performance?

work individually or in pairs to produce a visual (perhaps using prezi or sway) that clearly shows the classification of practice types (this product could lead into building a shared bank of materials and/or be a trigger for reviewing/devising exam questions)

find and view a range of a video clips of athletes in competitive situations and choose one example to share and identify a particular skill their chosen athlete performs well., then working in groups of three learners examine each example and discuss possible coaching implications, challenges and opportunities with regard to schema development (this activity could be followed up by each group choosing and sharing one of the three examples with the rest of the class)

engage in a whole class discussion on the games sense approach as well as examples of skill transfer that have a positive or negative impact when moving between sports - this discussion could also lead to further conversations about topics like modified sport, deliberate cross training for schema development, and ways coaches can encourage and develop problem solving and competition scenarios into their training

choose or are provided with a/some online tools or activities designed to test reaction time or decision making - after performing the tests, learners should have a partner/small group/whole group discussion about the value of these tools and the ways technology could be used to help athletes

work with a partner to create a series of cards for the steps in the Information Processing model, on the back of each card record dot points of the relevant features and/or relevant sporting situations - take turns shuffling the cards, then one partner organises the cards in order of an IP loop (try arranging them using the features face up instead of the steps) - discuss how the IP Model concepts and terminology could be applied to the learning tasks just completed

take part in a whole class discussion to examine the skills involved in driving a car from a motor learning perspective, identify examples of ways that motor behaviour principles and concepts are used to enhance road safety, spend some time in category based groups unpacking details and examples where learning to drive a car can be related to skill practice, information processing, reaction time and decision making, memory, and feedback

- consider changes that have taken place over time in an effort to reduce driver errors and accidents
- groups share their work with the whole class along with any ideas on ways we could improve the teaching of driving skills

coach a small group of classmates through the process of learning a new or unfamiliar skill; determine the stages of learning of the members of the group; consider and apply skill acquisition principles, use personal and group feedback to reflect on the effectiveness

of the approach taken and identify positives and any issues which might have been handled differently

discuss the importance of memory and its role for different forms of practice, then allocate learners to small groups to examine the role of memory and its implications for an assigned movement skill

design, undertake and report on a practical laboratory that compares the use of different forms of feedback on the performance of a particular skill

determine the effectiveness of each of the three types of sprint starts: bullet or bunch start, medium start and elongated start; perform and record each start; contrast the three starts by identifying the differences in the height of the centre of gravity, the position of the line of gravity, the impulse generated and the acceleration of the individual; for more information, see: http://richwoodstrack.com/rhs_team_area/sprints/tech_biomechanics_sprint_start.pdf

capture some video footage and undertake a movement analysis (initially this might be a whole class project to make a video comparison of two athletes of different skill levels), include discussion and use of cameras, software, etc. (this may be built upon to work progressively from whole class, to small groups, and pairs to scaffold individual capacity to complete the investigation task)

complete a reflection following an in class assessment task (past exam question competed under exam conditions), then learners experience the process of rating work against designated course criteria (rubric, standard elements, or both)., discussion or reflection may also include review of their work quality – examining both process and product, a summary of their key takeaways from the task, and self - identification of areas for further improvement in future tasks

work in small groups at regular intervals to build a visual or mind map of Cross Discipline Links (CDLs) identifying connections across and between performance components.

Unit 4
Sport Psychology (30 hours)

In the discipline of Sport Psychology, learners examine the mental aspects required for preparing participants for sporting activities. They also explore and consider cognitive processes that occur and how this impacts on sporting performance.

This unit covers topics including:

- Self-Confidence in Sport and Exercise
- Goal Setting
- Preparation for Competition
- Motivation
- Arousal/Stress and Anxiety
- Concentration
- Visualisation

Teachers may wish to open the unit with a discussion of the unique aspects of this discipline and its evolution and role in sport.

Examples of learning activities:

Learners:

read http://believeperform.com/performance/what-is-sport-psychology/ (or similar) then work in small groups to construct a concise working definition for "Sport Psychology"

write a 1 minute response to the question "What is different about the many intangibles in Sport Psychology that makes it challenging from a science perspective?"

prepare a 3 – 5 minute podcast or video report on self-efficacy traits and the 4 main antecedents that influence it as well as some closing examples of the ways that self-efficacy can impact performance

design a diagram or infographic that depicts the connections between Arousal, Stress and Anxiety and common factors which can increase or reduce levels of each

produce a mind map that demonstrates the links between Coping Strategies and performance for a range of 6 different scenarios from a sport of their choice

conduct a survey of athletes to investigate visualisation strategies they have successfully used to improve performance - data gathered should be sorted into approaches for a) relaxing or reducing arousal and b)" getting pumped up" or increasing arousal levels

engage and contribute to a class discussion on the intent, impact and ethics of sledging

participate in a range of psychological strategies (eg; Progressive Muscular Relaxation, Skill Visualization, 'What if?' scenarios, etc.) and following each they spend a few minutes analysing and describe their personal experience and opinion of the potential effectiveness of each activity

devise a 10 minute sample exam question on the physiological signs of anxiety and ways a coach can use awareness of this cross discipline link to athlete mental state, to help them in their role

work with a partner to create a timeline of pre competition strategies that would be appropriate for a boxer in the lead up to a title fight on Saturday night

work in small groups to undertake a Respond, React, Reply activity around goal setting here the trigger statement might be "goal setting is a waste of time – good athletes already know that to get your best you just have to give 100% effort"

subsequently, complete a short reflection or written statement on the topic "Does goal setting work?"

contribute research-supported opinions to the class online forum via a series of posts on:

- sharing thoughts on the value of goal setting strategies
- ways mental skills from sport can transfer to any high pressure high performance setting
- how the AIS develops mental toughness
- grit and how to build it
- other

work with a partner to prepare an infographic, Prezi, Sparkol, Sway that shows: Concentration - "Nideffer's attentional dimensions"

work individually to find and analyse an advertisement, article or clip that is current and high profile and which is focussed on athlete Motivation, then share a powerful motivation clip in the class forum and explain why it was chosen

work in small groups to undertake a 20 minute online investigation of flow state - groups then use the remainder of the session/next session to report back, and the class collectively discuss sports and activities which commonly create flow, as well as the reasons why they do

work in small groups at regular intervals to build a visual or mind map of Cross Discipline Links (CDLs) identifying connections across between performance components.

Unit 5
Scientific Investigative Methodologies and Skills (30 hours)

In this Unit learners examine the range of skills and conventions that are part of Sport Science research. The unit fills a key role in researching and connecting theoretical concepts across the disciplines with their practical application towards improved sporting performance. For many learners this unit is crucial in building an understanding of the broader field of Sport Science and developing awareness of the many pathways and related roles that are included within this field.

Learners are challenged to use higher order thinking and analysis as they examine scientific method, approaches used for research, data gathering and analysis, and reporting of findings. Teachers will need to sequence a range of scaffolded practical experiences and supporting class discussions to build the skillset and confidence of learners so they are able to work individually to meet the demands of the major investigation studies.

Examples of learning activities:

Learners:

visit AIS Performance Support and watch a series of clips outlining the work of Sport Science in supporting Australian elite athletes – Sport Science at the AIS (2015) , Australian Sport Scientists and the NBA (2016) , Careers in Sports Science and Human Movement (accessed Feb 2018).

follow up with a class brainstorm and discussion around volunteer and professional roles, pathways and options for a sport science related career (whilst not a requirement of this course, organising an ex-student guest speaker and/or panel session would be a logical extension that connects and supports the broader development of the learners' understanding)

read a provided article (eg; Ethics in Reasearch and Why it is important) and in small groups, unpack the key messages then relate them to the work they will be doing as part of this course (this leads well into a report task and whole class discussion of the Australian Government Statement on Ethical Conduct in Human Research and Australia's approach to managing ethics in research referencing)

work in pairs to examine and summarise the Harvard Referencing system and provide a source example for the rest of the class - use a volunteer and the whiteboard to get collective input and ensure it has been correctly referenced

undertake a 20 minute web based research challenge on a suitable topic (eg; Maximal Aerobic Speed Training) with the focus on finding, filtering and referencing 3 good sources

spend some time in small groups or as a whole class comparing sources located and the processes undertaken to make the final selections

work in small groups to read one of a provided set of 4 scientific research articles - after reading time learners give a 2 minute summary regarding the article content and findings, groups then spend 10-15 minutes discussing the article format, reasons why there is a conventional model, the type of language used, and where to find out the details of the process or where to look if just wanting the findings of the research

work in a small group to complete a basic Biomechanical movement analysis comparing performance of a skill between 2 subjects (eg; running gait, throwing etc.), then do a group end of task review and reflection, with each group giving a brief verbal report on:

1. the analysis task, and
2. the process, skills, learning, and areas to address that this activity has highlighted in working towards the individual research task

work with a partner to do a 2 hour research and presentation on a negotiated exercise physiology or sport psychology topic.

Unit 5 develops learners understanding of scientific investigative methodologies and skills within the context of a detailed study of two topics drawn from Units 1–4.

From the course document:

Students **will** undertake TWO (2) studies:

- one (1) study **will be** a movement analysis (Unit 3)
- one (1) study is **selected** from a topic chosen from Unit 1 *OR* Unit 2 **OR** Unit 4.

Within the given requirements and guidelines there is flexibility to select specific topics/focuses for each study.

These studies are scientific research involving humans. They must take full account of relevant principles and guidelines related to ethical conduct in human research.

> *All human interaction, including the interaction involved in human research, has ethical dimensions. However, 'ethical conduct' is more than simply doing the right thing. It involves acting in the right spirit, out of an abiding respect and concern for one's fellow creatures. This National Statement on 'ethical conduct in human research' is therefore oriented to something more fundamental than ethical 'do's' and 'don'ts' – namely, an ethos that should permeate the way those engaged in human research approach all that they do in their research.*
>
> *Human research is research conducted with or about people, or their data or tissue. It has contributed enormously to human good. Much human research carries little risk and in Australia the vast majority of human research has been carried out in a safe and ethically responsible manner. But human research can involve significant risks and it is possible for things to go wrong. Sometimes risks are realised despite the best of intentions and care in planning and practice. Sometimes they are realised because of technical error or ethical insensitivity, neglect or disregard.* https://www.nhmrc.gov.au/book/preamble https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research. (accessed 7 Sept 2016)

Where the specific topic/focus for the study is selected by the teacher, the teacher (on behalf of the provider) will record the relevant ethical conduct in human research principles and guidelines, and the actions taken to address them.

Note: If specific topics/focuses for both studies are selected by the teacher, opportunities must be provided for learners to demonstrate their achievement on Criterion 7, Element 4.

Where the specific topic/focus for the study is selected by the learner/s, the learner/s must gain approval from the teacher – on behalf of the provider – prior to undertaking the study. Records will be made of the relevant ethical conduct in human research principles and guidelines, the actions taken to address these principals and guidelines, and the teacher's approval (or rejection) of the proposed study.

Useful resources on principles and guidelines related to ethical conduct in human research include:

- *National Statement on Ethical Conduct in Human Research 2007* (updated May 2015) https://www.nhmrc.gov.au/book/national-statement-ethical-conduct-human-research
- UTAS '*About Human Research Ethics*' webpage http://www.utas.edu.au/research-admin/research-integrity-and-ethics-unit-rieu/human-ethics/about-human-research-ethics (accessed 7 Sept 2016)

5.1 Movement Analysis (COMPULSORY)

It is recommended that the delivery of aspects of Unit 3.7 'Movement Analysis' (sections 'kinematics' and 'kinetics') relevant to the specific topic/focus of the study be undertaken in conjunction with this study.

NOTES:

1. The nature/scope of the movement that is analysed is **not** prescribed. The movement may be a simple one, or one involving a particular part of the human body, e.g. a wrist action in a hitting or bowling sport, a knee movement or leg action in a kicking sport. Highly complex, whole of body movements (such as the body when swimming or triple-jumping) may be studied depending on availability of resources.
2. The analysis will be limited to a 2-Dimensional analysis of a movement/set of movements that are easily observed in a single plane.

Learners may work in groups to gather data, but are required to **individually** complete and submit a written study. Learners may wish to present some or all of their work in an electronic format which aligns to the work requirements outlined below. The research topic and methodology employed in the Movement Analysis study will take full account of relevant principles and guidelines related to ethical conduct in human research.

Minimum Work Requirements – Unit 5.1

The written product for the Movement Analysis study **MUST** contain and address the following topics:

- Aim/Hypothesis
- Background Research and Ethical Considerations (1000 words submitted electronically)
- Method (equipment list, procedure, etc...)
- Results (including supporting tables, graphs, graphics, etc..., all clearly labelled)
- Discussion (1000–2000 words or equivalent)
- Conclusions and Recommendations
- References (citation) and a reference list/bibliography.

The research methodology for the Movement Analysis study will be guided by the principles of *Application of Biomechanical Knowledge* (according to Amezdroz et. al., 2010, *Queensland Senior Physical Education*, 3rd Ed., Macmillan Education Australia):

- determine the objective of the skill
- using observation (naked eye and video analysis) techniques
- identify the movement patterns involved
- divide the skill into skill phases (key subroutines)
- detecting errors: application of the biomechanical principles (kinematics and kinetics) listed above
- identifying starter mechanisms.

The research will involve the use of video and computers to run video analysis software. Students will need some background support learning to develop their skills in the application of Movement Analysis ICT tools:

- guidelines (procedures) which should be followed for obtaining good video footage
- ICT: application of video analysis software, and its analysis.

The assessment for the Movement Analysis study is based on the degree to which a student can:

- Criterion 3 – analyse and discuss principles of skill acquisition in sport
- Criterion 5 – analyse and interpret sport science data and information
- Criterion 7 – access, research and analyse information
- Criterion 8 – communicate information in a variety of forms.

5.2 Selected Investigative Study

The topic of this study can be selected from Unit 1, Unit 2 *OR* Unit 4.

The topic must have a direct relationship to course content from the selected Unit.

Learners may work in groups to gather data, but are required to individually complete and submit a written study.

The research topic and methodology employed in the selected study will take full account of relevant principles and guidelines related to ethical conduct in human research.

The assessment for the Selected Investigative Study is based on Criteria 5, 7 ,8 and either Criterion 1 *OR* 2 *OR* 4 (Depending on the Unit of study)
The degree to which a learner can:

Criterion 5 – analyse and interpret sport science data and information
Criterion 7 – access, research and analyse information
Criterion 8 – communicate information in a variety of forms

AND

Criterion 1 – describe and analyse physiological aspects of exercise

OR

Criterion 2 – analyse and explain physiological responses to training

OR

Criterion 4 – examine and discuss how sport psychology influences athletic performance.

Minimum Work Requirements – Unit 5.2

The Selected Investigative Study's written product MUST contain and address the following topics:

- Aim/Hypothesis
- Background Research and Ethical Considerations (1000+ words submitted electronically)

- Method (equipment list, procedure, etc...)
- Results (includes tables, graphs, etc..., all clearly labelled)
- Discussion (1000–2000 words)
- Conclusions and Recommendations
- References (citation) and a reference list/bibliography.

The completed product represents a significant scientific research and investigation and should comprise at least 8 pages and approximately 2000 - 4000 words in its written and graphic content.

RECOMMENDED REFERENCING SYSTEMS

- UTas Referencing Practices (current 2016)
- Human Movement – APA
- Exercise and Health Sciences – Harvard

SUPPORTING STUDENT RESPONSES AND ELABORATIONS

Sport Science balances a theoretical focus with a range of applied experiences designed to allow learners to develop their skills, knowledge and understanding of issues related to the training and performance of athletes of all ages and levels.

The course integrates science, literacy and numeracy concepts developed in the Australian Curriculum F–10 and helps connect to future learning in a range of allied health, exercise science, human movement and performance sport-related areas.

The course is intended to provide learners with broad experience and awareness of contemporary practice across the Sport Science fields. In preparation for further study and/or vocational pathways the course also aims to develop understandings around how Sport Science practices are applied in various amateur, semi-professional and high performance sport settings and a wide range of sports, industry and related roles.

Learners are encouraged to undertake higher-order thinking and are challenged to consider the complex cross-discipline links between core areas of study, in addition to completing scientific investigative studies.

Providers of this course must ensure learners have access to video camera(s) and ICT tools for the movement analysis investigative study.

Suitable packages – such as SkillSpector, Kinovea, and Hudl technique – are available without cost.

High-performance sport is an evolving, dynamic and technology-connected area. *Sport Science* research tasks and laboratory sessions will require students to be able to access a range of suitable performance testing equipment, software and facilities. Movement analysis will also require students to use suitable filming devices, IT software and hardware.

WORK REQUIREMENTS

The work requirements outlined in the course document should form the minimum assessment tasks for each of the units. Teachers will need to acknowledge these requirements when designing their scope and sequence however, additional assessment (particularly of a formative nature) may be included to support and enhance the learning program. The learning activities, described in the preceding section, may support, facilitate and enrich learners' understandings in preparation for completion of the following work requirements.

Unit	Task	Criteria
1	Task 1.1 Energy Systems Assignment (400-800 words or multi-modal equivalent)	1, 8
	Task 1.2 LIP/ VO2 max Lab & Report (1000 words)	1, 5, 7, 8
	Task 1.3 Unit Summary Report (400-800 words or multi modal equivalent)	1, 5, 6
2	Task 2.1 Training Review (400-800 words)	2, 6, 7, 8
	Task 2.2 Lab & Report (1000 words)	2, 5, 7, 8
	Task 2.3 Unit Summary Report (400-800 words or multi modal equivalent)	2, 5, 6
3	Task 3.1 Lab & Report (1000 words)	3, 7, 8
	Task 3.2 Investigative Study (see Task 5.1)	3, 5, 7, 8
	Task 3.3 Unit Summary Report (400-800 words or multi modal equivalent)	3, 5, 6
4	Task 4.1 Sport Psychology Task (800-1200 words)	4, 6, 7, 8
	Task 4.2 Lab & Report (1000 words)	4, 5, 7, 8
	Task 4.3 Unit Summary Report (400-800 words or multi modal equivalent)	4, 5, 6
5	5.1 Movement Analysis (2000-4000 words or multi-modal equivalent)	3, 5, 7, 8
	5.2 Selected Investigative Study (2000-4000 words or multi-modal equivalent)	1, 2, 4 , 5, 7, 8

RESOURCES

Recommended books

- Amezdroz, G., Dickens, S., Hosford, G., Stewart, T. & Davis, D., 2010, *Queensland Senior Physical Education 3rd Ed.*, Macmillan Education Australia, Melbourne.
- Amezdroz, G., Dickens, S., Hosford, G & Davis, D., 1999, *Queensland Senior Physical Education,* Macmillan Education Australia, Melbourne.
- Amezdroz, G., Dickens, S., Hosford, G., Stewart, T. & Davis, D., 2006, *Queensland Senior Physical Education 2nd Ed.*, Macmillan Education Australia, Melbourne.
- Arkinstall, M., Dawson, T., Johnson, C., Sinclair, P. & Zahra, M., 2010, *VCE Physical Education*, Macmillan Education Australia, Melbourne.
- Beckman, J. & Elbe, A., 2015, Sport Psychological Interventions in Competitive Sports, Cambridge Scholars Publishing, UK.
- Bowers, R. W. & Fox, E. L., 1992, *Sports Psychology 3rd Edition*, WCB McGraw-Hill, USA.
- Bowers, R., W. & Foss, M., L., 1989,*The Physiological Basis of Physical Education and Athletics*, Brown and Benchmark, USA.
- Buchanan, D., O'Connor, D., McLean, J. & Ingram, K., 2009, *Peak Performance 2: HSC PDHPE,* Macmillan Education Australia, Melbourne.
- Burton, D. & Raedeke, T., 2008, *Sport Psychology for Coaches,* Human Kinetics, USA.
- Cox, R., 1990, *Sport Psychology: Concepts and Applications,* WCM, USA.
- Davis, D., Kimmet, T., Ackerley, D., & McAree, A., 2000, *VCE Physical Education – Book 1, 3rd Ed.,* MacMillan Education Australia, Melbourne.
- Davis, D., Kimmet, T., Ackerley, D., & McAree, A., 1999, *VCE Physical Education – Book 2, 3rd Ed.,* MacMillan Education Australia, Melbourne.
- Deci, E., & Ryan, R. (Eds.), 2002, *Handbook of self-determination research*, University of Rochester Press, Rochester.
- Fox, E. L., Bowers, R. W. & Foss, M. L., 1989, *The Physiological Basis of Physical Education and Athletics 4th Ed.* WMC Brown Publishers, USA.
- Littlewood, K., Broadbent, D., Seery, P. & Telford, A., 2006, *Nelson Physical Education VCE Units 1 & 2,* Nelson, Australia.
- Martens, R., 1987, *Coaches Guide to Sport Psychology,* Human Kinetics, USA.
- McMorris, T., 2004, *Acquisition & Performance of Sports Skills*, Wiley, England.
- McArdle, W., Katch F. I. & Katch, V. L., 2007, *Exercise Physiology: Energy, Nutrition & Human Performance 6th Ed.* Lippincott Williams & Wilkins, Maryland.
- Morris, T. & Summers, J., 2004, *Sport Psychology: Theory, Applications & Issues, 2nd Ed.*, Wiley, Australia.
- Ricci, E. & Letch, N., 2010, *Psychology in action: an introductory text,* MacMillan, Australia.
- Schmidt, R & Wrisberg, C., 2008, *Motor Learning and Performance; A situation-Based Learning Approach 4th Ed,* Human Kinetics, US.
- Schmidt, R. A., & Wrisberg, C. A., 2008, *Motor Learning and Performance: A Situation-Based Learning Approach, 4th Ed.* Champaign, IL.

- Smyth, D., Judge, W., O'Rourke, K., O'Keffe, M., Flouch, M. & Shepherd, F., 2011, *Live it up 1,: VCE Physical Education Units 1 & 2, 3rd Ed. Qld,* John Wiley & Sons, Melbourne.
- Smyth D., Brown, H., Judge, W., McCallum, C. & Pritchard, R., 2006, *Live it up 2: VCE Physical Education Units 3 & 4 2nd Ed. Qld,* John Wiley & Sons, Melbourne.
- Syer, J. & Connolly, C., 1998, *Sporting Body, Sporting Mind: An athlete's guide to mental training,* Simon & Schuster, London.
- Telford, A., Malpeli, R.,, Whittle, R., Seery, P. & Corrie, M., 2010, *Physical Education VCE Units 1 & 2,* Nelson Cengage Learning, South Melbourne.
- Tortora , G., J. & Grabowski, S. R., 2003, *Principles of Anatomy & Physiology 10th Ed.* John Wiley & Sons, New York.
- Vanderkooi, J. M., 2014, *Your Inner Engine: an Introductory Course on Human Metabolism*, Createspace Independent Publishers, Pennsylvania.
- Weinberg, R. S., & Gould, D., 2007, *Foundations of sport and exercise psychology, 4th Ed.,* Human Kinetics, USA.

Additional reading

- Csikszentmihalyi, M., 1990, 'Flow: The psychology of optimal experience', *Journal of Sport Behaviour, 20,* pp.54-68.
- Deci, E., & Ryan, R., 1985, *Intrinsic motivation and self-determination in human behaviour.* New York: Plenum. Advances in Sport Psychology 2nd Ed. Champaign IL: Human Kinetics, 2002: pp.459-499
- Follard, J. P. & Williams, A. G., 'The adaptations to strength training: morphological and neurological contributions to increased strength', *Sports Med.*, 2007,37 (2) https://www.ncbi.nlm.nih.gov/pubmed/17241104 (viewed 15 January 2018)
- Harger-Domitrovich, S. G., McClaughry, A. E., Gaskil, S. E. & Ruby, B.,C., 2007, 'Exogenous carbohydrate spares muscle glycogen in men and women during 10 h of exercise', *Medicine and science in sports and exercise* Volume 39, Issue 12, pp.2171-2179.
- Heil, N., F'atigue Is All in Your Head', *Outside Magazine*, October 2016, https://www.outsideonline.com/2112241/fatigue-all-your-head (viewed 15 January 2018).
- Kane, T., Baltes, T. & Moss, M., 2001, 'Causes and consequences of free-set goals: An investigation of athletic self-regulation', *Journal of Sport and Exercise Psychology, 23,* pp.55-75.
- Milner, C. & Cote, K., 2009, 'Benefits of napping in healthy adults: impact of nap length, time of day, age, and experience with napping', *Journal of Sleep Research*, 18(2), pp.272-281.
- Milroy, T. H., 'Fatigue studied in reaction time experiments', Quarterly Journal of Experimental Physiology Volume 2, Issue 3, Version of Record online: 16 JAN 1999, Wiley Online Library http://onlinelibrary.wiley.com/doi/10.1113/expphysiol.1909.sp000040/pdf (viewed 15 January 2018).
- Mohammed Abdelfattah H., Abdelazeim F.H. & Elshennawy S, 'Physical and cognitive consequences of fatigue: A review' *Journal of Advanced Research,* Volume 6, Issue 3, May 2015, pp.351-358, https://www.sciencedirect.com/science/article/pii/S2090123215000235 (viewed 15 January 2018)
- Nideffer, R. M., 1976, 'Test of attentional and interpersonal style', *Journal of Personality and Social Psychology,* 34, pp.394-404.
- Sahlin, K, 'Muscle Energetics During Explosive Activities and Potential Effects of Nutrition and Training', *Sports Med.,* 2014; 44 (Suppl 2): 167–173. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4213384/ (viewed 15 January 2018)
- Schunk, D. H., 1990,' Goal setting and self-efficacy during self-regulated learning', *Educational Psychologist, 25,* (1), pp.71-86

- Smith, R. E., & Smoll, F. L., 1997, 'Coach-mediated team building in youth sports', *Journal of Applied Sports Psychology, 9*, pp.114-132
- van den Berg, J. and Neely, G., 2006, 'Performance on a Simple Reaction Time Task While Sleep Deprived' *Perceptual and Motor Skills*, 102(2), pp.589-599.
- Volek, J. S., Freidenreich, D. J., Saenz, C., Kunces, L. J., Creighton, B. C., Bartley, J. M., & Kraemer, W. J., 2016, Metabolic characteristics of keto-adapted ultra-endurance runners', Metabolism: Clinical and Experimental, pp.100-110 https://www.ncbi.nlm.nih.gov/pubmed/26892521 (viewed 5 March 2018)
- e-Teaching Physical Education - CD resource available from www.eteaching.com.au

Websites

All URLs (website addresses) cited were accessed and checked for accuracy and appropriateness of content on 5 March 2018. However, due to the transient nature of material placed on the web, their continuing accuracy cannot be guaranteed.

- Art of Coaching Speed http://artofcoachingspeed.com/2012/07/31/olympic-prep-video-feedback/
- Brian Mac http://www.brianmac.co.uk/muscle.htm
- Kansas State University
- University of Maryland http://www.umm.edu/ency/article/002469fod.htm & https://www.umm.edu/health/medical/altmed/supplement/creatine
- *A Video Analysis: Where do I start?* www.ausport.gov.au/sportscoach
- Motivation www.pponline.co.uk/encyc/motivation-in-sports-psychology-35892
- Goal Setting http://www.tennisserver.com/mental-equipment/me_5_96.html
- Simple and Choice Reaction time https://www.psytoolkit.org/lessons/simple_choice_rts.html
- Reaction time tests http://www.topendsports.com/testing/reaction-tests.htm
- The Mechanics of Sprinting http://graphics.wsj.com/armchair-olympian/track/