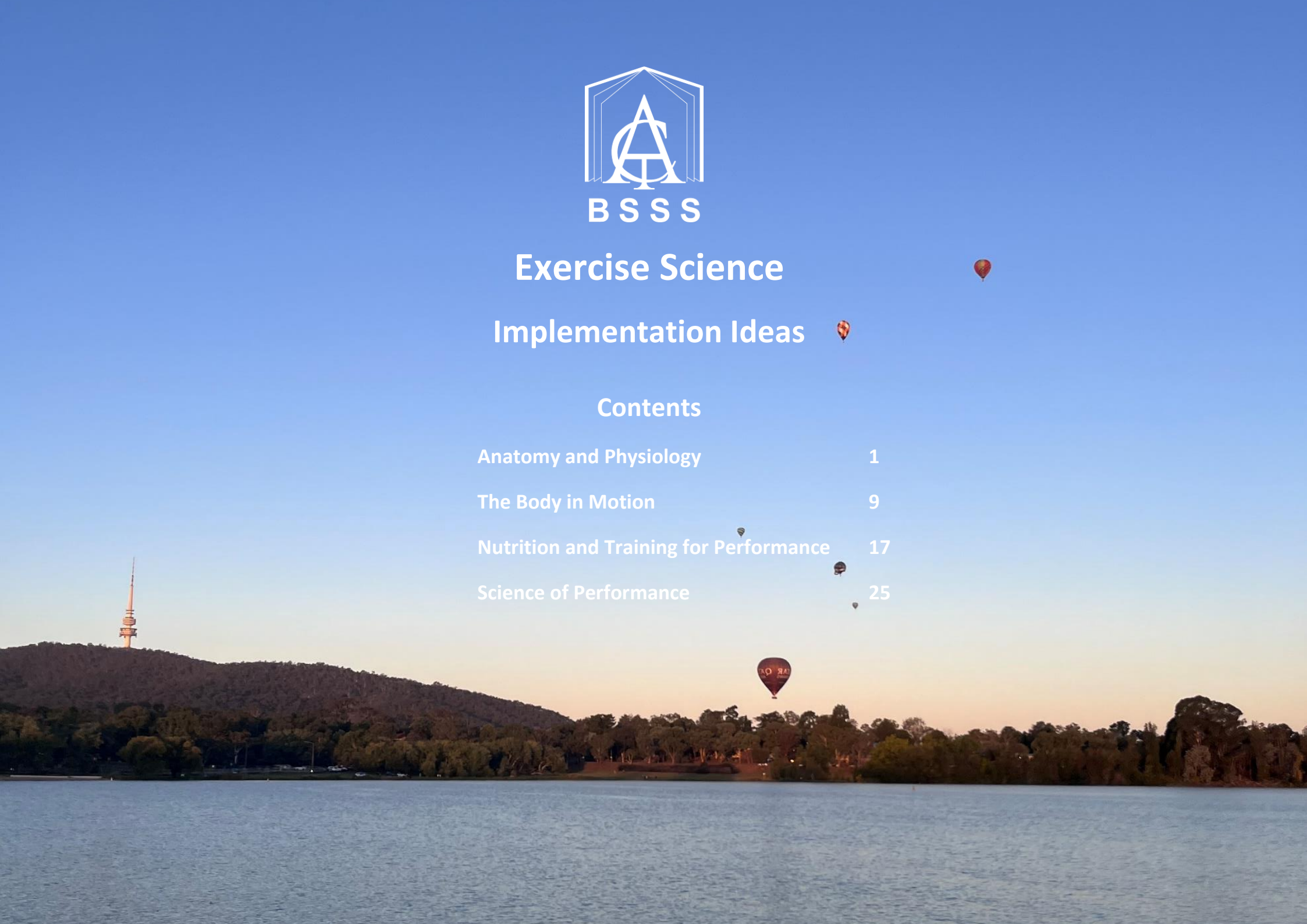


BSSS

Exercise Science

Implementation Ideas

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Implementation Ideas

Preface

The ideas for the implementation of the course were developed by the course writers and BSSS officers to support teachers in their thinking about the breadth of possibilities for the delivery of the course.

There are multiple options provided for at each stage of the unit. Teachers may select from the options, apply their own knowledge and experience, or use a combination of the two in the development of a program of learning.

The possible themes, topics, and resources are not mandated but are there to support and stimulate thinking about the design of the programs of learning suitable for particular school contexts. It is expected that teachers will support the content descriptions with aligned case studies and materials to develop the focus of the unit.

Teachers may also use the elaborations contained in the implementation ideas either as they are or as a starting point for developing thinking and formulating pedagogical approaches around the content descriptions.

The resources suggested were accurate and links current at the time of production in 2025. There are resources provided at a range of levels from journal articles to general media resources. Some of the scientific journal articles have been provided for the benefit of teachers with the expectation these would be used for professional learning, for the development of teachers' presentations, or the research data for case studies in classwork or tests.

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Anatomy and Physiology

Knowledge and Understanding

Content Description	Elaborations
critically analyse theories, concepts, and models related to the structure and function of the musculoskeletal and cardiorespiratory systems to **draw informed and insightful conclusions** about their capacity, and how these systems contribute to exercise and adjust to increasing demands	Students will develop core knowledge of the structure and function of the musculoskeletal and cardiorespiratory systems, as well as supporting systems and concepts. This knowledge will underpin later analysis of how these systems contribute to exercise and respond to increasing demands. Diagnostic testing may indicate that some of these topics are known to students from PDHPE 7-10. Teachers are advised to consider the aspects of the Musculoskeletal and Cardiorespiratory systems relevant to the unit. • Identify and describe the structure and function of the muscular system • Identify and describe skeletal muscle and muscle cells • Identify and describe the structure and function of the cardiorespiratory system • Identify and describe the structure of the skeletal system and of a synovial joint • Explore the nervous system briefly to support integration with movement and physiological responses. • Anatomical and movement terminology to support concepts • Explain the process of homeostasis and how systems respond to internal and external stressors • Explain the process of muscle contraction (micro and macro processes) • Explain the process of change in cardiac output due to increasing demands of exercise • Explain the process in change in respiration due to increasing demands of exercise • Explore chronic adaptations of the musculoskeletal and cardiorespiratory systems to regular exercise NSW Stage 5 PASS Resource – Skeletal, Muscular, and Cardiovascular Systems HealthDirect – Bones, Muscles and Joints Functional Anatomy & Movement : Anatomy TOOL – Open Anatomy Learning Resources Once student have some fundamental knowledge of the topics above, research or present key theories and models about how the musculoskeletal and/or cardiorespiratory systems contribute to exercise and then determine comparative validity by considering factors such as evidence base, logic, plausibility and correlation to lived experience. Theories and models might be accessed through academic texts or general HOPE textbooks written for senior secondary or junior college settings. Theories may include: • The Fick Principle (Cardiorespiratory System) - video • The SAID Principle (Specific Adaptation to Imposed Demands) – article link As models are complex and time consuming to investigate, it would be best to focus on one model. Models for investigation may include: • Cardiorespiratory model focused on the prediction of the healthy human response under rest and aerobic exercise • Musculoskeletal model focused on the prediction of the healthy human response under rest and aerobic exercise • Models of homeostasis – stimulus response model • Stress response model

	Evaluate how the musculoskeletal and/or cardiorespiratory systems contribute to exercise performance and how they adjust to increasing demands. This includes: • Evaluating the impact of temperature on performance • Evaluating the impact of exercise intensity on cardiovascular responses • Evaluating the impact of altitude on cardiovascular response • Evaluating the role of the cardiorespiratory or musculoskeletal systems in different types of exercise *This aspect develops foundational knowledge for further engagement with higher order thinking and development of skills. Care should be taken in scheduling and volume of content to ensure that students engage with the subsequent content description and the development of skills.* **Resources** Teach me anatomy - Website Khan Academy – Human Anatomy & Physiology - Website Fick Principle Video: VO2max Explained – Fick Equation and Cardiorespiratory Fitness by Live Physiology or Fick Principle Overview SAID Principle - Article: Better Movement – The SAID Principle Central Governor Model - Overview: Wikipedia – Central Governor Integrated Mathematical Model of Cardiovascular and Respiratory Response Journal Article (PDF): American Journal of Physiology – Full Text
critically analyse principles, strategies and methodologies related to the structure and function of the musculoskeletal and/or cardiorespiratory systems and **evaluate limitations and assumptions** of knowledge about and inquiry into these systems	Following on from understanding of theories, concepts and models, consider continuing the chosen contexts by linking to the principles, strategies and methodologies. **Principles** • Gross anatomy as it relates to the function of the human musculoskeletal and cardiorespiratory systems • Functional anatomy and its role in movement and physiological response • Physiological principles underpinning system performance (e.g., oxygen transport, muscle contraction) OpenStax – Types of Body Movements Physiological Principles (Oxygen Transport, Muscle Contraction) - OpenStax – Muscle Fiber Contraction: Students will explore and apply a range of strategies and methodologies used in exercise science to assess system function and performance. **Strategies and Methodologies** • Methods and strategies used to measure heart rate e.g. manual, digital, wearable tech • Methods for assessing the function and efficiency of the respiratory system e.g. spirometry, VO_2 max testing • Methods used to evaluate muscle function e.g. strength testing, fatigue protocols • Methods to predict maximum heart rate and limitations e.g. e.g., age-based formulas vs. lab testing

Cleveland Clinic – Heart Rate Monitors
American Heart Association – Target Heart Rates
Trek Education – Muscle Strength Assessment
American Heart Association – Max HR Chart

Limitations and Assumptions

Evaluate *limitations and assumptions* by considering the axioms, evidence-base, the validity of theories/models underpinning the principles, strategies and methodologies and whether concepts have been used accurately and effectively in arguments.

- Identify and evaluate the limitations inherent in commonly used assessment methodologies.
- Explore and discuss the underlying assumptions that inform current strategies and testing methods.
- Assess the reliability and validity of assessment, including both internal consistency and external applicability of results
- Consider the influence of context (e.g., environment, population, equipment) on data interpretation
- Evaluate whether concepts have been used accurately and effectively in arguments, and assess the evidence base and logic underpinning the use of specific methodologies

Possible assessment

Examine histological slides of different muscle types with mitochondria specifically stained. Students can:

- Identify and compare the relative density of mitochondria in various muscle tissues.
- Analyse how mitochondrial distribution relates to the function and energy demands of each muscle type.
- Evaluate the methodological limitations and underlying assumptions of using histological staining to assess mitochondrial content and muscle function.

Frontiers in Cell and Developmental Biology – Mitochondrial Specialization in Muscle
Muscle Histology Lab – University of Oklahoma

Resources

Gross Anatomy & System Function - OpenStax Anatomy & Physiology 2e (textbook)
Biology LibreTexts – ATP and Muscle Contraction
Intro to Exercise Physiology Watch on YouTube
What is VO_2 Max? Watch on YouTube
VO_2 Max Testing (Lab Demo) – University of South Australia Watch on YouTube
Sliding Filament Theory Explained – Teach PE
Muscle Contraction (Simple Animation) – OpenSciEd
VO_2 Max Test Explained + Data – The Movement System
Heart Rate Zones & VO_2 Max – MegSquats

critically analyse anatomy and physiology **research methods, problems or questions** using the principles of **ethics or sustainability** to evaluate solutions	Examine one or more research methods, problems or questions used in anatomy and physiology that follow on from the CDs above and critically analyse it by considering different critiques of the method, solutions to the problem or question so students can draw their own conclusions about the value and effectiveness of the topics studied. **Some ideas for consideration** • Research methods used in anatomy and physiology, including experimental designs, observational studies, case studies, and the use of technological tools. • Investigate real-world anatomical and physiological problems through case studies and explain how research methods are applied to address these issues. • Analyse the strengths and limitations of different research designs, including sample size, control of variables, reproducibility, and data interpretation. • Evaluate the appropriateness of data collection methods in different contexts (e.g. lab-based vs. field-based research). **Ethical and sustainability consideration** • Apply ethical reasoning to the design, implementation, and outcomes of research, considering participant rights, consent, and potential harm. • Apply sustainability principles to research and proposed solutions, considering long-term health outcomes, environmental impact, and equitable access. • Evaluate and propose solutions to anatomical or physiological problems, using evidence-based reasoning **Considerations for Analysis** • Methods of data collection and their appropriateness for the research question • Ownership, privacy and security of data. • Research design quality, including sample size, control of variables, and reproducibility. • Potential biases in research (e.g. gender, age, socioeconomic status). • Ethical concerns in different types of assessments (e.g. maximal vs. predictive testing). **Examples of Research Topics for Ethical and Sustainable Evaluation** • Blood sampling in athletic or clinical settings. • Muscle biopsies for performance or disease research. • Use of cadavers in anatomical education and research. • Skinfold testing in adolescents and its psychological and ethical implications. • Implications of using maximal testing v predictive assessments. • Data collection practices.

	Resources Blood Collection Practice Guidelines: Blood Collection Guidelines PDF Health.vic – Includes ethical and clinical protocols for blood use Download Handbook National Blood Authority – Ethical stewardship of blood products Patient Blood Management Business Queensland – Explains when ethics approval is required for cadaver use. Read the Guidelines National Safety and Quality Health Service Standards. Includes ethical use of human tissue in education and research. Download Standards PDF
evaluate a range of **resources and technologies** intended to enhance cardiovascular and/or musculoskeletal research or performance	Students examine at least one resource and one technology to evaluate their efficacy and ethics/sustainability in enhancing musculoskeletal and/or cardiovascular research or performance outcomes for individuals. The examination might be as a part of an empirical investigation or via a literature review. Students may also consider the ethics, assumptions, models and theories that underlie the technology or resource that may determine the output of the technology. It is a good idea to link this to the topics studied above so that the learning follows on and uses the prior learning. **Resources** • Educational platforms or apps (e.g., anatomy learning tools, physiology simulations) • Health and fitness programs or guides • Wearable tech user manuals and data dashboards • Peer-reviewed articles on technology efficacy **Technologies** • Heart rate monitors • Activity trackers e.g. step counters • MRI and imaging technologies e.g. cardiac imaging • Data analysis software • Emerging technologies e.g. AI driven diagnostics Consider efficacy, ethical implications and limitations, such as cost, accessibility and accuracy. **Resources** Interactive Anatomy Tools - BioDigital Human or ZygoteBody Microchip Wearable Heart Rate Monitor Design Files Microchip Demo Wearable Technology in Healthcare Open Access PDF Impact of Wearables on Fitness in Students with Disabilities Journal of Physical Activity Research AI in Anatomy Education – Ethical and Practical Review Wiley Online Library Artificial muscles to keep hearts pumping

Skills	
Content description	**Elaborations**
synthesise exercise science **knowledge, understanding and skills** to investigate and solve problems related to the musculoskeletal and cardiorespiratory system both in others and self across **familiar and unfamiliar** contexts	Students bring together knowledge to investigate a problem related to the musculoskeletal and cardiorespiratory system. This can be linked to the topics outlined in the knowledge and understanding CDs or a new topics could be introduced. This could be a foundational learning process or a capstone project for learning across the semester. However, as the CD calls for dealing with unfamiliar contexts, in any investigation there must be content or problems not covered in class but extends from or is related to the studied content, so the students' abilities to transfer their learning to the unfamiliar can be tested. This could be a comparative study of something new with something closely examined in class. **Possible Problems for Investigation** • Design a recovery protocol using controlled deep breathing techniques to reduce heart rate • Create a joint stability program for injury prevention in a specific sport • Develop a warm-up protocol to activate hamstrings and quadriceps prior to exercise. • Investigate individual heart rate variability • Compare the cardiovascular responses of two different exercise modalities (e.g., swimming vs. cycling) • Analyse the impact of environmental conditions (e.g., heat, altitude) on musculoskeletal or cardiorespiratory performance • Investigate the role of respiratory muscle training in improving endurance performance **Resources** Deep Breathing for Heart Rate Recovery– Breathing Retraining PDF Sports Injury in Australia – Australian Institute of Health and Welfare - AIHW Sports Injury Report Australian Institute of Sport (AIS) – Performance and injury prevention resources - AIS Home Warm-Up Protocol for Hamstrings and Quadriceps. Physical Activity Guidelines – Exercise Guidelines Heart Rate Variability (HRV) Resting Heart Rate Guide Cardiovascular Responses Cardiovascular Exercise Environmental Impact on Performance (Heat & Altitude) Heat Stress Resource and Altitude Illness Fact Sheet Breathing and Exercise – Breathing and Exercise
create evidence-informed, targeted and high-quality plans to achieve desired exercise science outcomes using an integrated approach to anatomy and physiology	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts and a chosen problem by creating plans to address them or uses them. The students work creatively to generate something new but draw on and refer to examples of similar plans encountered in class or in their research to prepare their plan. **Plans in response to Problems** • Design evidence-informed plans for recovery, incorporating physiological principles and system responses to exercise. • Develop targeted strategies for injury prevention, using an integrated understanding of musculoskeletal and cardiorespiratory function. • Create high-quality, outcome-focused plans that demonstrate the application of anatomical and physiological knowledge to complex exercise scenarios.

	Resources Australian Physical Activity Guidelines – Physical Activity Guidelines Evidence-Based Care in Clinical Settings – Evidence-Based Care Strategy to Prevent Musculoskeletal Disorders (2022–2024) WorkSafe ACT PDF Minimising Musculoskeletal Disorders (Video + PDF) Safe Work Australia Resource Musculoskeletal Disorder Prevention Plan (2024–2026) SafeWork NSW PDF Exercise Programs Exercise Programs Guide Physical Activity in Australia - AIHW Physical Activity Report About Physical Activity and Exercise – About Physical Activity
plan and undertake **independent enquiries using science methods** and critically analyses relevant data and information based on critical evaluation of valid and reliable sources	**Drawing on learning** from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts/theories/models/strategies/principles and a chosen problem by gathering empirical data or using an existing data set to analyse trends, correlations, distributions etc. in the data and validates or challenges findings using established research on the problem. Students may choose from the following approaches: **Empirical data collection and analysis** • Design and conduct their own surveys or low-risk experiments (e.g. measuring the impact of exercise on cardiovascular responses). • Collect and evaluate their own data sets, identifying trends, correlations, and distributions. • Validate or challenge their findings by comparing them with established research and data from reliable sources. • Represent data in engaging and meaningful ways (e.g. using visualisation tools inspired by Information is Beautiful). (Teachers should make reference to the BSSS Ethical Research Principles and Guidelines, in particular if any experiments are to involve people.) **OR** **Literature-Based Inquiry** Rather than a quantitative data science approach, students could undertake a literature review on the chosen problems and critically analyse by comparing perspectives and data to determine their own point of view on the problem. • Conduct a structured literature review on a selected problem (e.g. the impact of altitude on cardiovascular response). • Critically analyse and compare perspectives, data, and methodologies from multiple sources. • Evaluate the validity and reliability of sources to form a well-supported personal viewpoint on the issue. **Resources** NSW Department of Education – Data Types: Strengths and Limitations Data Types Resource Australian Bureau of Statistics – Data Visualisation Concepts ABS Data Visualisation Physiological responses to exercise at altitude Exposure to air pollution and human health Cardiovascular physiology at high altitude

communicate effectively using a range of modes, mediums and technique for a chosen purpose, adhering to the principles of **academic integrity**	This will be measured as students complete tasks indicated in other CDs. Communication modes are ideally from the discipline and authentically represent communication in Exercise Science Contexts. Care should also be taken to keep in mind vulnerability to AI cheating, or AI be harnessed in the generation of texts. This range also includes written and spoken exams. Note that exams can contain a variety of written formats or genres such as letters, promotional scripts, essays, client plans, case notes. Only three to five tasks are permitted in a 1.0 unit. **Examples of texts students can create** • Numerical comparisons and analysis of size and measurements • Interpreting and using graphs, tables, diagrams and data • Presentation/conference poster for expert audience • Research report • Experimental Report • Essay • Editorial writing • Stimulus Response- essay, short responses, multiple choice • Seminar or oral presentation
applies **interpersonal, intrapersonal, and leadership skills** with integrity and understanding of differences to exercise science problems and research methods	Students may show these people skills within the contexts of tasks. This will involve group tasks in which students demonstrate effective inter/intrapersonal skills, and leadership skills. Teachers will need to set up rubrics or observations opportunities that isolate the personal skills to make them assessable. Teachers will need to explicitly teach positive interaction/ leadership/ intrapersonal strategies and practices. Intrapersonal skills may need to be measured in combination with the reflection activities. **Examples of Tasks** • Students lead mini-seminars or lessons on selected topics and respond to peer questions • Jigsaw activities involving collaborative research and shared teaching • Group-based experimental studies where roles and responsibilities are distributed • Fishbowl activities to model and reflect on group dynamics and communication
reflects using evidence on exercise science knowledge, understanding and skills to make targeted and justified **proposals for improvement**	Either orally or in writing, as part of an investigation, experiment, or summative exam, or as a stand-alone summative task (e.g. journaling), students are required to **reflect** on planning, time management, and use of appropriate independent and collaborative work strategies. **Some suggested methods for reflection include:** • Yarning circles • Kolb's learning cycle • Rolfe's framework of reflective practice • Gibb's reflective cycle • Group/team reflection • Other methods for reflection Students need explicit teaching on how to reflect and opportunities to practice and receive feedback prior to assessment of this skills.

The Body in Motion

Knowledge and Understanding

Content Description	Elaborations
critically analyse biomechanical and physiological **theories, concepts, and models** to draw informed and insightful conclusions about movement patterns and the physiological demands of sports performance	Students will develop core knowledge in biomechanics and physiology, focusing on the scientific principles and models that explain how the body moves and functions. This foundational understanding will support the analysis of movement patterns, physiological responses to sports performance, and the impact of fatigue. Diagnostic testing may indicate that some of these topics are known to students from PDHPE 7-10. Teachers are advised to consider the aspects of biomechanics and physiology relevant to the unit. **Motion and Forces** • Kinematics and kinetics • Angular and linear kinematics • Projectile motion • Momentum and impulse • Summation of force **Stability and Movement** • Balance and stability • Centre of mass and stability • Levers and torque **Energy and Fatigue** • Energy systems • Review of energy systems • VO_2 Max and Lactate Threshold • Mechanisms of fatigue • Limiting factors leading to fatigue **Resources** Australian Institute of Sport – Biomechanics Clearinghouse for Sport – Sports Biomechanics The Biomechanics initiative Newton's Laws of Motion: Newton's Laws Law of Conservation of Momentum Momentum and Collisions Bernoulli's Principle Bernoulli's Equation Biomechanics website

	Once students have developed foundational knowledge in the above areas, they will research and present key **theories and models** that explain how biomechanics and physiology influence movement patterns and contribute to sports performance. Students will critically analyse these theories and models by evaluating their evidence base, logical consistency, plausibility, and relevance to lived experience. Theories and models might be accessed through academic texts or general HOPE textbooks written for senior secondary or junior college settings. Possible theories and models may include: • Newtons Laws on Motion • Law of Conservation of Momentum • Bernoulli's Principle • Sliding Filament Theory - website UNSW Physclips – Momentum and Collisions UNSW – Work, Energy, and Bernoulli's Equation Newton's First Law – Science of NFL Football (NSF) What is Momentum? Mechanics in Sport How Bernoulli's Principle Shapes Sports Conservation of momentum video What Is Kinematics? – Sports Jobs The Real Science Behind the 40-Yard Dash – Momentum in Sport As models are complex and time consuming to investigate, it would be best to focus on one model in depth to allow for meaningful analysis and application. Models for investigation may include: • Free Body Diagrams • Inverse Dynamics Model • Three-Energy System Model - human kinetics • Oxygen Transport Cascade video **Resources** Respiratory Physiology: Oxygen and Carbon Dioxide Transport – *Watch on YouTube* This aspect of the unit develops foundational knowledge for further engagement with higher order thinking and development of skills. Care should be taken in scheduling and volume of content to ensure that students engage with the subsequent content description and the development of skills.

critically analyse biomechanical and physiological **principles, strategies and methodologies** and evaluate **limitations and assumptions** for analysing and interpreting the body in motion	Following on from understanding of theories, concepts and models, consider continuing the chosen contexts by linking to the principles, strategies and methodologies used to interpret the body in motion. **Principles** • Muscle activation and muscle function • Force -velocity relationship • Length-tension relationship • Work, power and energy transfer • Joint range of motion and flexibility • Balance and stability Force-velocity curve Crash Course: Muscle Cells and muscle biomechanics Muscular System Overview Force of muscle contraction Length-Tension Relationship Work, Power & Energy Transfer Joint Range of Motion & Flexibility **Strategies and Methodologies** • Methods and strategies used to measure ground reaction force e.g. force plates • Methods and strategies used to measure biomechanical coordination • Lab simulations to replicate sport-specific conditions • Testing protocols and movement analysis • Field-based tests Skeletal muscle – length tension relationship Using force plates to analyse running and walking. Software for simulating musculoskeletal movement. **Limitations and Assumptions** **Evaluate** *limitations and assumptions* by considering the axioms, evidence-base, the validity of theories/models underpinning the principles, strategies and methodologies and whether concepts have been used accurately and effectively in arguments. • Identify and evaluate the limitations inherent in commonly used assessment methodologies. • Explore and discuss the underlying assumptions that inform current strategies and testing methods. • Assess the reliability and validity of assessment, including both internal consistency and external applicability of results. • Consider the influence of context (e.g., environment, population, equipment) on data interpretation. • Evaluate whether concepts have been used accurately and effectively in arguments, and assess the evidence base and logic underpinning the use of specific methodologies.

critically analyse biomechanical and physiological **research methods, problems or questions** using the **principles of ethics or sustainability** to evaluate solutions	Examine one or more research methods, problems or questions used in biomechanics and physiology that follow on from the theories, strategies studied in the CDs above and critically analyse it by considering different critiques of the method, solutions to the problem or question so students can draw their own conclusions about the value and effectiveness of the topics studied. Some ideas for consideration include: • Research methods used in biomechanics and physiology, including experimental designs, observational studies, case studies, and the use of technological tools. • Investigate real-world biomechanics and physiology problems through case studies and explain how research methods are applied to address these issues. • Apply ethical reasoning to the design, implementation, and outcomes of research, considering participant rights, consent, and potential harm. • Apply sustainability principles to research and proposed solutions, considering long-term health outcomes, environmental impact, and equitable access. • Evaluate and propose solutions to biomechanics and physiology problems, using evidence-based reasoning. **Considerations for Analysis** • Methods of data collection and their appropriateness. • Ownership and privacy of data. • Research design quality, including sample size, control of variables, and reproducibility. • Potential biases in research (e.g. gender, age, socioeconomic status). • Ethical concerns in different types of assessments (e.g. maximal vs. predictive testing). **Examples of Research Topics for Ethical and Sustainable Evaluation** • Ethical boundaries between therapeutic interventions and performance enhancement. • Use of motion analysis and wearable tech in competitive sports. • Ethical handling of motion capture and physiological data in elite and youth athletes • Bias and transparency in AI-driven biomechanical diagnostics. • Development and use of biodegradable or recyclable materials in prosthetics or sports equipment. • Equity in access to high-performance testing technologies across different populations or regions **Resources** AMA Journal of Ethics: therapy and enhancement Human enhancement Player movement analysis AMA Digital Health and AI World Economic Forum – turning plastic bottles into prosthetic limbs Climate of Our Future: plastic prosthetics and their global impact

evaluate a range of **resources and technologies** intended to enhance biomechanical and physiological research or performance	Students examine at least one resource and one technology to evaluate their efficacy and ethics/sustainability in enhancing the intended health outcomes for individuals. The examination might be as a part of an empirical investigation or via a literature review. Students may also consider the ethics, assumptions, models and theories that underlie the technology or resource that may determine the output of the technology. It is a good idea to link this to the topics studied above so that the learning follows on and uses the prior learning. **Resources** • Metabolic testing equipment • Biomechanical testing equipment • Field-based testing kits e.g. vertical jump mats • Wearable sensors e.g. accelerometers **Technologies** • Video analysis software • Analysis software • Data loggers and real-time monitoring tools • Sport technology apps • Motion capture systems • Physiological testing tools such as WHOOP, Garmin • AI driven biomechanical analysis e.g. automated gait analysis • Future trends in testing and performance enhancement (e.g. virtual reality training, digital twins) Consider efficacy, ethical implications and limitations, such as cost, accessibility and accuracy. **Resources** Cutting edge research in sports biomechanics Review of Vertical Jump Testing Methods Vertical Jump Comparison in Athletes Validity of Accelerometer-Based Tracking Devices Wearables in Sports: Safety and Performance CAS: Latest Sports Tech Innovations Markerless Motion Capture in Biomechanics Ethics of Wearable Health Tech

Skills	
Content description	**Elaborations**
synthesise Exercise Science **knowledge, understanding and skills** to investigate the mechanics of the body and the interrelationship between biomechanical or physiological principles that influence movement and sports performance in **familiar and unfamiliar contexts**	Students bring together knowledge to investigate a problem related to biomechanics and physiology. This can be linked to the topics outlined in the Knowledge and understanding CDs or a new topics could be introduced. This could be a foundational learning process or a capstone project for learning across the semester. However, as the CD calls for dealing with Unfamiliar Contexts, in any investigation there must be content or problems not covered in class but extends form or is related to the studied content, so the students' abilities to transfer their learning to the unfamiliar can be tested. This could be a comparative study of something new with something closely examined in class. **Possible Problems for Investigation** • Create a pacing strategy to minimise the impact of fatigue on performance. • Analyse Joint Angles to Improve Technique or reduce injury. • Investigate Muscle Activation Patterns - How do different training techniques affect muscle activation during a specific exercise? • Design a workstation or tool to reduce musculoskeletal strain in repetitive tasks. • Investigate physiological responses to dehydration and propose strategies to maintain performance. • Synthesise knowledge of forces to improve performance. **Resources** Regulation of Pacing Strategy during Athletic Competition Analyse Joint Angles to Improve Technique or Reduce Injury Strength training and muscle activation benefits Mayo Clinic Ergonomics Guide Hydration strategies to prevent heat illness and performance decline
create evidence-informed, targeted, and high-quality plans about biomechanical and physiological problems to achieve desired outcomes that influence movement and sports performance	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts and a chosen problem by creating plans to address them or uses them. The students work creatively to generate something new but draw on and refer to examples of similar plans encountered in class or in their research to prepare their plan. **Plans in response to Problems** • Injury Prevention Plan for a Specific Sport e.g. design a warm-up and conditioning routine to reduce ACL injuries in netball or hamstring strains in sprinting. • Recovery Strategy Plan e.g. create a post-match recovery protocol. • Technique Optimisation Plan e.g. analyse and improve a student's sprint start or swimming stroke using biomechanical feedback. • Load Management Plan e.g. develop a weekly training schedule that balances intensity and recovery to avoid overuse injuries. • Environmental Adaptation Plan e.g. prepare an athlete for competition in hot/humid conditions (e.g., Tokyo Olympics-style heat). • Biomechanical Equipment Improvement Plan e.g. redesign a piece of sports equipment (e.g., a cricket bat grip or running shoe sole) to improve performance and reduce injury.

	Resources Injury Prevention Plan (e.g., ACL in Netball) ACL injury prevention or Evidence-based ACL injury prevention programs. Access PDF Recovery Strategy Plan and Recovery insights from elite sports medicine Biomechanical analysis of the swim start Download PDF Load Management Plan - Frontiers in Sports Science – Framework for player movement and load analysis. Read full article
plan and undertake independent enquiries using science methods and critically analyse relevant data and information based on critical evaluation of **valid and reliable sources**	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts/theories/models/strategies/principles and a chosen problem by gathering empirical data or using an existing data set to analyse trends, correlations, distributions etc. in the data and validates or challenges findings using established research on the problem. • conduct own survey • evaluate own data sets • representing data in engaging ways e.g. *Information is Beautiful* website • compare primary data with peer-reviewed research findings • statistical analysis to interpret experimental results **OR** Students could design and carry out a low-risk scientific experiment. • Gait Analysis - record and analyse walking or running patterns using video or a phone app. • Grip Strength and Fatigue - Measure grip strength before and after a repetitive task. • Heart Rate and Exercise Intensity - Measure resting, active, and recovery heart rates after different types of exercise. • Reaction Time Testing - Use a ruler drop test or online tool to measure visual or auditory reaction time. • Balance and Stability - Test balance on one leg with eyes open vs. closed, or on different surfaces. Teachers should make reference to the BSSS Ethical Research Principles and Guidelines, in particular if any experiments are to involve human participants. **OR** rather than a quantitative data science approach, Students could undertake a literature review on the chosen problems and critically analyse by comparing perspectives and data to determine their own point of view on the problem. • Literature review of impact of ageing and its effects on biomechanical and physiological function • Literature review about the impact of fatigue on movement patterns and injury risk Validity and reliability of ruler drop test Hand grip strength assessment Physiology of ageing Fatigue and recovery in sport Balance and stability tests Gait analysis using smart phones: reliability and validity

communicate effectively using a range of modes, mediums, and technique for a variety of purpose, adhering to the principles of **academic integrity**	This will be measured as students complete tasks indicated in other CDs. Communication modes are ideally from the discipline and authentically represent communication in Public Health Contexts. Care should also be taken to keep in mind vulnerability to AI cheating, or AI be harnessed in the generation of texts. This range also includes written and spoken exams. Note that exams can contain a variety of written formats or genres such as letters, promotional scripts, essays, client plans, case notes. Only three to five tasks are permitted in a 1.0 unit. **Examples of texts students can create** • Numerical comparisons and analysis of size and measurements • Interpreting and using graphs, tables and diagrams/ data • Presentation/conference poster for expert audience • Research report • Experimental Report • Essay • Seminar
apply **interpersonal, intrapersonal, and leadership skills** with integrity and understanding of differences to Exercise Science problems and research methods	Students may show these people skills within the contexts of tasks. This will involve group tasks in which students demonstrate effective inter/intrapersonal skills, and leadership skills. Teachers will need to set up rubrics or observations opportunities that isolate the personal skills to make them assessable. Teachers will need to explicitly teach positive interaction/leadership/intrapersonal strategies and practices. Intrapersonal skills may need to be measured in combination with the reflection activities. **Examples of Tasks** • Students lead mini seminars/lessons of topics and take questions • Jigsaw activities • Collaborative research tasks • Conducting an experimental study as a group • Fishbowl Activity
reflect, using evidence, on Exercise Science knowledge, understanding and/or skills to make **targeted and justified proposals** for improvement	Either orally or in writing, as part of an investigation, experiment, or summative exam, or as a stand-alone summative task (e.g. journaling), students are required to **reflect** on planning, time management, and use of appropriate independent and collaborative work strategies. **Some suggested methods for reflection include:** • Yarning circles • Kolb's learning cycle • Rolfe's framework of reflective practice • Gibb's reflective cycle • Group/team reflection • Other methods for reflection Students need explicit teaching on how to reflect and opportunities to practice and receive feedback prior to assessment of this skills.

Nutrition and Training for Performance

Knowledge and Understanding

Content Description	Elaborations
critically analyse nutritional and training **theories, concepts, and models** to draw informed and insightful conclusions about human performance during sport and exercise	Students will develop core knowledge of the principles of athletic nutrition and training for performance. This knowledge will underpin later analysis of how these concepts contribute to exercise and respond to increasing demands. **Diagnostic testing may reveal that some of these topics are already familiar to students from Years 7–10 PDHPE. Teachers are advised to select and emphasise the aspects of nutrition and training most relevant to the unit focus.** • Training principles • Nutrition fundamentals • Energy systems • Fuel for energy • Fitness components • Fitness testing • Monitoring training • Food protocols and food labelling • Nutrition models • Digestive system function and nutrient absorption • Adaptations to training • Periodisation models • Energy metabolism • Different diets **Resources** Energy Systems and Training Principles Energy Systems 3 Energy Systems – Quick Intro Carbs vs Fats for Fuel Different diets Nutrition Information Panels Pre-Exercise Fuelling PDF Australian Dietary Guidelines (2013): NHMRC Guidelines PDF AIS Performance Nutrition HQ: Modules on food labels, hydration, and planning AIS Nutrition HQ

	Once student have some fundamental knowledge of the topics above, research or present key theories and models that explain how nutrition and training influence human performance and then determine comparative validity by considering factors such as evidence base, logic, plausibility and correlation to lived experience. Theories and models might be accessed through academic texts or general HOPE textbooks written for senior secondary or junior college settings. Possible theories and models may include: **Theories may include** • Interference theory - website • Supercompensation theory - website • Set point theory.) - article As models are complex and time consuming to investigate, it would be best to focus on one model. Models for investigation may include: • Periodisation Models – comparison of periodisation models journal article • Carbohydrate Periodisation Model – fuel for work: periodisation of carbohydrate intake • Nutrient Timing Models – International society of sports nutrition position stand: nutrient timing • Glycaemic Index – GI journal article This aspect of the unit develops foundational knowledge for further engagement with higher order thinking and development of skills. Care should be taken in scheduling and volume of content to ensure that students engage with the subsequent content description and the development of skills.
critically analyse strategies, methodologies and functional principles of athletic nutrition and training for performance and evaluate **limitations and assumptions** of knowledge about and inquiry into these areas	Following on from the understanding of theories, concepts, and models, students continue working within their chosen contexts by linking these to the principles, strategies, and methodologies used in athletic nutrition and training. This integrated approach allows students to critically analyse how these elements interact to influence performance and to evaluate the assumptions and limitations that underpin them. **Principles** • Principles of athletic nutrition such as energy balance, macronutrient distribution, hydration, micronutrient sufficiency and supplementation • Principles of athletic training for performance such as specificity, progressive overload, individualisation, recovery and adaptation, periodisation and variation Requirements of Energy, Carbohydrates, Proteins and Fats for Athletes Sports and Nutrition: What Athletes Need to Know Sports and Athletic Performance Principles of Athletic Training for Performance Top 6 Training Principles

	Strategies could include: • Carbohydrate Loading • Nutrient Timing • Ergogenic nutritional methods • Energy Availability Management • Periodisation • Cross-Training • Recovery Optimisation • Load Monitoring • Skill-Specific Drills Dietary Carbohydrate and the Endurance Athlete: Contemporary Perspectives Nutritional Demands in Athletes: Timing, Supplements, and Recovery Nutrition and Performance Resources Methodologies could include: • Methodologies used in research and practice to assess and guide nutrition e.g. dietary analysis tools, biomarker testing, body composition assessment • Methodologies used in training science e.g. biomechanical analysis, physiological testing • Methodologies used in fitness testing Dietary Assessment Methods For the Athlete: Pros and Cons of Different Methods Measurement Toolkit **Limitations and Assumptions** **Evaluate** *limitations and assumptions* by considering the axioms, evidence-base, the validity of theories/models underpinning the principles, strategies and methodologies and whether concepts have been used accurately and effectively in arguments. **Resources** Principles of athletic nutrition Methodologies of fitness testing

critically analyse nutritional and training programs, problems or questions using the principles of **ethics or sustainability** to evaluate solutions for athletic performance	Examine one or more research methods, problems or questions used in nutrition and training that follow on from the theories, strategies studied in the CDs above and critically analyse it by considering different critiques of the method, solutions to the problem or question so students can draw their own conclusions about the value and effectiveness of the topics studied. Some ideas for consideration include: • Research methods used in nutrition and training, including experimental designs, observational studies, case studies, and the use of technological tools. • Investigate real-world nutrition and training problems through case studies and explain how research methods are applied to address these issues. • Apply ethical reasoning to the design, implementation, and outcomes of research, considering participant rights, consent, and potential harm. • Apply sustainability principles to research and proposed solutions, considering long-term health outcomes, environmental impact, and equitable access. • Evaluate and propose solutions to nutrition and training problems, using evidence-based reasoning Considerations for Analysis • Methods of data collection and their appropriateness. • Ownership and privacy of personal and biometric data. • Research design quality, including sample size, control of variables, and reproducibility. • Potential biases in research (e.g. gender, age, socioeconomic status). • Ethical concerns in different types of assessments (e.g. maximal vs. predictive testing). Examples of Research Topics for Ethical and Sustainable Evaluation • Ethics of supplementation – e.g. creatine use in adolescents, transparency in marketing. • Ethics of training trends – e.g. extreme conditioning programs, overtraining in youth sport. • Body composition ideals – e.g. pressure to conform to lean body types, disordered eating risks. • Sustainability of high-protein diets – e.g. environmental cost of animal-based protein. • Access to elite-level nutrition and training resources – e.g. equity in rural or low-income communities. AIS Nutrition Education Module on Supplements BodyKind Youth Survey Findings CSIRO Future Protein Mission Future Protein Mission Overview

evaluate a range of **targeted resources and technologies** intended to enhance nutritional and training outcomes, experiences or performance	Students examine at least one resource and one technology to evaluate their efficacy and ethics/sustainability in enhancing the intended health outcomes for individuals. The examination might be as a part of an empirical investigation or via a literature review. Students may also consider the ethics, assumptions, models and theories that underlie the technology or resource that may determine the output of the technology. It is a good idea to link this to the topics studied above so that the learning follows on and uses the prior learning. **Resources** • Nutritional planners – structured meal planning tools for athletes • Nutrition/calorie tracking apps – e.g. MyFitnessPal • Activity trackers – pedometers, step counters, or app-based movement logs • Smart kitchen scales & meal prep tools – for portion control and macronutrient accuracy • Blood biomarker testing kits– home-based or lab-based kits for tracking nutrient status, hydration, or recovery markers **Technologies** • GPS data • Wearable fitness trackers – e.g. WHOOP, Garmin, Fitbit for HRV, sleep, and recovery • Virtual Reality (VR) and Augmented Reality (AR) training • Sweat analysis patches • AI-driven coaching platforms Consider limitations, such as cost, accessibility, accuracy, and ethical implications. **Resources** Wearable Physiological Systems for Metabolic Monitoring Nutrition tracking apps Diabetes Australia – Nutrition Apps i-screen Australia – Blood Work & Health Dashboard Advanced Athletes Performance – GPS Tracking ABC News – Athlete Data Privacy AIS – Privacy Advice on Wearables Sport Integrity Australia – VR Learning Tools ZealAR – AR in Sports Inspire Athletic – Sweat Testing Brisbane Curam AI – AI in Sports Performance & Injury Prevention

Skills	
Content description	**Elaborations**
synthesise Exercise Science **knowledge, understanding and skills** to investigate nutritional and training problems **in familiar and unfamiliar** contexts	Students bring together knowledge to investigate a problem related to nutrition and training . This can be linked to the topics outlined in the Knowledge and understanding CDs or a new topics could be introduced. This could be a foundational learning process or a capstone project for learning across the semester. However, as the CD calls for dealing with Unfamiliar Contexts, in any investigation there must be content or problems not covered in class but extends from or is related to the studied content, so the students' abilities to transfer their learning to the unfamiliar can be tested. This could be a comparative study of something new with something closely examined in class. **Possible Problems for Investigation** • Compare and evaluate two nutrition plans for performance improvement in different sports • Investigate recovery nutrition strategies for an individual athlete with specific dietary needs • Design a hydration strategy for an athlete competing in a hot/humid climate • Develop a nutrition plan for an ultra-endurance event (e.g. Ironman, multi-day trail run) • Analyse the impact of intermittent fasting on training outcomes in adolescent athletes • Investigate the effectiveness of plant-based diets in strength-based sports
create evidence-informed, targeted, and high-quality plans about nutritional and training problems to achieve desired Exercise Science outcomes that influence human performance during sport and exercise	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts and a chosen problem by creating plans to address them or uses them. The students work creatively to generate something new but draw on and refer to examples of similar plans encountered in class or in their research to prepare their plan. **Plans in response to Problems** • Designing an evidence-based plan to increase protein or carbohydrate intake for a specific athlete profile • Creating a periodised training and nutrition plan for a team or individual preparing for a competition • Developing a recovery protocol that integrates nutrition, hydration, and rest strategies • Constructing a comparative analysis of two training methodologies applied to different sports or populations
plan and undertake independent enquiries using science methods and critically analyse relevant data and information based on **critical evaluation** of **valid and reliable sources**	Drawing on learning from the Knowledge and Understanding strands, students demonstrate their understanding of key concepts, theories, models, strategies, and principles by planning and conducting an independent enquiry into a chosen problem related to nutrition or training. This enquiry should involve the collection or analysis of data and the critical evaluation of findings using valid and reliable sources. **Empirical Data Collection and Analysis** • Conduct their own survey (e.g. dietary habits, hydration practices, training routines) • Evaluate their own data sets (e.g. food diaries, heart rate logs, training loads) • Represent data in engaging and meaningful ways

	OR **Experimental Investigations** Students may design and carry out a **low-risk scientific experiment** related to nutrition or training. Examples include: • Are portion sizes on food labels realistic? • Heart rate differences between aerobic and anaerobic activities
communicate effectively using a range of modes, mediums, and technique for a variety of purposes, adhering to the principles of **academic integrity**	This will be measured as students complete tasks indicated in other CDs. Communication modes are ideally from the discipline and authentically represent communication in Exercise Science Contexts. Care should also be taken to keep in mind vulnerability to AI cheating, or AI be harnessed in the generation of texts. This range also includes written and spoken exams. Note that exams can contain a variety of written formats or genres such as letters, promotional scripts, essays, client plans, case notes. Only three to five tasks are permitted in a 1.0 unit. **Examples of texts students can create** • Numerical comparisons and analysis of size and measurements • Interpreting and using graphs, tables, diagrams and data • Presentation/conference poster for expert audience • Research report • Experimental Report • Essay • Editorial writing • Stimulus Response- essay, short responses, multiple choice, health related plan • Seminar • Client education material
apply **interpersonal, intrapersonal, and leadership skills** with integrity and understanding of differences to Exercise Science problems and research methods	Students may show these people skills within the contexts of tasks. This will involve group tasks in which students demonstrate effective inter/intrapersonal skills, and leadership skills. Teachers will need to set up rubrics or observations opportunities that isolate the personal skills to make them assessable. Teachers will need to explicitly teach positive interaction/ leadership/ intrapersonal strategies and practices. Intrapersonal skills may need to be measured in combination with the reflection activities. **Examples of Tasks** • Students lead mini seminars/lessons of topics and take questions • Jigsaw activities • Collaborative research tasks • Conducting an experimental study as a group • Fishbowl Activity • Fitness testing rotations – students take turns leading, recording, and participating in fitness assessments, requiring clear communication and shared responsibility • Team-based problem-solving challenges – students work together to develop a training or nutrition plan for a hypothetical client or scenario

reflect using evidence on Exercise Science knowledge, understanding and skills to make **targeted and justified proposals** for improvement	Either orally or in writing, as part of an investigation, experiment, or summative exam, or as a stand-alone summative task (e.g. journaling), students are required to **reflect** on planning, time management, and use of appropriate independent and collaborative work strategies. Some suggested methods for reflection include: • Yarning circles • Kolb's learning cycle • Rolfe's framework of reflective practice • Gibb's reflective cycle • Group/team reflection • Other methods for reflection Students need explicit teaching on how to reflect and opportunities to practice and receive feedback prior to assessment of this skills.

Science of Performance

Knowledge and Understanding

Content Description	Elaborations
critically analyse **theories, concepts, and models** about factors affecting performance to **draw informed and insightful conclusions** about the management of sports injuries, rehabilitation, and the athletic mindset	Students will develop core knowledge of psychology and behaviour. This knowledge will underpin later analysis of how these concepts contribute to athletic performance. Fundamental knowledge to allow problem solving in exercise science. Diagnostic testing may indicate that some of these topics are known to students from PDHPE 7-10. Teachers are advised to consider the aspects of performance relevant to the unit. **Sports Psychology** • Nature of arousal in sport (causes/effects) • Motivation and Goal setting • Personality Types • Strategies (Control arousal, goal setting, Visual Imagery) **Sports Medicine** • Anatomical structures – tendon, ligament, muscles, joints • Types of Injuries • Phases of healing/growth • Treatment and management of Injury Once student have some fundamental knowledge of the topics above, research or present key theories and models that explain how psychological and behavioural factors influence performance, injury, and recovery and then determine comparative validity by considering factors such as evidence base, logic, plausibility and correlation to lived experience. Theories and models might be accessed through academic texts or general HOPE textbooks written for senior secondary or junior college settings. Possible theories and models may include: Theories may include: • Bandura's self-efficacy theory • Goal setting theory • Motivational theories such as achievement goal theory, self-determination theory, flow theory • Inverted-U Hypothesis/theory • Intrinsic v extrinsic motivation • Lewin's Interactionalist Theory • Personality theories such as Trait Theory and social-cognitive theory • Eysneck's Theory of personality • Performance Theory • Hull's Drive Theory

	As models are complex and time consuming to investigate, it would be best to focus on one model. Models for investigation may include: • Mental toughness model • The Stress-Injury Model • Grief response model • The Individual Zones of Optimal Functioning Model • Cognitive Appraisal Model of Injury Response • Biopsychosocial Model of Injury Rehabilitation • Integrated Model of Psychological Response to Sport Injury and Rehabilitation Process • Fear-Avoidance Model • Transtheoretical Model of Behaviour Change This aspect of the unit develops foundational knowledge for further engagement with higher order thinking and development of skills. Care should be taken in scheduling and volume of content to ensure that students engage with the content description and the development of skills.
critically analyse **principles strategies, and methodologies** of injury, psychological and behavioural factors that influence athletic performance and **evaluate limitations and assumptions** of knowledge about and inquiry into these areas	Following on from the understanding of theories, concepts, and models, students continue working within their chosen contexts by linking these to the principles, strategies, and methodologies used to enhance athletic performance. **Principles** • Injury-Related Principles such as early intervention, progressive overload and recovery, individualised rehabilitation and return-to-play readiness • Psychological Principles such as mental readiness, emotional regulation, motivation and growth mindset • Behavioural Principles such as consistency and routine, goal-oriented behaviour, adherence to training and rehab, feedback and reinforcement and self-regulation • Psychological behaviour principles **Strategies and Methodologies** • Cognitive-Behavioural Therapy • Graded Exposure Therapy • Biopsychosocial Rehabilitation Model • Return-to-Play Protocols • Mindfulness and relaxation techniques • Injury prevention strategies (physical, laws/rules, training) **Limitations and Assumptions** **Evaluate** *limitations and assumptions* by considering the axioms, evidence-base, the validity of theories/models underpinning the principles, strategies and methodologies and whether concepts have been used accurately and effectively in arguments.

critically analyse **research methods, programs, problems** or questions about injury, psychology or behaviour using the principles of **ethics or sustainability** to evaluate solutions about the relationship between mental and physical performance	Examine one or more research methods, problems or questions used in injury, psychology or behaviour that follow on from the theories, strategies studied in the CDs above and critically analyse it by considering different critiques of the method, solutions to the problem or question so students can draw their own conclusions about the value and effectiveness of the topics studied. Some ideas for consideration include: • Research methods used in psychology, behaviour and injury, including experimental designs, observational studies, case studies, and the use of technological tools. • Investigate real-world psychology, behaviour and injury problems through case studies and explain how research methods are applied to address these issues. • Apply ethical reasoning to the design, implementation, and outcomes of research, considering participant rights, consent, and potential harm. • Apply sustainability principles to research and proposed solutions, considering long-term health outcomes, environmental impact, and equitable access. • Evaluate and propose solutions to psychology, behaviour and injury, using evidence-based reasoning **Considerations for Analysis** • Methods of data collection and their appropriateness. • Ownership and privacy of data. • Research design quality, including sample size, control of variables, and reproducibility. • Potential biases in research (e.g. gender, age, socioeconomic status). • Ethical concerns in different types of assessments (e.g. psychological screening, return-to-play decisions) **Examples of Research Topics for Ethical and Sustainable Evaluation** • Contact sport and concussion – ethical concerns around youth participation and return-to-play decisions • Methods of psychological testing and interventions • Psychological impacts of body image – especially in aesthetic or weight-class sports • Mental health support in elite sport – sustainability of high-performance environments • Use of wearable tech in behaviour tracking – privacy, data ownership, and long-term use
evaluate a range of **targeted resources and technologies** intended to enhance, experiences or performance associated with injury, performance or behaviour	Students examine at least one resource and one technology to evaluate their efficacy and ethics/sustainability in enhancing the intended health outcomes for individuals. The examination might be as a part of an empirical investigation or via a literature review. Students may also consider the ethics, assumptions, models and theories that underlie the technology or resource that may determine the output of the technology. It is a good idea to link this to the topics studied above so that the learning follows on and uses the prior learning. **Resources** • Psychological assessments e.g. Mental Toughness Questionnaire • Cryotherapy chambers • Ultrasound and MRI imaging • Rehabilitation apps

	• Mindfulness apps e.g. Headspace • Psychological profiling tools • Wearable trackers – e.g. WHOOP, Garmin • Video analysis software • Habit tracking apps **Technologies** • Activity trackers • Smart mouth guards • Neurofeedback devices • AI-driven rehab platforms • Virtual reality rehab tools • Biofeedback tools – e.g. HRV monitors, EMG sensors for stress and muscle activation Consider limitations, such as cost, accessibility, accuracy, and ethical implications.
Skills	
Content description	**Elaborations**
synthesise Exercise Science **knowledge, understanding and skills** to investigate the psychological and behavioural problems in **familiar and unfamiliar contexts**	Students bring together knowledge to investigate a problem related to the musculoskeletal and cardiorespiratory system. This can be linked to the topics outlined in the Knowledge and understanding CDs or a new topics could be introduced. This could be a foundational learning process or a capstone project for learning across the semester. However, as the CD calls for dealing with Unfamiliar Contexts, in any investigation there must be content or problems not covered in class but extends form or is related to the studied content, so the students' abilities to transfer their learning to the unfamiliar can be tested. This could be a comparative study of something new with something closely examined in class. **Possible Problems for Investigation** • Create a rehabilitation program • Create a rehabilitation program that integrates psychological and behavioural strategies • Investigate the impact of mental fatigue on physical performance in a new sport or age group • Compare coping strategies used by athletes in individual vs. team sports • Explore the psychological effects of long-term injury in adolescent athletes • Analyse the role of motivation and adherence in rehabilitation outcomes • Investigate how goal-setting strategies differ across cultural or gender contexts • Evaluate the behavioural impact of return-to-play protocols in contact vs. non-contact sports

create **evidence-informed, targeted, and high-quality plans** about psychological and behavioural problems to achieve desired Exercise Science outcomes that influence human performance during sport and exercise	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts and a chosen problem by creating plans to address them or uses them. The students work creatively to generate something new but draw on and refer to examples of similar plans encountered in class or in their research to prepare their plan. **Plans in response to Problems** • Design evidence-based plans for injury recovery • Design evidence-based plans for return to play • Design evidence-based plans for psychological skills • Design a behavioural intervention plan • Create a mindset development plan
plan and undertake independent enquiries using science methods and critically analyse relevant data and information based on critical **evaluation of valid and reliable sources**	Drawing on learning from the Knowledge and Understanding strands topics, students demonstrate understanding of concepts/theories/models/strategies/principles and a chosen problem by gathering empirical data or using an existing data set to analyse trends, correlations, distributions etc. in the data and validates or challenges findings using established research on the problem. Examples include: • Conduct their own survey (e.g. athlete attitudes toward injury recovery, use of mental skills training, motivation levels across training phases) • Evaluate their own data sets (e.g. mood tracking journals, perceived exertion logs, sleep and recovery diaries) • Represent data in engaging and meaningful ways (e.g. like Information is Beautiful website) **OR** Students could design and carry out a low-risk scientific experiment. • Impact of positive self-talk on increased performance in a physical task • Impact of music on motivation or performance • Impact of mindfulness training on focus and error rates in skill-based tasks (Teachers should make reference to the BSSS Ethical Research Principles and Guidelines, in particular if any experiments are to involve human participants.) **OR** rather than a quantitative data science approach, Students could undertake a literature review on the chosen problems and critically analyse by comparing perspectives and data to determine their own point of view on the problem. • Literature review of links between repeated concussions and permanent impacts on cognitive, behavioural and social functioning • Comparative analysis of psychological rehabilitation strategies post-injury • Review of the relationship between mental toughness and performance under pressure

communicate effectively using a range of modes, mediums, and technique for a variety of purposes, adhering to the **principles of academic integrity**	This will be measured as students complete tasks indicated in other CDs. Communication modes are ideally from the discipline and authentically represent communication in Public Health Contexts. Care should also be taken to keep in mind vulnerability to AI cheating, or AI be harnessed in the generation of texts. This range also includes written and spoken exams. Note that exams can contain a variety of written formats or genres such as letters, promotional scripts, essays, client plans, case notes. Only three to five tasks are permitted in a 1.0 unit. Examples of texts students can create • Numerical comparisons and analysis of size and measurements • Interpreting and using graphs, tables and diagrams/ data • Presentation/conference poster for expert audience • Research report • Experimental Report • Essay • Editorial writing • Stimulus Response- essay, short responses, multiple choice, health related plan • Seminar • Reflective journal
apply **interpersonal, intrapersonal, and leadership skills** with integrity and understanding of differences to Exercise Science problems and research methods	Students may show these people skills within the contexts of tasks. This will involve group tasks in which students demonstrate effective inter/intrapersonal skills, and leadership skills. Teachers will need to set up rubrics or observations opportunities that isolate the personal skills to make them assessable. Teachers will need to explicitly teach positive interaction/ leadership/ intrapersonal strategies and practices. Intrapersonal skills may need to be measured in combination with the reflection activities. Examples of Tasks • Students lead mini seminars/lessons of topics and take questions • Jigsaw activities • Collaborative research processes • Conducting an experimental study as a group • Fishbowl Activity • Case studies/scenarios

reflect using evidence on Exercise Science knowledge, understanding and skills to make **targeted and justified proposals for improvement**	Either orally or in writing, as part of an investigation, experiment, or summative exam, or as a stand-alone summative task (e.g. journaling), students are required to **reflect** on planning, time management, and use of appropriate independent and collaborative work strategies. Some suggested methods for reflection include: • Yarning circles • Kolb's learning cycle • Rolfe's framework of reflective practice • Gibb's reflective cycle • Group/team reflection • Other methods for reflection Students need explicit teaching on how to reflect and opportunities to practice and receive feedback prior to assessment of this skills.

Resources – Exercise and sports psychology https://open.umn.edu/opentextbooks/textbooks/1198
Anatomy and physiology textbook - https://openstax.org/details/books/anatomy-and-physiology-2e


BSSS
AUSTRALIAN CAPITAL TERRITORY