THE UNIVERSITY OF WESTERN AUSTRALIA

Honours and Master's Research Projects 2026

Anatomy and Human Biology, Physiology, Neuroscience, Sport Science, Exercise and Health

School of Human Sciences

uwa.edu.au/schools/human-sciences

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Supervision

The role of the supervisor is to advise, guide and provide constructive feedback to the student through the processes of choosing a realistic topic, designing a project, doing the research, and interpreting the findings and writing the dissertation.

Things to do before deciding on a supervisor:

- Talk with a few prospective supervisors about their research interests and prospective topics, as well as their styles of supervision and what they expect of their students; and
- Talk with your prospective supervisors' current and former Honours and postgraduate students about their experiences.
- Things to discuss and negotiate with your supervisor very early in the program.
- The regularity, timing and format of your meetings.
- The type and level of assistance that you would like, and your supervisor is prepared to give, with respect to choosing a topic and setting goals; finding appropriate literature; collecting the data and information; analysing and interpreting your findings; planning the dissertation; and writing and reviewing the dissertation.

Choosing a topic

Before deciding on a topic, it is usually a good idea to first identify one or more prospective supervisors according to the criteria above. Then, in consultation with your prospective supervisor/s, identify some possible topics and projects according to the following criteria:

- Choose an area that is sufficiently interesting to you to maintain your enthusiasm for a year-long project.
- Choose a topic in which you can identify questions to be answered or gaps to be filled in the current knowledge; and
- Find a project that is realistic for you to complete within the time allocated for your research and dissertation.

Information for applicants

In an Honours year, the learning emphasis is on completing an original research project. Projects are guided by academic staff who are internationally recognised in their specific fields of research. Students acquire the specialized skills required to complete their particular research project and also develop generic research skills such as analytical and problem-solving abilities, and a variety of communication skills. These are not only vital for future success in research but stand graduates in good stead whatever career they may subsequently pursue. Throughout the year, students also work in close collaboration with a like-minded peer group and professional university staff.

Honours are available in the following disciplines:

Anatomy and Human Biology

Physiology

Neuroscience

Sport Science, Exercise and Health

Essential qualifications

For Honours: An appropriate undergraduate degree with a minimum weighted average of 65% in the level 3 subjects that comprise the relevant major, from an approved institution. Applicants will be assessed on a case-by-case basis.

For Master or PhD: An appropriate Honours degree or equivalent research experience from an approved institution. Applicants will be assessed on a case-by-case basis.

Enrolment must be full time.

Honours Scholarships available

DR MARGARET LOMAN-HALL HONOURS SCHOLARSHIP (APHB)

Scholarships are funded by a bequest from Dr Margaret Loman-Hall for the purpose of encouraging eligible students to undertake a Bachelor of Science (Honours) or Bachelor of Philosophy (Honours) in the Department of Anatomy, Physiology & Human Biology, School of Human Sciences, UWA.

Each Scholarship is valued at $7500 and comprises:

- $6000 during the honours enrolment as a stipend
- $1500 during the honours enrolment as research costs allowance payable to the student's supervisor.

https://www.uwa.edu.au/study/scholarship-listing/dr-margaret-loman-hall-scholarship-f512651

THE FRANK PYKE MEMORIAL SCHOLARSHIP (SSEH)

A stipend of $5000 is available to assist an Honours student, (who has demonstrated academic excellence and other outstanding achievements, abilities, leadership or community involvement in sport or exercise related activities) to undertake a Bachelor of Science (Honours) in the Department of Sport Science, Exercise and Health, School of Human Sciences, UWA.
https://researchdegrees.uwa.edu.au/scholarships/1vvwx1/frank-pyke-memorial-hdr-scholarship-in-sport-science

THE HIGH-PERFORMANCE SPORT RESEARCH CENTRE (HPSRC) AD-HOC HONOURS SCHOLARSHIP (SSEH)

These scholarships will provide selected UWA honours students with research project funds and a small personal stipend ($3,000) in order to conduct an honours-level research project that aligns with the research focus areas of the HPSRC. In a collaborative effort between service providers from the Western Australian Institute of Sport (WAIS) and academic staff from the University of Western Australia (UWA), the honours research project should have a focus on the daily training environment and/or the performance outcomes of WAIS athletes and sport programs.

THE "KIDDO" HONOURS SCHOLARSHIP (SSEH)

The Kiddo $5000 Honours Scholarship is open for students eligible to undertake a BSc (Honours) course in 2026. The aim of this scholarship is to encourage and assist a meritorious student to undertake an honours course with a thesis related to the Kiddo program, www.kiddo.edu.au within the School of Human Sciences in 2026 The stipend of $5000 is expected to contribute to the student's living expenses. Successful applicant/s will be selected based on their academic performance. Prior experience in the Kiddo program will be considered favourably.

Email amanda.derbyshire@uwa.edu.au to register your interest.

Overview of SHS Honours units (2026)

Bachelor of Science (Honours) BH004

2026 HON-ANHBY Anatomy and Human Biology

Semester 1

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4001	Scientific Communication Part 1	Project Plan, Research Proposal, Proposal Seminar	12.5%	AC
HMSC5004	Research Methods in Human Sciences	Conceptual Examination of the Research Process	12.5%	Grade
HMSC5005	Data Analysis in Human Sciences	Statistics and Data Analysis Modules	12.5%	Grade
APHB5514	Honours Dissertation Part 1	Dissertation	AC	AC

Semester 2

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4008	Scientific Communication Part 2	Final Seminar, Student Viva	12.5%	Grade
APHB5515	Honours Dissertation Part 2	Dissertation	AC	AC
APHB5516	Honours Dissertation Part 3	Dissertation	AC	AC
APHB5517	Honours Dissertation Part 4	Dissertation	50%	Grade

2026 HON-PHYGY Physiology

Semester 1

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4001	HMSC4001	Project Plan, Research Proposal, Proposal Seminar	12.5%	AC
HMSC5004	Research Methods in Human Sciences	Conceptual Examination of the Research Process	12.5%	Grade
HMSC5005	Data Analysis in Human Sciences	Statistics and Data Analysis Modules	12.5%	Grade
APHB5514	Honours Dissertation Part 1	Dissertation	AC	AC

Semester 2

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4008	Scientific Communication Part 2	Final Seminar, Student Viva	12.5%	Grade
APHB5515	Honours Dissertation Part 2	Dissertation	AC	AC
APHB5516	Honours Dissertation Part 3	Dissertation	AC	AC
APHB5517	Honours Dissertation Part 4	Dissertation	50%	Grade

2026 HON-NEURS Neuroscience

Semester 1

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4001	Scientific Communication Part 1	Project Plan, Research Proposal, Proposal Seminar	12.5%	AC
HMSC5004	Research Methods in Human Sciences	Conceptual Examination of the Research Process	12.5%	Grade
HMSC5005	Data Analysis in Human Sciences	Statistics and Data Analysis Modules	12.5%	Grade
NEUR5514	Honours Dissertation Part 1	Dissertation	AC	AC

Semester 2

Unit (6pts)	Unit name	Tasks	Weighting	Unit results
HMSC4008	Scientific Communication Part 2	Final Seminar, Student Viva	12.5%	Grade
NEUR5515	Honours Dissertation Part 2	Dissertation	AC	AC
NEUR5516	Honours Dissertation Part 3	Dissertation	AC	AC
NEUR5517	Honours Dissertation Part 4	Dissertation	50%	Grade

Bachelor of Sport Science Exercise and Health (Honours) BH032

2026 HON-SSCEH Sport Science, Exercise and Health

Semester 1

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4001	Scientific Communication Part 1	Project Plan, Research Proposal, Proposal Seminar	12.5%	AC
HMSC5004	Research Methods in Human Sciences	Conceptual Examination of the Research Process	12.5%	Grade
HMSC5005	Data Analysis in Human Sciences	Statistics and Data Analysis Modules	12.5%	Grade
SSEH5011	Honours Dissertation Part 1	Dissertation	AC	AC

Semester 2

Unit (6pts)	Unit name	Tasks	Weighting	Unit result
HMSC4008	Scientific Communication Part 2	Final Seminar, Student Viva	12.5%	Grade
SSEH5012	Honours Dissertation Part 2	Dissertation	AC	AC
SSEH5013	Honours Dissertation Part 3	Dissertation	AC	AC
SSEH5014	Honours Dissertation Part 4	Dissertation	50%	Grade

Student Research Projects

Honours in the Department of Health, Western Australia

In 2026 there is an opportunity for two students to conduct their Honours project within the Government of Western Australia, Department of Health (Health Networks division). This initiative is suitable for students who are interested in research but see themselves pursing employment outside of academia.

Support is provided by a supervisor from the Department of Health and an internal supervisor with the School of Human Sciences.

For further information please contact: A/Prof Peter Noble (peter.noble@uwa.edu.au)

Project 1: Quantifying Carbon Savings from WA Health's Sustainability Initiatives.

WA Health has introduced a range of sustainability measures across facilities, operations, and service delivery, but its current emissions trajectory remains short of the goal to reach net zero by 2040. This project will collate and analyse data on carbon savings from existing initiatives, calculate emissions reductions and develop a monitoring tool or dashboard to track progress. Findings will demonstrate the impact of current efforts, identify the gap between achieved and required reductions, and support future investment in high-impact strategies to reduce the health sector's carbon footprint and improve community resilience.

Student Role:

- Conducting emissions calculations to quantify reductions and assess progress, including sourcing emissions factors.
- Developing a monitoring tool/dashboard for tracking carbon savings.
- If UWA has expertise in this field to co-supervise, complex emissions reduction modelling on how to achieve NetZero can be explored.

Project 2: Understanding Our Dementia Patient Cohort and Their Care Needs.

This honours project aims to profile the cohort of patients diagnosed with dementia who are currently receiving care at hospitals within the Sir Charles Gairdner Osborne Park Health Care Group (SCGOPHCG). The study will utilise both qualitative and quantitative data to explore and evaluate the following:

- Definition and scope of dementia: What is dementia, and how is it classified within clinical settings?
- Models of care: What care do these patients require? What care models are currently employed at SCGOPHCG, and how do they compare to recognised gold standards?
- Patient demographics and clinical profiles: Who are these patients? Where do they come from, how frequently do they attend hospital, what are their diagnoses, and what types of care do they receive?
- Resource requirements: What financial, workforce, and clinical resources are necessary to support the care of dementia patients within the health service?
- Future demand projections: What are the anticipated trends in dementia-related hospital care, based on data modelling and future projections?

The Auditory Laboratory

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Deafness and other hearing disorders such as tinnitus are among the most common forms of sensory impairment with profound consequences for the individual and society. Hearing loss can affect quality of life including mental health and cognition. In our laboratory we work with animal models to investigate neural mechanisms of tinnitus, effects of hearing loss on cognition and the effects of fibrosis on the effectiveness of cochlear implants.

Project 1: Relationship between hearing loss and spatial memory.

Human studies have demonstrated a strong association between hearing loss and cognitive decline. It has been suggested that changes in central auditory processing following hearing loss are associated with high incidence of cognitive decline and Alzheimer's disease. We have previously investigated cognition (spatial learning and memory via Morris water Maze) in young and old guinea pigs with and without hearing loss. We now want to investigate Amyloid beta and Tau accumulation in the brains of these animals. This project will involve using a freezing microtome to cut sections, histology and immunohistochemistry.

Project is suitable for: Honours, Masters, PhD
Supervisors: Dr Kristin Barry and A/Prof Helmy Mulders

Project 2: Modelling and regulating extracellular matrix deposition in the inner ear.

Fibrosis in the inner ear can occur following cochlear implant surgery and as a complication of infection. This can result in the formation of a fibrotic barrier between the electrode and the target neurons, causing loss of residual hearing and function of the implant. In this study we will examine the efficacy of the anti-fibrotic drugs in regulating extracellular matrix protein deposition by inner ear fibroblasts. Dose response curves will be performed and effects on TGFB-induced smad2/3 and p38 pathway activation will be confirmed by western blot. The effects of drug treatment on inner ear fibroblast cell proliferation, differentiation and ECM protein deposition by inner ear fibroblasts confirmed using in vitro assays.

Project is suitable for: Honours, Masters
Supervisors: A/Prof Cecilia Prêle and A/Prof Helmy Mulders

Project 3: Investigation into the potential of anti-fibrotic drugs as treatment for cochlear fibrosis.

Cochlear implants, the gold standard treatment for profound hearing loss, are as yet the most successful sensory prosthesis, however there is considerable variation in outcomes for patients. One of the factors may be fibrosis in the cochlea caused by the insertion of the implant. In this project we will investigate the potential of a novel anti-fibrotic drug as a treatment using in vitro techniques and an in vivo animal model.

Project is suitable for: Honours, Masters
Supervisors: A/Prof Cecilia Prêle and A/Prof Helmy Mulders

Project 4: Tracing auditory neural pathways of the brain.

Tinnitus, the perception of sound without an external source, has been proposed to be associated with dysfunction in sensory gating neural circuitry. Sensory gating, the brain's ability to filter out irrelevant stimuli, may break down in tinnitus, leading to persistent auditory perceptions. However, the specific neural pathways involved in sensory gating within the auditory system remain underexplored. The thalamic reticular nucleus (TRN) and the medial geniculate nucleus (MGN) are key components in the auditory processing pathway of the brain. Using neuronal tracing, immunofluorescence and lightsheet imaging to understand the specific pathways from the TRN and MGN to other auditory areas can shed light on how auditory information is processed in the brain.

Supervisors: Dr Kristin Barry and A/Prof Helmy Mulders

Project is suitable for: Honours, Masters, PhD

Project 5: Investigating sensory gating circuitry in tinnitus.

Human studies, and our lab, have shown that prefrontal cortex stimulation may benefit some of those with tinnitus. While the mechanism for this effect is unknown it has been proposed to be due to activation of sensory gating circuitry. We have previously shown that after hearing loss there is an alteration of this circuitry that may lead to the dysfunction in sensory gating hypothesised to underlie tinnitus. We now want to test in an animal model of hearing loss if these alterations of sensory gating after hearing loss lead to the development of tinnitus.

Supervisors: Dr Kristin Barry and A/Prof Helmy Mulders

Project is suitable for: Honours, Masters, PhD

Biological Anthropology

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Projects:

- Human behavioural ecology: Study of children's growth, family ecology, social organization, and food production in rural Timor-Leste. There is much room for developing specific projects springing from students' interests. In country research requires some language study prior to fieldwork. Only highly motivated students with achievement in relevant units will be considered for fieldwork projects.

- There are a limited number of projects with data from the longitudinal Timor-Leste project that do not require in-country research.

- Interview, survey, or observational studies of human social behaviour in Australian context.

Desirable: Knowledge of basic statistical analyses is helpful but can be learned duirng the project. Ability to learn a second language to basic skills level.

Cancer and Cancer Targeted Therapies

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Each project will take place in the Cancer Epigenetics Laboratory at the Harry Perkins institute of Medical Research.

Project 1. Engineering the cancer epigenome and targeting metastatic behaviour using epigenetic editing tools.

Cancer is one of the major causes of death in Australia. For decades, the origin of cancer was attributed to genetic mutations, deletions and copy number amplifications. Recent advances have illuminated the aberrant epigenetic landscape which not only contributes but, in some cases, drives cancer development and progression. Epigenetic marks are heritable covalent modifications in the DNA or associated proteins. Epigenetic modifications provide the mechanisms by which a cell "knows" and "remembers" which genetic information to read and which to ignore. Epigenetic modifications include DNA methylation and modifications in the proteins that the DNA is wrapped around. Unlike genetic mutations, epigenetic modifications are reversible, and this can be used to restore the normal state of gene expression in the cancer. Our laboratory develops novel epigenome-targeted therapies to reverse the abnormal epigenetic modifications frequently observed in cancer. In this proposal, we aim to reverse the epigenetic modifications of key cancer drivers using the CRISPR/dCas9 system. We propose the development novel and more selective technologies able to stably suppress the genes that cause cancer spread.

Supervisors: A/Prof Pilar Blancafort, Dr. Charlene Waryah

Project is suitable for: Honours, Masters, PhD

Essential qualifications:

For Honours: An appropriate undergraduate degree with a biological science, cell biology and basic molecular biology emphasis, and a minimum weighted average of 65% in the level 3 subjects that comprise the relevant major from an approved institution. Applicants will be assessed on a case-by-case basis.

For Masters or PhD: An appropriate Honours degree with a biological, cellular and basic molecular biology science emphasis or equivalent research experience from an approved institution. Applicants will be assessed on a case-by-case basis.

Desirable Skills/Experience

Knowledge of statistics, cell biology, basic biochemistry and cell biology

Project 2. Development of a novel strategy using engineered peptides to selectively sensitise metastatic breast cancers to chemotherapy agents.

The goal of this study is to develop innovative targeted treatments for triple negative breast cancers (TNBCs). TNBCs are responsible for the majority of breast cancer deaths in Australia and throughout the world. These cancers do not express oestrogen receptor alpha, progesterone receptor and epidermal growth factor receptor 2, which are common targets exploited in the clinic.

They belong to the basal-like subtype breast cancer, which accounts for 15% of all breast cancers. In the metastatic setting, they are highly resistant to chemotherapy. DNA-damaging agents used in chemotherapy that lack target specificity, cause wide range adverse effects. Thus, there is an urgent need to develop novel, more specific and targeted molecular approaches to treating this lethal disease.

As a cutting-edge therapy for TNBCs, we propose the generation of interference peptides (iPeps), which are synthetic peptides engineered from oncogenic transcription factors overexpressed in these breast cancers. The iPeps carry cell penetration and nuclear localization sequences that allow the peptide to be rapidly internalized across the cell and nuclear membranes. In addition, the iPeps are designed with residues essential for protein-protein interactions and DNA-binding derived from the endogenous oncogenic transcription factor. The iPeps then compete with the endogenous transcription factor by sequestering the binding partners necessary for transcriptional and DNA-binding activities.

Furthermore, we will use this highly innovative approach to physically link the iPep with small molecules like Doxorubicin and pro-drugs like platinum IV, to localize them specifically in the nucleus of the cancer cells. We hypothesize that the iPeps will serve as “guides” for the chemotherapeutic drugs, directing them precisely into the nucleus to induce DNA damage. These iPeps will increase the selectivity and the kinetics of the small molecule’s uptake, as well as decrease the dose of the small molecule required for anti-cancer efficacy, thus lowering chemotherapy toxicity. This strategy will be employed in both TNBC cell lines and several aggressive breast cancer animal models, and eventually be adapted to patients to help eliminate the mortality associated with metastatic breast cancer, particularly for these triple negative breast cancers.

Supervisors: A/Prof Pilar Blancafort, Dr. Edina Wang

Essential qualifications

For Masters or PhD: An appropriate Honours degree with a biological, cellular and basic molecular biology science emphasis or equivalent research experience from an approved institution.
Applicants will be assessed on a case-by-case basis.

Desirable Skills/Experience

Knowledge of statistics, cell biology, basic biochemistry and cell biology.

Gene Regulation and RNA Therapeutics

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The Fox laboratory focuses on understanding the role of RNA within cell physiology, and how to apply this knowledge for the development of RNA therapeutics for various types of cancer. A major focus of the lab has been the study of paraspeckles, nuclear bodies built on a long noncoding RNA. Another key focus is the infant cancer neuroblastoma, a heterogeneous cancer that is amenable to RNA/epigenetic manipulation.

The School of Human Sciences also hosts the Australian Centre for RNA therapeutics in Cancer (ACRTC). In this Centre we extend our basic understanding of cancer pathways and targets to make and test the efficacy of different mRNA treatments. Interested students should contact Archa to learn more about research opportunities with the centre.

Project 1: Development of RNA therapeutics for the infant cancer, neuroblastoma. (*ACRTC project)*

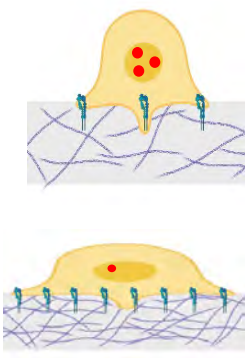
Neuroblastoma is a paediatric cancer that makes up 8-10% of all childhood cancer diagnoses and is the most common extracranial tumour in children. To combat the high recurrence rate and late-complications of current neuroblastoma treatments often associated with chemotherapy, alternative therapies are currently of high interest. Our previous work focused on manipulation of paraspeckles, and their component proteins and RNAs in neuroblastoma, to alter cell state.

In this project you will extend these findings to explore combinatorial RNA treatments of neuroblastoma. You will increase understanding of these pathways in neuroblastoma by measuring the responses to different treatments using a variety of sequencing and microscopy methods.

This project would suit someone with an interest in cell biology, genetics and cellular models of disease.

Project 2: Investigating how the cell nucleus responds to mechanical insults.

Cells need to navigate and adapt to different environments within the body. There is growing appreciation that the rigid cell nucleus has to respond to the external environment that a cell experiences. The nucleus can respond to environmental cues by altering gene expression in the cell.



In this project you will investigate nuclear organisation, primarily focusing on paraspeckle nuclear bodies, within a variety of cells that experience different external environments. You will culture cells in different conditions and monitor how the nuclear responds. You will also assess the impact of increasing paraspeckles on cell responses to different environments. This work is critical for understanding and eventually targeting diseases such as cancer, where metastasis involves cells experiencing, and surviving, under extreme confinement.

This project would suit someone with an interest in cell biology, mechanobiology, and cellular models of disease.

References:

McCluggage and Fox. Paraspeckle nuclear condensates: Global sensors of cell stress? Bioessays. 2021

Zhang S, et al., ..Fox AH. NONO enhances mRNA processing of super-enhancer-associated GATA2 and HAND2 genes in neuroblastoma. *EMBO reports*, 24 (2), e54977 2023

Naveed A, et al., ..Fox AH. NEAT1 polyA-modulating antisense oligonucleotides reveal opposing functions for both long non-coding RNA isoforms in neuroblastoma. *Cell Mol Life Sci*, 2020

Todorovski V, McCluggage F, Li Y, et al., Fox AH, Choi YS. Confined environments induce polarized paraspeckle condensates. *Communications Biology* 6(1), 145, 2023

RNA Multi-Omics and Design

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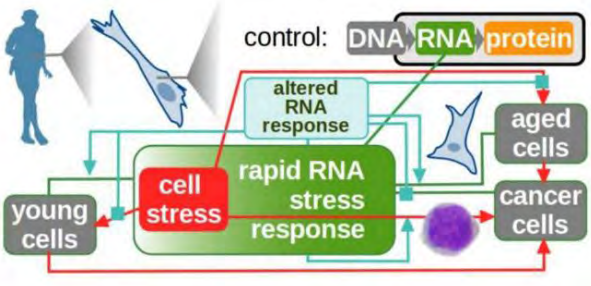
Unlocking the RNA Code for Next-Generation Cancer Therapies

The RNA Multi-Omics and Design Laboratory (RMODEL) is at the forefront of RNA biology and biotechnology, decoding how cells read, regulate, and respond to information inputs. We combine cutting-edge molecular RNA biology with artificial intelligence to understand and engineer RNA molecules that control life's fundamental processes. Our research spans from basic mechanisms of protein biosynthesis to developing revolutionary RNA therapeutics for cancer treatment.



Working in our dynamic team, you'll explore how RNA molecules orchestrate cellular responses to stress, aging, and disease. We invent and use state-of-the-art techniques including nanopore sequencing, high-throughput RNA profiling, ribosome footprinting, and machine learning to reveal RNA's hidden regulatory codes. Our ultimate goal is to translate these discoveries into life-saving therapies that can precisely target cancer at its molecular roots.

World-Class Facilities

RMODEL works together with Western Australia's two world-class RNA research facilities that provide unique opportunities for student training.

ACRTC - A dedicated RNA innovation node developing next-generation cancer treatments. The centre brings together RNA innovators, oncologists, and patient advocates to uncover new insights and develop RNA-based therapies.
Learn more: https://www.uwa.edu.au/australian-centre-for-rna-therapeutics-in-cancer

RNA Innovation Foundry (RIF) - A state-of-the-art mRNA production facility offering end-to-end services for RNA therapeutic development. As the Western Australian node in a national network supported by Therapeutics Innovation Australia, RIF provides cutting-edge capabilities in RNA design, synthesis, and formulation. Learn more: https://www.uwa.edu.au/rna-innovation-foundry

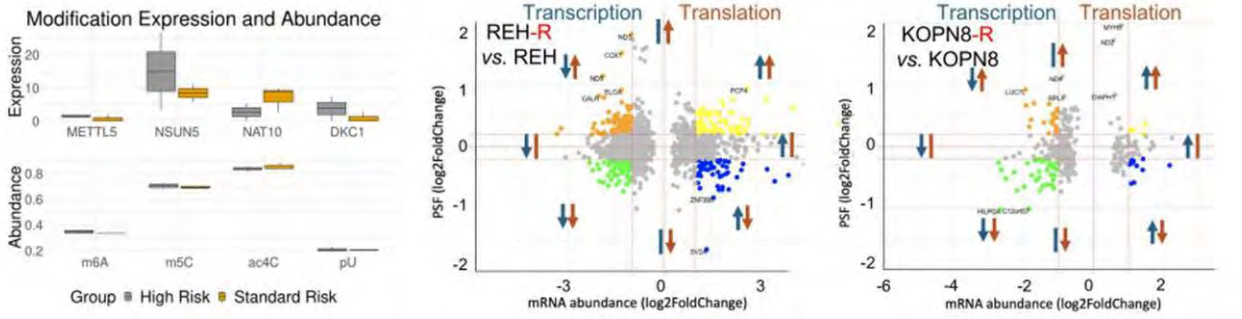
Why RNA Research Matters

RNA therapeutics represent a paradigm shift in medicine. Unlike traditional drugs that target proteins, RNA medicines can directly control genetic information, offering unprecedented precision in treating disease. The COVID-19 mRNA vaccines demonstrated RNA's potential, but this was just the beginning. Cancer cells often hijack RNA regulatory mechanisms to survive and spread. By understanding these processes, we can design RNA-based interventions that outsmart cancer's defenses, restore normal cellular function, and activate the body's natural tumor-fighting capabilities.

Project 1: RNA Diagnostics and Therapeutics in Cancer.

Decoding cancer's RNA fingerprint to develop precision therapies

Cancer cells produce unique RNA signatures that reveal their vulnerabilities. This project will use direct RNA nanopore sequencing to comprehensively profile RNA modifications, isoforms, and stability in cancer cells. You'll work with cutting-edge Oxford Nanopore technology to measure poly(A) tail lengths, map RNA modifications including m6A and pseudouridine, and identify RNA-binding protein interactions that drive cancer progression.



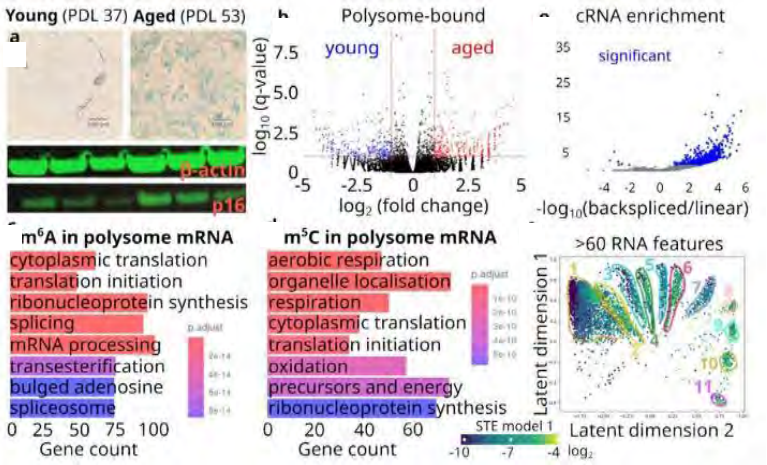
You'll learn to integrate multi-omic data using AI/ML approaches to identify therapeutic targets and biomarkers. This project combines wet-lab techniques with computational analysis, providing excellent training in both experimental design and bioinformatics.

Project 2: Cytosolic Cell Stress Response and RNA Control of Ageing and Longevity.

Understanding how RNA regulation determines cellular resilience and lifespan

Cellular stress responses are orchestrated by complex RNA regulatory networks that determine whether cells survive, adapt, or die. This project investigates how cytosolic free RNA, RNA stress granules and processing bodies control mRNA fate during oxidative stress, nutrient deprivation, and DNA damage - conditions that accelerate aging and promote cancer.

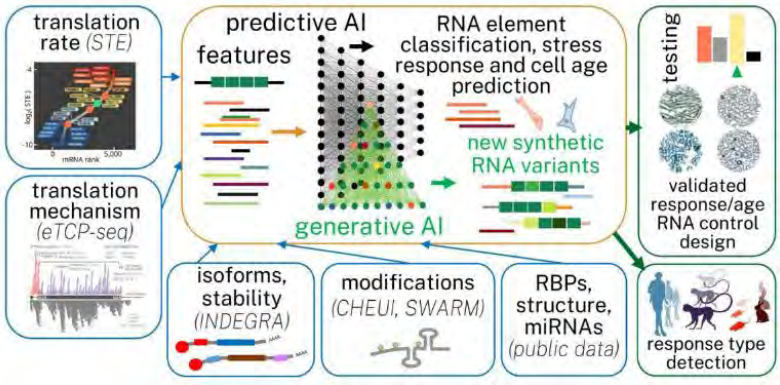
Using our advanced ribosome profiling and polysome fractionation techniques, you'll map translation dynamics in real-time during stress responses. Direct RNA sequencing will reveal how RNA modifications and poly(A) tail dynamics regulate stress-responsive genes. You'll explore how these mechanisms break down during aging and how they can be therapeutically targeted to enhance cellular resilience.



Project 3: Design of New RNA Therapeutics.

Engineering next-generation RNA medicines using AI and synthetic biology

The future of medicine lies in programmable RNA therapeutics that can be designed to target any disease-causing gene. This project focuses on developing technologies that invest into RNA therapeutic modalities, including cell-specific and condition-specific response elements.



You'll use our RNA modeling pipeline and test RNA sequences for stability, specificity, and therapeutic efficacy. Direct RNA sequencing will be used to validate RNA structure, modifications, and interactions with cellular machinery. You also will have an opportunity to develop and invent new technologies in this area.

This project offers unique access to industrial-scale RNA production capabilities and the opportunity to see your designs progress from computer to clinic. Our collaboration with the RNA Innovation Foundry provides hands-on experience with GMP-like RNA manufacturing processes.

Multi-Omic Technologies

All projects leverage our comprehensive RNA multi-omic toolkit:

- **Direct RNA Nanopore Sequencing**: Real-time, single-molecule analysis of native RNA
- **RNA Modifications**: Map m6A, pseudouridine, and other epitranscriptomic marks
- **Isoform Analysis**: Discover novel splice variants and their functional consequences
- **Poly(A) Tail Profiling**: Measure tail lengths that control RNA stability
- **RNA-Protein Interactions**: Identify regulatory complexes using CLIP-seq and proximity labeling
- **Translation Dynamics**: Ribosome profiling to measure protein synthesis rates
- **Machine Learning Integration**: AI-powered analysis to extract biological insights

Select references

1. **Cleynen A, Ravindran A, Sethi A, Kumar B, Javaid T, Mahmud S, Woodward K, Vieira HGS, Änkö ML, Weatheritt R, Eyras E, Robin S, Shirokikh N** (2024). High-Accuracy RNA Integrity Definition for Unbiased Transcriptome Comparisons with INDEGRA. *bioRxiv*. doi: 10.1101/2024.12.12.627949
    - *Revolutionary method for RNA integrity assessment - critical for all RNA-seq experiments*
2. **Santos-Rodriguez G, Srivastava A, Ravindran A, Oyelami F, Ip KH, Gupta P, Villanueva J, King HE, Grootveld A, Blackburn J, Gupta I, Vieira HGS, Shirokikh NE, Eyras E, Weatheritt RJ** (2024). The conserved landscape of RNA modifications and transcript diversity across mammalian evolution (EpiEvo). *bioRxiv*. doi: 10.1101/2024.11.24.624934
    - *Comprehensive m6A modification atlas across mammalian tissues - directly relevant to Projects 1 & 3*

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Cardiovascular Electrophysiology - Ion Channels in Heart Muscle

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Currently, cardiovascular disease accounts for 32 % of all deaths in Australia. This is a staggering proportion and continues to exceed death from all cancers combined (30%) and from road deaths (4%). A number of the deaths in the cardiovascular group are due to arrhythmia or disturbances in the electrical activity in the heart.

The normal electrical activity in the heart is controlled by the movement of ions through specialised channels in the membranes of cardiac cells. The autonomic nervous system plays an essential role in regulating cardiac function and many of its effects are mediated via sympathetic neurotransmitters that regulate the activity of these ion channels.

Certain pathophysiological conditions contribute to arrhythmias such as hypoxia and oxidative stress. Under these conditions there is a reduction in blood flow to the muscle in the heart resulting in a reduction in available oxygen and reactive oxygen species production. This is then followed by an increase in generation of reactive oxygen species. There is increased sympathetic drive and the heart has a greater vulnerability to sudden cardiac death. Understanding how cardiac ion channels are regulated under these conditions is crucial to understanding the ionic mechanisms involved in the triggering of ischemic arrhythmias. In addition an increase in reactive oxygen species can contribute to the development of cardiac hypertrophy (enlarged heart) and cardiac failure. We have good evidence that an early mechanism involves increased calcium influx through the L-type calcium channel.

The laboratory uses molecular biology techniques for expression and purification of ion channel protein and biochemical techniques for assay of generation of reactive oxygen species and cell viability. The method that will be used to study membrane currents is the patch-clamp technique. This technique is an extremely powerful method for studying the electrophysiological properties of biological membranes and its contribution to the advancement of research was justly recognised with the awarding of the Nobel Prize in Physiology or Medicine in 1991 to its developers Erwin Neher and Bert Sakmann. The technique can be used to study ion channels either at a whole-cell level or at the level of a single channel. In addition, since the intracellular composition of the cell can be controlled, this can be exploited to determine any second messengers involved. Patch-clamp technique is also used in the laboratory in conjunction with fluorescent dyes to record changes in intracellular calcium, reactive oxygen species generation and mitochondrial function.

Project 1. How does the L-type calcium channel regulate mitochondrial function in pathology where actin filaments are disrupted?

(Collaboration with Prof Christine Seidman, Harvard University and Prof Chris Semsarian, Sydney University)

Mitochondrial respiration is abnormal in hearts where actin or cytoskeletal proteins are disrupted and it is not understood why. This project follows from data generated by previous students in the lab. We have evidence that the L-type calcium channel can regulate mitochondrial function via the actin cytoskeleton. The project involves the use of patch clamp technique to study L-type calcium channel currents in mouse myocytes isolated from hearts of mice with disease involving disruption in cytoskeletal proteins and fluorescent detection of changes in mitochondrial membrane potential, NADH and superoxide production after activation of the channel.

Alterations in expression of proteins in mdx mouse hearts that co-immunoprecipitate with the channel (assessed by Mass Spec) will be identified using immunoblot analysis.

Project 2. How does oxidative stress alter the sensitivity of the L-type calcium channel to isoproterenol? What effect does this have on the action potential?

(Collaboration with Professor Yoram Rudy, University of Washington, St Louis, Missouri, USA)

This question seeks to understand how arrhythmias occur during ischemia/reperfusion in the heart (after a heart attack). Isoproterenol is a beta- adrenergic agonist (and mimics the effects of catecholamines such as adrenaline in the heart). This project will use patch clamp technique to study the effect of oxidative stress and isoproterenol on L- type calcium channel currents in addition to K and Na channel currents and record changes in action potentials. Information gained from patch-clamp studies are incorporated into the Rudy-Luo model. Changes in action potential configuration are modelled and the relative risk of arrhythmia is determined.

Supervisor: Prof Livia Hool

Cell/Molecular Biology and Genetics

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Project 1: High-resolution analysis of the human immune response to HIV: implications for cure research and vaccine design.

Summary: More than 35 million people worldwide are infected with HIV including >22,000 Australians. Anti-HIV therapy can reduce mortality associated with infection but treatment does not provide a cure, is life-long and remains a substantial financial burden in Australia and worldwide. The main impediment to cure is the enormous diversity of HIV. A significant proportion of this variation is due to mutations in the HIV genome that allow the virus to escape from our immune response (viral adaptation). In this study, we will utilize our unique ability to analyze the host's immune response at the single cell level to examine viral adaptation during the critical acute phase of infection. Understanding viral adaptation will aid in the rational design of vaccine candidates for either preventative or therapeutic strategies.

Scientific Background and Rationale: The prototypic anti-viral immune response requires the actions of an array of naïve $CD4^+$ and $CD8^+$ T cells which, upon antigen-stimulation, differentiate into a highly specific population of "best–fit" clonotypes with an optimal T cell receptor (TCR) repertoire for clearance of virally infected targets and anti-viral memory. In the case of highly mutable viruses such as HIV, this process is subverted prominently by an extreme capacity for viral escape from $CD8^+$ T cells. The extent of $CD8^+$ escape, or more broadly adaptation, to immune responses, in founder/transmitting viruses or vaccine immunogens influences the subsequent quality of immunological control (1).

However, this mechanism alone is not sufficient to explain immune failure in HIV infection. It has been established that effective $CD4^+$ T cell responses are necessary for quality $CD8^+$ T cell responses (2, 3). We have characterised mutations in HIV sequences, which suggest that HIV can actually adapt to $CD4^+$ T cell responses. This is a novel form of adaptation, which may operate in early infection, and have critical long-lasting effects on subsequent antibody and $CD8^+$ T cell responses. Furthermore, while functional studies have shown examples of viral mutations causing disruption of antigen presentation leading to loss of antigen recognition, these 'classical' mechanisms represent only one strategy of adaptation. We have previously shown that the adapted viral strain can still be recognised by the host's T cells in many instances (4, 5) and these T cells can exhibit greater functional avidity to the cognate peptide than T cells that target the non-adapted form (6).

We **hypothesise** that viral adaptation to T cell pressure, rather than leading to 'classical' escape, may result in the selection of a narrow, high avidity, TCR repertoire that ultimately is less effective at viral control, perhaps because of viral exhaustion. We can now address this issue using our established single cell analysis approach. Understanding how the TCR diversity of a maturing immune response can be altered or exploited by a pathogen is a fundamental question for many acute and chronic pathogens for which natural, vaccine or cell therapy-based immunity is not currently effective or available.

The link between TCR repertoire changes and effector functions at the single clonotype and global response levels is also a fundamental question for anti-viral immunity.

Significance: The mechanisms of viral adaptation to T cell responses **are fundamental concepts for host-pathogen interaction** and have important clinical implications. The cumulative burden of providing immediate and life-long anti-retroviral therapy (ART) to all individuals with HIV infection is significant, and the HIV incidence and prevalence continues to increase in Australia every year since 1999 despite good ART coverage (7). Harnessing immunological clearance as an alternative to 'drugs for life' could reduce this health and economic burden, as well as advance the global research efforts for HIV eradication. Improved therapeutic vaccines could ideally be combined with anti-latency strategies as a potential synergy in Australian research, with resulting benefits for global health.

Current immunogen design approaches do not solve the problem of viral adaptation nor do they consider how to overcome viral adaptation to CD4+ T cell responses in ensuring sustained CD8+ and antibody responses for vaccine memory.

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Project 2: The role of NKT cells in the outcome of liver transplantation in a murine model.

Organ transplantation is the final treatment option for many patients with end-stage diseases. Despite improvements in short-term outcomes, long-term organ survival has remained poor for the past two decades. This is primarily due to chronic rejection, caused by a long-term, uncontrolled immune response against the transplanted organ. Understanding this damaging immune response is vital to improving outcomes for organ transplant patients.

We have an established liver transplantation model in mice which can be manipulated to tolerate or reject the transplanted liver depending on the genetic mismatch between the donor and recipient mice. Preliminary data in our model indicates that a specific type of immune cell, called a natural killer T (NKT) cell, could be vital in controlling the survival of the transplanted liver. NKT cells are multi-functional immune cells that recognise and react to a broad range of activating signals in different ways.

There is evidence that immune cells that are contained within the transplanted liver are necessary for it to be tolerated by the recipient. By transplanting livers which have or which lack NKT cells we can assess their importance for successful transplantation. By transplanting normal livers into recipients which have or which lack NKT cells, we can assess if transplant success is dependent on recipient NKT cells.

The health of the transplants will be assessed by measuring levels of liver tissue damage and cytokines in the blood, and by characterisation of the immune response in the graft and peripheral lymphoid organs using flow cytometry. Ultimately, we aim to use this model to discover potential new targets to enable tolerance to transplanted solid organs and consequently reducing the need for life-long immunosuppression and the associated adverse side effects.

Supervisors: Prof Silvana Gaudieri, Prof Michaela Lucas and Dr Amy Prosser (Perkins)

Desirable Skills/Experience: Background in immunology would be preferred.

Project 3: The effect of plastic-chemical exposure on cellular signalling in fat cells

Though traditionally thought to be a passive energy storage depot, we now understand that fat cells (adipocytes) are a critical source for signalling molecules such as Adiponectin and Leptin which regulate the adipose tissue microenvironment to control inflammation and promote metabolic balance. Plastic associated chemicals (PACs) such as Bisphenols and Phthalates that leach from plastic goods and personal care products have the capacity to interrupt the core functional pathways that allow adipocytes to carry out their role, potentially implicating them in the growing prevalence of obesity and its comorbidities. While a growing volume of evidence suggests that PACs can affect adipocyte metabolism, their effect on intercellular signalling is unclear. This project aims to use a variety of molecular biology techniques, including cell culture, fluorescent microscopy, ELISA and flow cytometry to investigate if/how 3T3-L1adipocytes that have been exposed to PACs communicate with naïve cells in a way that affects their function.

Supervisors: Prof Silvana Gaudieri, Jacob Warger (Perkins) work to be completed at Harry Perkins Institute

Comparative Physiology of Adaptation

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Prof Shane Maloney


Dr Dominique Blache

Our group is interested in the physiological mechanisms whereby animal species (including humans) adapt to environmental stressors. We focus mainly on thermal and osmotic stress, but exercise, inanition (starvation), and infection are also studied, and recently the operation of circadian clocks and their role in physiological function (with Dr Peter Mark). Most experimental work is at systems level, but organ and molecular levels are also studied. Our long-term aim is to identify specific adaptations that allow animals to survive and reproduce in challenging environments, and to identify how "homeostasis" handles the trade-offs when simultaneous challenges are presented to an organism. Prospective Honours students with a background in General Systems Physiology, Exercise Physiology, Applied Animal Physiology, or Comparative Physiology are encouraged to apply. Depending on the project chosen a background in Cell Physiology could be an advantage.

Students will be exposed to a range of approaches and techniques including (in non-human animals) recovery anaesthesia and surgery, implantation of physiological recording equipment, blood sampling for hormone measurement, and husbandry techniques for various species. In human research we use state of the art equipment to record physiological parameters in ambulatory subjects, including core and skin temperature transmitters, ambulatory blood pressure recording equipment, laser Doppler skin blood flow techniques, and infra-red thermography for surface temperature measurement.

Project 1: Models of human heat balance – how important is the effect of wind speed that is usually ignored?

Following a well-cited study in 2010, it has become common place to project the impact of climate change on human thermoregulation and work capacity using the wet-bulb temperature as an index of human heat stress. There are several issues with such an approach that limit its utility and accuracy; one is that way that the wet-bulb temperature is derived from meteorological data, which inevitably means that the index ignores the effect of wind (convection) on heat exchange, as discussed in a recent article.

https://onlinelibrary.wiley.com/doi/10.1111/apha.14196

The difference between the natural-wet-bulb temperature and the ventilated-wet-bulb temperature is well grounded in theory, but has been measured only once formally; at 25°C. Other than those few measures at 25°C, there are no empirical data on the wet-bulb temperature that is registered at different combinations of dry-bulb temperature, humidity, and wind speed.

The project will involve the measurement of the wet-bulb temperature while the dry-bulb temperature, the humidity, and the wind speed are systematically varied. The outcome will be empirical formula to calculate the natural-wet-bulb temperature. Good mathematical knowledge will be an advantage.

Supervisors: Prof Shane Maloney, Prof Duncan Mitchell (WITS, South Africa], Prof Mike Kearney [U Melb]

Project 2: The relative importance of different Zeitgebers in the control of rhythmicity and survival in *Drosophila*.

Circadian rhythms refer to endogenous biological processes that fluctuate over a 24-hour period, allowing organisms to anticipate predictable physiological challenges that occur during the day/night cycle. Research in chronobiology increasingly indicates that robust circadian rhythms (i.e., rhythms with large amplitudes) are linked to improved metabolic health and longevity. Zeitgebers refer to resetting cues that synchronize and set the timing of circadian rhythms. Temperature appears to be a potent zeitgeber for circadian rhythms and may directly drive clock gene expression; therefore, it is possible that an increased amplitude of clock gene expression, driven by an increased amplitude of temperature cycles, could have a positive effect on longevity. In laboratory mammals, it is a challenge to demonstrate a direct relationship because of the difficulties of manipulating their body temperature. However, we can drive circadian gene expression in *Drosophila melanogaster*, a well-established model organism for genetics and circadian biology, by manipulating ambient temperature, which is impossible to do in mammals. Recently, we demonstrated that flies exposed to cycling ambient temperatures live significantly longer compared to flies housed at constant temperature.

The project aims to investigate the effect of constant or cycling ambient temperatures on circadian gene expression and lifespan. Sub-projects may include investigations into the interaction of temperature with various other known zeitgebers, including light, noise, and diet, and investigate their effects on clock gene expression, lifespan, activity, feeding/mating behaviour, and physiology. Results from this project may shed light onto the role of circadian rhythms and various zeitgebers on the process of ageing.

Supervisors: Prof Shane Maloney, Dr Dominique Blache [SAgE], Dr Peter Mark [SHS]

Project 3: Nerve conduction velocity, ion pump activity, and the cardiac pacemaker during cooling in the cane toad (*Rhinella marina*).

In Australia, cane toads (*Rhinella marina*) are classified as pests. Since their introduction into Queensland in 1930, their numbers have reached around 200 million. To try to limit the population, many thousands of toads are killed annually using a variety of methods. Toads are also killed for university teaching and research. Gradual cooling then freezing has been a common method for humane killing, but is now deemed unacceptable by some authorities. The aim of the project is to measure the activity of various components of the nociceptive pathway at different temperatures. You will make measures using a PowerLab, similar to the practicals you did in PHYL2002, to elucidate the Q_{10} for nervous activity in toads. Your results will help to determine whether cane toads have the necessary physiology to detect pain when they are frozen.

Supervisors: Prof Shane Maloney, Dr Dominique Blache [SAgE]

Project 4: Can IRS be used to assess animal welfare?

The increasing public interest in the quality of life of animals used by humans (research or production animals) has led to calls for objective means to assess how an animal experiences events in their life. Vibrational spectroscopy techniques, such as infrared spectroscopy, have been proposed to assess the welfare of different domestic animals (Manteufell et al., 2023). These techniques are used in the field of animal nutrition and physiology. Our team has published the results of a preliminary experiment showing that the profile of IRS of brain tissue is associated with short- and long-term events that compromise animal welfare. However, there is a need to develop methodologies to use infrared spectroscopy (IRS) techniques to analyse biological samples such as blood or saliva, which would be more practical to collect. With this project, you will test different methods of collection and preservation of blood, plasma, saliva, and brain samples to optimise the use of a handheld infrared spectroscopy machine.

Supervisors: Dr Dominique Blache [SAgE], Dr Luoyang Ding [SAgE], Prof Shane Maloney [SHS]

Project 5: Fibre, rumen function, circadian rhythms, and sleep in ruminant animals. Is rumination a form of sleep?

Ruminant animals can consume and process foods that monogastric animals (like us humans) cannot metabolise. That occurs because the rumen is densely populated by microorganisms that can break $a_{1,6}$ bonds between monosaccharides that form the long chain polysaccharide molecules of cellulose. The digestion of those molecules begins with mechanical processing, the act of chewing. Particles larger then about 1.2 mm cannot move from the rumen further along the digestive tract, and rumination exposes ruminal contents to another round of mechanical digestion. Diets that are low in fibre require no rumination to process, and so a normal behaviour is not expressed in animals on high quality diets. There is some evidence that rumination is a form of sleep; it occurs only when animals are undisturbed and calm. We would like to know what brain activity looks like in a ruminating animal, and whether rumination is a form of sleep. If it is, there are important implications for animal welfare. This project aims to feed sheep diets that are high or low in fibre, and see if the time spent ruminating is impacted, and whether total sleep time changes when rumination time changes.

Supervisors: Prof Shane Maloney [SHS], Dr Joh Milton [SAgE], Dr Dominique Blache [SAgE], Prof John Lesku [LaTrobe].

Project 6: Exploring the role of the gut-brain axis in the development of personality in sheep.

Variation in the personality of ruminants between individuals has been studied for several decades and has similarities with temperament in humans. Personality (often named temperament in animals) refers to the response of an animal to a situation that the animal perceives as challenging. Personality can affect most biological functions, primarily the stress axis, but also other functions that can impact production traits and the health and welfare of the animal. An essential part of the expression of temperament is the way that an individual perceives a stressor. Studies using molecular tools have begun to identify the central pathways that are involved in the expression of personality. Recent studies have led to the proposal that the rumen microbiome could play a role in temperament, similar to the way that the gut microbiota can influence the brain in monogastric species.

The nature of the interactions between the gut microbiome and the personality of ruminants needs to be explored. This project comprises a large number of studies, including studies aiming to modify the rumen microbiota to influence personality, exploration of the communication pathways between the gut and the brain related to specific temperament, and mapping the brain pathways such as serotoninergic, kynurenine, and short chain fatty acid pathways, that contribute to the expression of temperament phenotype. Both *in vivo* and *in vitro* approaches will be used to study the gut microbiome, the enteroendocrine system and / or the central nervous system.

Supervisors: Dr Dominique Blache [SAgE], Dr Luoyang Ding [SAgE], Prof Shane Maloney [SHS]

Project 7: Exploring the role of gut microbiome on dietary preference in *Drosophila* exposed to heat stress.

Heat exposure is a significant environmental challenge to the health of humans and other animals. Rising global temperatures forces species to endure temperatures outside of their thermal neutral zone, leading to many physiological disfunctions. However, while it is possible to mitigate the negative effects of heat stress, the nature and mechanism of action of some of the successful mitigating interventions are not fully understood. In *Drosophila melanogaster*, our model, exposure to high temperatures induces excessive production of reactive oxygen species (ROS) leading to oxidative stress. Vitamin E, a lipid soluble antioxidant, can reduce the negative effect of the overproduction of ROS and improve the health and performance of the flies. In our laboratory, we have shown that under heat stress conditions, *Drosophila* exhibit a preference for vitamin E-rich foods within 6 days of being offer the Vit-E food. The trigger of the cognitive process that leads to that preference in response to exposure to heat stress is not understood. It has been proposed, in other species, that the gut-brain axis could be involved in cognitive function. For example, the kynurenine pathway, amongst the different pathways linking the gut microbiome to the brain, is promising because at the brain level, in other species, the kynurenine pathway is involved, for example, in neuroplasticity and oxidative stress. This project will use probiotics, brain mapping, gene expression, immunohistochemistry, genetic modification, and microbiome sequencing to explore the importance of the gut-brain axis in the establishment and maintenance of the preference of *Drosophila* for vitamin E rich food during exposure to heat stress.

Supervisors: Dr Dominique Blache [SAgE], Prof Shane Maloney [SHS], Dr Jaime Beros and Prof Jennifer Rodger [SBS]

Project 8: Making sense of 25 years of data about sheep personality: A desktop project.

Our laboratory has pioneered the study of personality (also referred to as temperament) in sheep since 1993. We maintain a unique resource to study the impact of personality on most biological functions, primarily the stress axis, reproduction, and metabolism of sheep: this resource comprises two divergent lines of sheep selected for their personality phenotypes: one line was labelled calm, and one line was labelled nervous. In each generation, the phenotype was measured using two behavioural tests and the males with the most extreme phenotype (either calm or nervous) were used to produce the next generation by mating them to females of the same genotype. The selective breeding was maintained from 1992 to 2017. The database accumulated over these 25 years needs to be explored using state-of-the art statistical analyses. The database contains around 9,000 personality phenotypes of individual sheep to understand the nature of the variability in the phenotype, the evolution of that variability, and the stability of the traits over time.

The student leading this project will have to test the analytical tools selected from the large array of methods that can be used to analyse a clinical database. In addition to the large database available at UWA, we also have access to a smaller database from overseas collaborators using different breeds of sheep that could be used to extrapolate the model, or integrate other breeds into the model.

Supervisors: Dr Dominique Blache [SAgE], Dr Luoyang Ding [SAgE], Prof Shane Maloney [SHS]

Project 9: Heat stress, nutrition and feedlot cattle in the tropics.

We conducted a study in Kununurra that investigated the potential benefits of supplementing steers with whole cottonseed as an alternative method for feeding growing steers that are not yet ready for sale to a feedlot or other market. All of the steers were fed hay made from local forages (primarily rhodesgrass); the hay was chopped and mixed with a molasses-based vitamin and mineral supplement to ensure that they received the appropriate number of vitamins and minerals. Control (CON) steers received only the hay/molasses/mineral mix, while treatment steers (TRT) also received whole cottonseed. All of the cattle were equipped with an intraruminal logger that measured body temperature every 5-minutes, a 3D accelerometer that measured activity, and a subcutaneous impact that measured skin temperature. The behaviour of the cattle was recorded using CCTV. Your role will be to analyse the physiological and behavioural data in relation to the growth performance of the cattle and the environmental conditions. This project is a computer-based project.

Supervisors: Dr Dominique Blache [SAgE], Prof Shane Maloney [SHS], Dr Luoyang Ding [SAgE]

All projects are suitable for: Honours, Masters, PhD

Essential qualifications

For Honours: An appropriate undergraduate degree with a minimum weighted average of 65% in the level 3 subjects that comprise the relevant major, from an approved institution. Applicants will be assessed on a case-by-case basis.

For Masters or PhD: An appropriate Honours degree or equivalent research experience from an approved institution. Applicants will be assessed on a case-by-case basis.

Neuroscience

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A/Prof Stuart Hodgetts


Emeritus Prof Alan Harvey

Project: Cell and tissue transplantation, pharmacotherapy, gene therapy and the repair of central nervous tissue damaged after injury.

The research by the neuroscience groups in Anatomy, Physiology and Human Biology has a particular emphasis on cell and tissue transplantation, gene therapy, bioengineering, in vivo reprogramming, pharmacotherapy, photobiomodulation, and the repair of central nervous tissue damaged after injury. Ways are being tested for preventing nerve cells from dying after injury and promoting plasticity and the regenerative growth of damaged axons. The potential for replacing compromised cells with new healthy cells, including stem cells, is also under investigation. Studies are mostly carried out in the spinal cord.

Supervisor(s): A/Prof Stuart Hodgetts and Emeritus Prof Alan Harvey

Desirable skills/experience

Neuroscience emphasis. Cellular and molecular biology knowledge would be helpful.

Neuroendocrinology

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Project 1: The role of kisspeptin in energy expenditure in the mouse.

Recent data from our laboratory demonstrate no effect of central kisspeptin treatment on accumulative food intake. Despite this, neuroanatomical links have been established between kisspeptin cells and appetite regulating neurons expressing neuropeptide Y (NPY) and Pro-opiomelanocortin (POMC). Moreover, kisspeptin results in the activation of NPY cells in the hypothalamus. Electrophysiological data also suggests kisspeptin regulates the activity of NPY, and also POMC neurons. Taken together, these data strongly suggest kisspeptin has effects on energy expenditure.

Experiments will be conducted to measure the effect of kisspeptin and the absence of kisspeptin signalling in mice on energy Expenditure.GPR54 (Kiss1r) knock-out mice or their wild-type littermates will be challenged with a high fat diet for 12 weeks. Mice will then be tested on indices of energy balance including:

- Measurement of whole body energy metabolism (using metabolic cages for indirect calorimetetry
- Assessment of whole body glucose metabolism (using intraperitoneal glucose and insulin tolerance tests)
- Assessment of body composition (Using dual energy X-ray absorptiomentry DEXA)
- Assessment of neuropeptide systems involved in energy metabolism (using in situ hybridisation).

Results from these experiments will shed light on the known link between the reproductive system and metabolism and will, potentially, offer novel therapeutic alternatives for the treatment of obesity and related metabolic disorders.

Project 2: The role of kisspeptin in implantation and placentation.

Kisspeptin, the neuropeptide product of the Kiss1 gene, is synthesized by neurons within the hypothalamus and is critical for the release of gonadotrophin-releasing hormone (GnRH) and fertility. In humans, kisspeptin secretion into the peripheral circulation increases dramatically (approximately ten-thousand-fold) during pregnancy and declines precipitously at term, indicating a placental origin. The placenta is known to express KISS1 and kisspeptin receptor (KISS1R) mRNA and it appears to be localized to the trophoblast compartment. We aim to determine the expression of Kiss1 mRNA in the mouse placenta and examine the effect of reduced kisspeptin signalling (using a kisspeptin receptor knock-out mouse) on feto-placental growth.

Experiments will be conducted to measure feto-placental growth in an Kiss1r KO model.

Kiss1rKO mice or their wild-type littermates will be examined at day 14 and 18 of pregnancy.

We will examine:

- Fetal weight
- Placental weight and morphology
- Assessment of key placental genes (using RT-PCR)
- The effect of kisspeptin and the absence of kisspeptin signalling in mice on placental histology

Results from these experiments will shed light on the function of kisspeptin in the placenta and will, potentially, offer novel therapeutic alternatives for the treatment of placental insufficiency and/or pre-eclampsia.

Supervisors Dr Jeremy Smith and A/Prof Caitlin Wyrwoll

Reproductive Physiology

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Effects of environmental stressors on pregnancy and subsequent development

Early life environment is a powerful determinant of adult health outcomes. Each year, A/Prof Wyrwoll offers a range of research projects that address this topic. Broadly, these environmental stressors encompass issues such as malnutrition, physiological stressors arising from climate change, drug use, and models of glucocorticoid exposure. Projects can range from working with animals models, to computer modelling, to cell based projects, to analysis of human health datasets.

Project is suitable for Honours, Masters, PhD

Supervisor: A/Prof Caitlin Wyrwoll (SHS)

Various project opportunities for 2026 focus on the impact of climate change on health outcomes. We have opportunities available for projects involving discovery science, population health analyses, and policy reviews.

An example of a specific project that we have is:

Impact of Late-Gestation Heat Exposure on Mammary Gland Structure and Colostrum Composition in a Sheep Model.

Climate change is intensifying the frequency and severity of heatwaves, posing significant challenges to maternal health and neonatal outcomes. While the effects of heat exposure during pregnancy on fetal development and maternal health are increasingly recognised, its impact on lactation, particularly mammary gland development and colostrum quality, is not known. Colostrum's uniquely high content of bioactives makes it critical not only for the health of the newborn, but also for laying the foundation of long-term health. Any compromise in its production and composition may have lasting consequences for offspring health.

This Honours project will investigate how exposure to heatwave-like conditions during late gestation affects mammary gland morphology and colostrum composition. Using samples collected from a sheep model which simulates real-world heatwave exposures during later gestation of pregnancy, the study will characterise:

- Mammary gland structure, through histological analysis to assess tissue architecture, cellular integrity, and potential heat-induced alterations.
- Colostrum composition, including immunoglobulin content, macronutrient profile, and bioactive molecules including growth factors and lactoferrin.

The project will involve laboratory-based biochemical assays, histological staining and imaging, and data analysis to compare heat-exposed and control groups. Findings will contribute to a deeper understanding of how maternal heat stress may compromise early-life nutrition and immunity, with implications for both animal and human health in a warming climate.

Ethics approval for this study has been obtained, and the study has already commenced with collections continuing throughout 2026. A background in physiology or reproductive biology is desirable.

Supervisory team: A/Prof Caitlin Wyrwoll, Prof Valerie Verhasselt,

Reproductive and Developmental Biology

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The major interests of our group centre on the importance of circadian biology in relation to placental function, maternal adaptation to pregnancy, and developmental programming. Current studies are focussed on the impact of maternal obesity, omega-3 fatty acids and glucocorticoid excess on pregnancy outcome (from the perspective of both the mother and the developing fetus).

Projects are suitable for Honours, Master by Research, PhD

Project 1: Developmental origins of health and disease (DOHAD).

Studies in relation to DOHAD focus on the effects of fetal glucocorticoid excess on the adult phenotype, particularly in relation to programming of adult-onset diseases such as hypertension, diabetes and obesity. The capacity of postnatal diets to either exacerbate (e.g. by a high fat diet) or rescue (e.g. dietary fish oil) adverse outcomes is an important focus of this work.

Tissue banks have been collected from a large scale glucocorticoid programming study and these are available for analysis. Tissues including heart, kidney and adrenal gland have been collected at 6 months of age from control and programmed offspring raised on standard, high fat or high fat/high omega-3 diets. They have been collected at four time points across a 24 hour period, enabling circadian profiling of gene expression and tissue function to be layered into the analysis.

Supervisors: Dr Peter Mark (Chief), with Em Prof Brendan Waddell

Project 2: Circadian rhythms in the spiny mouse placenta.

Circadian biology underpins all major metabolic processes to appropriately align physiology of the organism with behaviour. Altricial (immature at birth) organisms, such as the rat and mouse, have minimal circadian variation in placental function, possibly to supply the fetus with constant nutrition during the relatively brief period of fetal growth. Precocial (relatively mature at birth) organisms are often born with metabolic rhythmicity (e.g. in liver function) which may be driven by exposure to peaks and troughs in substrate supply from the placenta.

This project aims to determine whether placentas from the precocial spiny mouse exhibit distinct circadian rhythmicity in their function in association with fetal liver rhythmicity. Samples have been collected from pregnant spiny mice in collaboration with Dr Hayley Dickinson, The Ritchie Centre at The Hudson Institute, Victoria. Placental expression of clock genes and nutrient transporters will be determined at various stages throughout gestation to determine the timing of onset for placental rhythmicity.

Supervisors: Dr Peter Mark (Chief), with Em Prof Brendan Waddell and Dr Hayley Dickinson (Monash University)

Project 3: Maternal circadian adaptation to pregnancy.

Pregnancy is one of the greatest physiological and metabolic challenges the body is confronted with. Maternal metabolism exhibits a predominantly anabolic phase during the first half of gestation, to lay down sufficient nutrients in maternal metabolic tissues (e.g., liver and adipose tissue) to meet the high energetic demands of the developing fetus later in gestation, via catabolism of the stored nutrients.

In addition, many metabolic pathways exhibit circadian rhythmicity in their activity, so they can optimise their performance to appropriate times of day e.g. food consumption during the day and fasting overnight.

Tissues have been collected at 4 hourly timepoints across 24 hours from non-pregnant mice and during mouse pregnancy (days 6, 10, 14 and 18 of pregnancy; term =19 days). Metabolic pathways and their circadian rhythmicity in these tissues will be interrogated through quantitative PCR and Western blot analysis to identify how liver and adipose tissue change during this metabolic adaptation to pregnancy.

Supervisors: Dr Peter Mark (Chief), with Em Prof Brendan Waddell

Project 4: Maternal obesity disrupts circadian adaptation to pregnancy and fetal and placental development.

Obesity during pregnancy is associated with numerous adverse outcomes including preeclampsia, gestational diabetes, fetal overgrowth and somewhat counter-intuitively, some mothers exhibit fetal growth restriction. In obese pregnancies complicated by fetal growth restriction, placental dysfunction is considered a likely cause of the reduced fetal growth. This placental dysfunction may eventuate, in part, through maladaptation of maternal circadian rhythmicity in metabolic processes.

Female rats were fed cafeteria items (e.g., meat pies, biscuits, chocolate cake) for eight weeks prior to mating, and through pregnancy. By the time of mating, the CAF-fed rats were ~25% heavier than control rats, fed only normal chow. Maternal metabolic tissues (liver and adipose tissue), placental tissue and fetal liver were collected at 4 hourly intervals across days 15-16 and 21-22 of gestation (term = 23 days). These tissues show marked changes in circadian expression of clock genes following consumption of the CAF diet, with the amplitude of the rhythm frequently reduced. Further investigation in alterations in metabolic pathways will identify other genes that are dysregulated in maternal obesity.

Supervisors: Dr Peter Mark (Chief), with Em Prof Brendan Waddell

Project 5: Pathways to infertility: mechanisms of action of phyto-oestrogens.

Background: *Trifolium subterraneum* clover has historically been used as a pasture throughout Western Australian sheep farms, due to its palatability to livestock and low maintenance requirements. However, in the 1930s and 40s, reproductive anomalies in flocks grazing *Trifolium subterraneum* clover were linked to the presence of phytoestrogens. Phytoestrogens are non-steroidal, naturally occurring phytochemicals produced in plants, partly in response to stress. Phytoestrogens are functionally and structurally similar to oestrogens, particularly 17β-oestradiol, found in mammals including sheep. Phytoestrogens act as a mixed agonist/antagonist of oestrogen action, suppressing the hypogonadal-pituitary axis and competing for oestrogen receptors, ERα and ERβ.

In sheep ingesting oestrogenic clover, the cervix loses the ability to respond to oestrogen, thus failing to produce the viscoelastic mucous necessary for fertilisation. However, some sheep are not affected by the ingestion of oestrogenic clover.

The molecular basis of the resistance to phyto-oestrogen exposure is not understood. This project aims to compare the expression of oestrogen receptors ERα and ERβ and related intracellular mechanisms in ewes exposed to phyto-oestrogens, that were either successful or unsuccessful in the production of a lamb.

Supervisors: Dr Peter Mark, Dr Dominique Blache [SaGE], A/Prof Caitlin Wyrwoll

Reproductive Biology

Dr Kathy Sanders

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My research focuses on human reproduction with a particular emphasis on lifestyle and psychosocial factors influencing male and female fecundity (the ability to conceive) and fertility.

Student projects can be developed in the following areas:

- Lifestyle and psychosocial factors influencing human fecundity and fertility (database and survey studies). For example, student projects in this area have looked at climate change concern and reproductive intentions; and Fly-in-fly out work and risks for sperm health.
- Issues surrounding the use of donated gametes and embryos in assisted reproductive technology (survey based and qualitative projects). Student projects in this area have examined factors influencing the public's willingness to consider gamete donation.
- Reproductive health literacy and the healthcare system environment (survey based and qualitative projects). Projects have examined the sources of information people use when making decisions about fertility treatment and evaluated the accessibility and inclusivity of public facing fertility information.
- Optimising processes and clinical outcomes in assisted reproductive technology (database and laboratory-based projects). Recent student projects have focussed on optimising sperm selection protocols, evaluated the costs and benefits of different methods of assessing sperm DNA health, and examined the effect of ejaculatory abstinence period on sperm cryosurvival. Projects are in collaboration with Concept Fertility Centre or Fertility North and availability varies from year-to-year.

Students are encouraged to contact **Kathy Sanders** to discuss other topics on human reproduction they may wish to pursue.

Airway Physiological Research Laboratory

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Professor Alan James

Mr John Elliott

Dr Michael Hackmann

The Airway Physiological Research Laboratory in the School of Human Sciences, in collaboration with clinicians and scientists at Sir Charles Gairdner Hospital, has a long-standing interest in the control and function of conducting bronchi. The trachea, bronchi and other airways conduct air into and out of the lung. During an asthma attack, contraction of airway smooth muscle narrows the conducting bronchi and obstructs airflow. Airway obstruction also occurs in several other respiratory diseases including chronic obstructive pulmonary disease (COPD), chronic bronchitis and emphysema. We perform *in vivo* and *in vitro* experiments on human and animal models with a broad focus of understanding the detailed mechanisms involved in the control of airway diameter and airway obstruction.

Project 1: Pharmacological ablation of the airway smooth muscle layer as a new treatment for asthma.

One of the primary pathologies of asthma is increased airway smooth muscle thickness which contributes in no small part to disease severity; yet this structural abnormality has never seriously been used as a specific drug target. It has been well established that the airway smooth muscle layer is in a state of ongoing proliferation and apoptosis. Shifting the balance in favour of apoptosis (inhibiting proliferation or upregulating apoptosis) is a logical intervention to reduce airway smooth muscle thickness. Under biomechanically relevant cell culture conditions, this study will trial 'hypotrophic/anti-proliferative agents' and attempt to pharmacologically degrade the airway smooth muscle layer, forming a basis for a new therapy in the treatment of asthma.

Supervisors: A/Prof Peter Noble, A/Prof Yu Suk Choi

Project 2: Developing a new class of therapeutics to heal airway damage in asthma.

Asthma is the most common chronic respiratory disorder in children and remains one of the main causes of their hospitalisation. Thus, there is a pressing need for identification of novel therapeutic strategies that target the principal cause of asthma in early life and not just its clinical sequelae. Work by our team and others has established that the airway epithelium of children with asthma has intrinsic abnormalities relating to dysregulated responses to injury, infection and inflammation. Our team is developing novel therapeutics that target the airway epithelial repair with the goal to improve health outcomes for children with asthma.

There is now an opportunity for a motivated student/multiple students to contribute towards the assessment of new therapeutics for asthma that enhance airway repair. The project(s) aims to determine the preclinical efficacy of repurposed and novel therapeutics to enhance airway epithelial repair using cell-based and in vivo models.

Supervisors: A/Prof Peter Noble, Dr Thomas Iosifidis, A/Prof Alexander Larcombe, Dr Katherine Landwehr

Project 3: Quantification of airway-associated adipose tissue by polarisation-sensitive optical coherence tomography.

We have recently used *ex vivo* human tissue to demonstrate airway-associated adipose tissue as a contributing factor in co-morbid asthma and obesity. For a respiratory physician, fat infiltration of the airway wall was not previously a consideration and certainly not one to guide treatment. What we are in fact seeing is a fatty invasion of the airway wall and therefore an immediate shift in the constituent properties, analogous to airway remodelling (structural modification) that is believed to play a fundamental role in the manifestation of breathing difficulties in asthma. How do we diagnostically assess airway-associated adipose tissue in patients? We are developing polarisation-sensitive optical coherence tomography (PS-OCT) as a non-invasive diagnostic tool for the assessment of airway-associated adipose tissue in patients. The present study will validate measurements of airway-associated adipose tissue using PS-OCT in pig bronchial segments by comparing them with histological measurements.

Supervisors: A/Prof Peter Noble, Dr Alvenia Cairncross, Dr Michael Hackmann

Project 4: Electrical impedance tomography for the assessment of lung disease.

Electrical impedance tomography (EIT) is a safe, non-invasive, cheap and portable technology that constructs maps of lung ventilation from surface electrodes positioned around the chest. The underlying principle of EIT is that electrical impedance increases in proportion to lung inflation such that the degree of lung aeration during breathing can be tracked from changes in impedance. EIT has the potential to characterise ventilation heterogeneity which is typically increased in respiratory disease. The present project will determine whether EIT is a useful diagnostic approach in patients with asthma, chronic obstructive pulmonary disease, interstitial lung disease, cystic fibrosis and non-cystic fibrosis bronchiectasis.

Supervisors: A/Prof Peter Noble, A/Prof John Blakey, Dr Alvenia Cairncross

Project 5: Switching to renewable fuels to combat occupational diesel exhaust health effects may backfire.

Over a quarter of Australians between the ages of 14 and 18 have tried electronic cigarettes (vaping), with 1 in 10 being a "current" vaper. Even more alarmingly, 1 in 8 asthmatic Australians vape daily. Our unique preliminary data suggest vaping may impair the effectiveness of bronchodilator drugs, which are used in quick relief inhalers to treat asthma exacerbations. When we assessed vape-induced health effects in adolescent mice, we found airflow obstruction, likely due to vape aerosol congesting/lining the airways and alveoli. This could prevent the drugs from reaching where they are most needed. Vape aerosol also alters the expression of many cytochrome P450 and sulfotransferase genes in the airway. These gene families are responsible for the metabolism of most bronchodilator drugs, which could impact drug efficacy and reduce relief provided to asthmatics during an exacerbation.

The aim of this project is to determine if vape aerosol impacts bronchodilator drug efficacy in a mouse model of vaping. Mice will be exposed to vape aerosol 5 days a week for 8 weeks using standardised exposure guidelines. The trachea will be excised and organ bath experiments performed to assess smooth muscle contraction and relaxation in response to bronchodilator drug exposure. This will inform whether exposure to vape aerosol change the response to bronchodilator drugs.

Supervisors: A/Prof Peter Noble, A/Prof Alexander Larcombe, Dr Katherine Landwehr

Project 6: Characterising structural properties of kangaroo airways.

Comparative physiological studies using animal models provide an opportunity to better understand the relationship between airway structure and function. The present study will focus on the kangaroo airway. In preliminary findings, we have identified a thickened basement membrane, at the level and beyond that which is observed in patients with asthma. We also observed infiltration of eosinophils, which led us to conclude that kangaroos are an innate model of allergic airway disease. The present study will further characterise basement membrane thickness in relation to inflammation with the hope of revealing phenomena relevant to human asthma.

Supervisors: A/Prof Peter Noble, Dr Kimberley Wang, Mr John Elliott

Project 7: Application of the Airway Disease Biobank to advance our understanding of respiratory disease.

The Airway Disease Biobank is a Western Australian resource compromising airway samples from > 350 subjects with and without respiratory disease. Using histological and stereological techniques to examine human tissue, the Biobank has advanced our understanding of asthma and chronic obstructive disease. In particularly, the fundamental role of airway smooth muscle remodelling in determining disease severity has been revealed through decades of publications utilising Biobank tissue. Yearly projects are run for students who enjoy histology and are keen to generate clinically relevant data. Projects are custom-designed to student interest. An emerging question is whether sarcoidosis is also a disease where airway disorder is produced by thickening of the airway smooth muscle layer.

Supervisors: A/Prof Peter Noble, Mr John Elliott

Sleep Science – Sleep and its Disorders

Dr Jennifer Walsh

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Dr Kathleen Maddison

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Sleep disorders and poor sleep are common, affecting more than 40% of the Australian population.

Sleep researchers at the School of Human Science's Centre for Sleep Science (CSS) (UWA) and the West Australian Sleep Disorders Research Institute (Sir Charles Gairdner Hospital) have an active interest in understanding factors that predispose individuals to various sleep disorders and how they can be treated. They have a particular interest in cannabinoids as a therapy for sleep disorders.

They are also interested in gathering evidence to (potentially) debunk common sleep myths such as drinking a 'sleepy girl mocktail' and using 'mouth tape' to improve sleep.

Projects are suitable for: Honours, Masters, PhD

Supervisors: Dr Jennifer Walsh and Dr Kathleen Maddison

Skeletal Muscle Physiology

Dr Erin Lloyd

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Our research focuses on how skeletal muscle adapts in health, ageing, and disease. We combine experimental physiology with molecular, imaging, and computational approaches to study muscle contractile function, mechanics, and signalling, as well as neuromuscular disorders, including dysferlinopathy. Some areas of interest include interactions between muscle and other systems, the impact of tissue-level mechanics on muscle function, and cellular and physiological responses in models of growth, development, or drug treatment. Many projects are collaborative and benefit from complementary expertise within and beyond UWA. This work aims to identify strategies to preserve neuromusculoskeletal health, with the goal of improving movement and health outcomes across the lifespan.

Please come and talk with me about your specific interests; projects can be tailored to align with your goals and background.

Cell Mechanobiology

Associate Professor Yu Suk Choi

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The Choi Lab focuses on controlling cell behaviour by engineering diverse microenvironments. For decades, it was believed that cell fate was primarily regulated by biochemical signals such as cytokines and growth factors. However, more recent research has shown that cells also respond to their **physical** surroundings, including neighbouring cells and the extracellular matrix (ECM).

Our previous work demonstrated that adipose-derived stem cells (ASCs), which are stem cells isolated from fat tissue, can sense and respond (a process known as ***mechanosensing***) to the stiffness of different ECMs. When cultured on matrices mimicking the stiffness of brain, muscle, and bone, ASCs differentiated into the respective tissue types. This suggests that mechanical properties of the environment, such as stiffness, can direct stem cell fate.

Inside the cell, these mechanical cues are converted into biochemical signals through a process called ***mechanotransduction***. This involves signal transmission from the cell membrane to the nucleus, ultimately influencing gene expression and cellular behaviour.

Our group is particularly interested in understanding how mechanical cues—especially ECM stiffness—affect the behaviour of stem cells and cancer cells. We are currently focused on three main research areas:

1. developing bio-inspired ECM (2D and 3D biomaterials) as platforms to control cell fate,
2. screening cell behaviors in biomechanically mimicked hydrogels,
3. understanding cell mechanosensation to improve human health.

Project 1. Mechanosensing-driven cancer cell screening on high-throughput stiffness gradient hydrogel.

With Drs. Andrew Holle and Jennifer Young at National University of Singapore / Mechanobiology Institute

The stiffness (one of the mechanical properties of tissue) is known to be involved with epithelial to mesenchymal transition (EMT) which is the initial step for metastasis responsible for most of the deaths related to breast cancer in Australia and worldwide. However, our understandings of how cells in breast tissue interact with their healthy vs. cancerous microenvironment are very limited. In this project, MCF10A (healthy epithelial cells) will be tested on stiffness linear gradient hydrogel ranging from 1 to 10kPa (covering healthy and cancerous stiffness) to screen the interaction between cells and their mechanical environment at a single cell level. MCF7 (cancerous but not metastatic) and MDA231 (metastatic cancer) cells will also be studied on gradient platforms to study the effect of environmental stiffness on cancer migration/invasion. Findings from this project may open new opportunities to treat cancer patients as ‘mechanotherapy’ in near future.

Project 2. Developing biophysical environment and tools for anti-metastatic therapy using RNA technology.

With Dr Henry Park at Yonsei University and Prof Archa Fox

Cancer becomes more dangerous when it spreads to other parts of the body, but most treatments focus on killing cancer cells rather than stopping their spread. Unfortunately, our current understanding of cancer spread only covers the first step when cancer cells leave the primary tumor. We still don't fully understand what helps cancer cells survive in the lymphatic or blood vessels, which act like highways for cancer cells to travel to other parts of the body. These vessels don't provide the sticky surface that cancer cells need to survive and grow, unlike the tissues in the primary tumor.

Our team has discovered a special "switch" that helps control how cancer cells spread by blocking their ability to survive in the bloodstream. However, we haven't tested this switch in conditions that more closely resemble the actual environment in the body, which can be very different from the controlled conditions in a lab dish.

This project aims to study how this switch works in a 3D environment that simulates the physical challenges cancer cells face in the body. This will help us better understand how the switch operates in real-life situations. Using RNA technology (similar to the mRNA vaccines developed for COVID-19), we will test whether activating or blocking this switch can stop cancer from spreading. The results of this research could identify new targets for therapies aimed at preventing metastasis and improving cancer treatment.

Project 3. Stem cell migration: a triathlon, not a marathon.

With Prof Adam Engler at the University of California, San Diego (UCSD) and Prof Archa Fox

Cell adhesion level varies per cell migration mode - Cell migration is one of the fundamental features in living organisms. The journey of a cell can be a short distance, e.g., around a few hundred micrometres during early embryonic development, or it can extend over a long distance through different tissues and organs, e.g., in cancer metastasis. Cells migrating long distances need to adapt to various modes of migration upon the different microenvironmental challenges they encounter by altering the level of adhesion to their surroundings. Cells can migrate as an individual (mesenchymal migration) or as a group (collective migration) by utilising high levels of adhesion to extracellular matrix (ECM) and/or neighbouring cells. Furthermore, cells reduce the level of adhesion for faster migration under confinement (amoeboid migration) or totally lose adhesion to ECM when suspended in blood or lymph vessels under shear stress (suspension). Therefore, over these long distances, cells must act more akin to a triathlete rather than a marathoner, using multiple migration modes along their journey.

Stem cell migration studies need adhesion-to-suspension transition, better 3D migration platforms and screening tools. Current stem cell studies focus on migration in one microenvironment at one time point which **limits our understanding of long-distance stem cell migration** through multiplex scenarios due to the following current limitations and challenges:

a) no existing knowledge or *in vitro* tools in stem cell-based adhesion-to-suspension transition (AST) – Despite AST capability of stem cells *in vivo*, adult stem cells such as bone marrow- and adipose-derived stem cells undergo anoikis, anchorage-dependent cell apoptosis, *in vitro* due to the adhesion-based pre-selection process during isolation. Currently, there is no method to program adherent stem cells to suspension cells.

b) no understanding of long-distance stem cell migration under mechanical challenges – There is no study incorporating long-distance cell migration with AST under diverse mechanical microenvironments.

c) lack of suspension-based assay for screening stem cell fate – Most assays for monitoring stem cell fate were developed for the adherent cells, preventing the comparison between adhesion and suspension cells.

In this project, we will **aim** to

A1) develop adult stem cells with transient adherent-to-suspension transition using RNA technology

A2) fabricate 3D migration platform with varying mechanical challenges

A3) screen the effect of AST and mechanomemory on stem cell fate

Supervisor: A/Prof Yu Suk Choi

Exercise Physiology and Biochemistry

Professor Peter Peeling

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Peter's research program is centred around delivering evidence-based, innovative solutions to performance-driven questions generated in conjunction with the service provision team at the WA Institute of Sport (WAIS). Research projects aligned with WAIS are developed in collaboration with the performance science staff at the institute. Successful students will be embedded within a WAIS sports program, providing research support to applied sports science projects.

Current areas of research priority include:

- Enhancing athlete performance in competition
- Enriching our understanding of athlete development and adaptation
- Augmenting the daily training environment
- Generating new knowledge in performance health
- Leveraging sports data, technology and engineering

If you are interested in an honours project embedded at the WA Institute of Sport, please reach out to Peter on the above contact details for more information.

Associate Professor Olivier Girard

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https://www.oliviergirard.com/training-under-environmental-stress

If you have a passion for exploring the limits of human performance and implementing innovative interventions, come and have a chat!

My research identifies, quantifies and explains mechanisms responsible for fatigue during high-intensity intermittent exercises performed by team- or racket-sport athletes under challenging environmental conditions (i.e. heat stress or hypoxia).

Several projects also shed light on the neuro-mechanical determinants of team-sport performance, with a special focus on (repeated) sprinting mechanics and underpinning neuromuscular factors.

Current research is focussed on therapeutic use of hypoxia to improve cardio-metabolic health of 'at risk' patients and improve exercise tolerance in load-compromised individuals (injured athletes).

Four main research areas:

1. Training under environmental stress (altitude, heat)
2. Exercising in hypoxic and/or hot conditions
3. Neuro-mechanical adjustments to exhaustive running
4. Racket sports

Key words: Neuromuscular fatigue, repeated-sprint ability, hypoxia, altitude training, heat stress, sprinting mechanics, cardio-metabolic health, team and racket sports.

This year, several applied projects (working directly with athletes) are proposed and include:

- Energy requirements and physical demands (lower limb activity) in racket sports (tennis and new formats such as padel etc)
- Training load monitoring, fatigue and recovery practices in team and racket sports
- Repeated sprint training in hypoxia and altitude training
- Heat acclimation (high performance sport) and heat tolerance (occupational settings such as mining industry)
- Exercise with blood flow restriction

This list is certainly not exhaustive and if you have some burning real world (practical) questions that need to be answered working with your athletes or patients, please reach out!

Associate Professor Karen Wallman

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We have a proposed honours project working with the WA police in order to determine physical attributes required by police who work with the canine squad, and for police who work in the mounted section (riding horses).

Officers who work in the canine squad need to be able to lift their dog over fences, carry their dog if need be, and have good physical fitness to keep up with their dog.

Police in the mounted section need to be able to sit comfortably for many hours in the saddle, often wearing heavy uniform.

These projects will be about determining the physical attributes that officers in each squad need to be able to successfully perform their duties.

You would be working with myself, Dr Grant Landers and Prof Tim Ackland.

Email Karen if interested: karen.wallman@uwa.edu.au

Professor Paul Fournier

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Sport performance research

- Effect of breakfast skipping on exercise and cognitive performance. *Co-supervisor: Troy Visser*
- Effect of breakfast skipping combined with exercise on cognitive function and driving performance on a driving simulator. *Co-supervisor: Troy Visser, Brendan Lay*
- Effect of bicarbonate loading as a means to oppose the appetite suppression and nausea that occur after sprinting
- Effect of carbohydrate intake as a means to oppose the appetite suppression and nausea that occur after sprinting
- Effect of carbohydrate intake post-sprinting as a means to speed up recovery of sprint performance capacity

Nutrition Science

- Effect of ingesting protein to oppose the oxidative stress and other ill effects that are associated with breakfast skipping. **Co-supervisor:** *Prof Peter Arthur*
- Effect of dietary state and time of day on the oxidative stress that is caused by carbohydrate ingestion. **Co-supervisor***: Prof Peter Arthur*

Exercise and type 1 diabetes

- Effect of under-water cycling in cold water on blood glucose in people with type 1 diabetes. **Co-supervisor***: Prof Shane Maloney*
- Effect of high temperature and body hydration level on blood glucose response to exercise in people with type 1 diabetes**. Co-supervisor:** *Prof Shane Maloney*
- Localised skin cooling as a means to prevent exercise-mediated hypoglycaemia in type 1 diabetes**. Co-supervisor:** *Prof Shane Maloney*
- Effect of high blood glucose level on cognitive function and driving performance in type 1 diabetes. **Co-supervisor:** *Prof Brendan Lay*
- Effect of simulated high altitude on the hyperglycaemia associated with high intensity exercise in type 1 diabetes**. Co-supervisor:** *Prof Shane Maloney*

Senior Lecturer Grant Landers

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Projects for 2026 **assess the demands of human performance** to improve our understanding and allow suitable modifications be recommended to enhance performance in a variety of sport and exercise settings.

Open water swimming

- Determining the energy cost of swimming in waves (using the uwa wave flume).
- Determining the optimal feeding strategy during the Rotto Channel Swim.

Triathlon

- Should barefoot running be an important part of a triathletes training program?
- Do brick sessions improve the transitions from one discipline to the next in triathlon?

WA Police

- Exploring the physical demands of police officers working in the canine or mounted sections and determine appropriate minimum standards for inclusion.

Athlete Monitoring

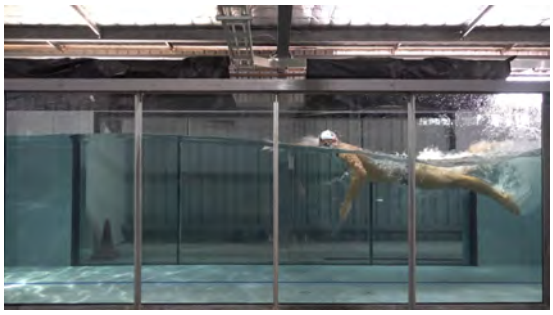
- Changes in perceived training distress before and after physical activity.

Body composition

- Does aquatic exercise affect the subsequent measurement of adipose tissue via ultrasound?
- The Bone, Muscle, and Balance (BOMB) study: Feasibility of a Community-based High Intensity Resistance and Impact Training Program for Older Adults.

Physical Activity & Inclusion

- Does wearing a chest binder affect physical function during exercise?



Cardiovascular Research Group

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WHO WE ARE We are a dedicated team of researchers and clinicians working at the forefront of cardiovascular disease prevention and management to optimise human health and wellbeing.

OUR VISION is to keep people healthier for longer by decreasing the progression and impact of cardiovascular diseases.

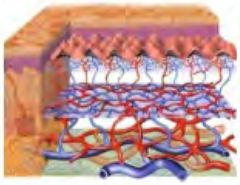
Our Mission: To optimise cardiovascular health across the lifespan by tailoring evidence-based preventative strategies which have direct impacts on cardiovascular function and health.

We combine translational research with service provision and vocational training to drive evidence provision, train the next generation of prevention specialists, deliver healthcare and impact patient benefit

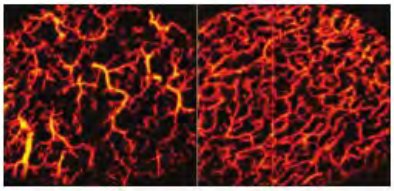
ARTERIOLOGY

The study of large and small artery structure, function and health, to detect and prevent the world's leading causes of mortality and morbidity. We prevent and treat heart disease, stroke, dementia, limb amputation, blindness and kidney disease.

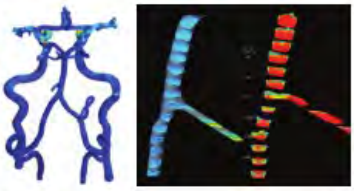
Early detection of atherosclerosis



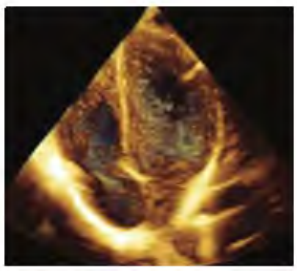
Inventing new imaging techniques to accelerate discovery

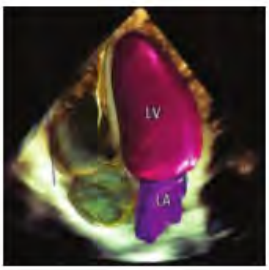


Visualising the impact of treatments to optimise health



Understanding artery function and health





HEART STRUCTURE AND FUNCTION

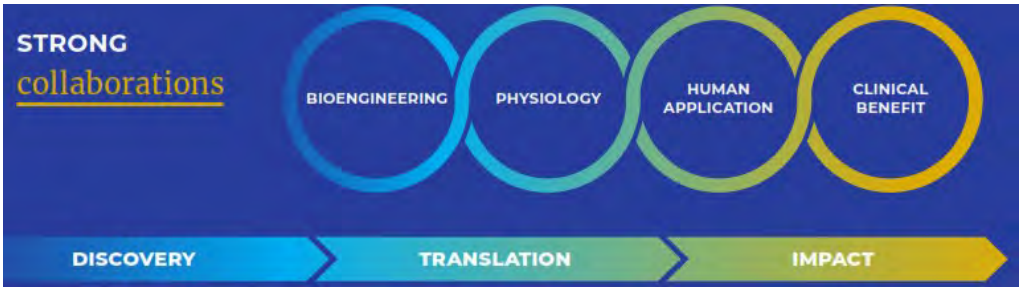
Novel insights into cardiac mechanics

State-of-the-art heart imaging including novel echocardiographic speckle tracking to assess heart stress and strain.

- Elite athletes
- Healthy aging
- Type 2 diabetics
- Bariatric surgery patients
- Heart failure
- Coronary artery disease

EXERCISE

A polypill for cardiovascular disease prevention and management



Lead Supervisors:

Winthrop Professor Danny Green: Danny is a cardiovascular exercise physiologist specialising in the prevention of chronic disease.

His research encompasses the lifespan; from exercise training in the prevention of the development of atherosclerosis in obese children and adolescents, to research on the best combination of exercise and medications in the management of patients with coronary disease, stroke, hypercholesterolaemia, diabetes and heart failure patients awaiting transplantation.

- Ranked in the top 0.34% of cardiovascular scientists globally
- >350 peer-reviewed papers, 300 top quartile 14,000 cites
- 34 career category 1 grants (NHMRC, ARC, NHF)
- NHMRC Principal Research Fellow

Professor Louise Naylor: Louise uses exercise to treat, prevent, and reduce the impact of chronic diseases across the human lifespan.

Louise works across the health spectrum, from elite athletes to chronically ill individuals with conditions such as heart failure, cancer and obesity.

Putting research into practice, as an ESSA Accredited Exercise Physiologist Louise also works as a Senior Exercise Physiologist in the Cardiac Rehabilitation Service at Fiona Stanley Hospital.

Here are some of our latest research questions:

- Defence Force research - what does exercising in the heat do to your blood vessels?
- Responder or non-responder to exercise: nature or nurture. Why do some people have a great response to exercise while others don't?
- Testosterone, exercise or both? A new direction for ageing men.
- The cost of being sedentary – what does prolonged sitting do to your brain?
- What can twins teach us about exercise?
- Childhood origins of adult disease – what's the impact of exercise?
- How does exercise stack up for improving obesity, diabetes, Metabolic Syndrome, and heart disease, and what difference can it make to outcomes for heart failure patients or survivors of childhood cancer?
- Use it or lose it – what's the effect of inactivity on small or large arteries? (Hint: it's not good.)
- Cardiac response to exercise – what is 'Athlete's heart' and is it good or bad?
- The exercise paradox – why does exercise *acutely* increase cardiovascular risk but reduce it in the longer term.

The team produces world-leading research as well as being friendly and supportive. You will gain experience with great technologies, including echocardiography, OCT and ultrasound. We will teach you to look inside arteries in the brain and limbs and see what happens when people exercise (or don't). You will be guided every step of the way, from your research proposal, through developing your technical skills, to writing your thesis and presenting at conferences – maybe even publishing a paper or two.

Reach out for a chat.

Motor Control & Exercise Rehabilitation

Dr Siobhan Reid

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Our research broadly seeks to understand neurodevelopmental disability and motor impairment particularly in paediatrics, with the aim of developing targeted interventions to improve functional outcomes for children and their families. We have many collaborative opportunities to work with clinical teams at **Perth Children's Hospital** and **Telethon Kids Institute** as well as community research partnerships with **Special Olympics Australia**.
Some of the projects we have on offer in 2025 include**:**

Special Olympic Athletes: Health & Wellbeing

Working in partnership with Special Olympics Australia, TKI and UWA, this project aims to understand the impact of being involved with Sport on the health and wellbeing of Athletes with Intellectual Disabilities.

Understanding Physical activity engagement in children with Disabilities

The benefits of physical activity are very well established, however children and families impacted by disability experience many barriers to participation in exercise. This project involves collaboration with the Disability Research team at Telethon Kids Institute to develop a tool to assess children's participation and engagement in physical activity.

Paediatric Exercise Programs

There are many opportunities to investigate the outcomes of children and their family's following participation in our paediatric exercise programs, Minigym, Unigym and iFit. If you want your research to have real impact for children and families – come and chat.

Dr Brendan Lay

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Project 1: Visual perceptual skill and anterior cruciate ligament (ACL) injury risk.

At UWA, we have a long history of investigating the Biomechanics of ACL injury risk when performing sidestepping manoeuvres. We know that the injurious loads carried by the ACL increase greatly when an individual has little time to organise a sidestep, therefore, more recently we have been investigating the visual perceptual skill and its role in giving an individual more time to plan a safe sidestep. We have also been investigating whether perceptual training (such as Above-Real-Time training) can improve an individual's capability to sidestep safely.

Project 2: Effect of diabetes on eye tracking and reaction time.

It is well established that diabetic individuals have a higher incidence of fall and are more prone to car accidents. Our goal is to elucidate some of the mechanisms involved.

Collaborator(s)*: Prof. Paul Fournier*

Project 3: Visual perceptual expertise and movement assessment.

We are currently undertaking a series of experiments assessing the capability of parents, teachers, coaches and other movement experts to assess various motor skills including Fundamental Movement Skills (FMS) and swimming technique. A key question we are asking is what do expert see (perceive) that novices don't? For these experiments, we utilise the eye-tracker and a verbal report protocol.

Collaborator(s): A*/Prof Rebecca Braham, Prof Michael Rosenberg (FMS) & Dr Nat Benjanuvatra (swimming)*

Project 4: Equipment scaling in a range of children's sport.

Up until very recently there has been no scientific rationale for the different sized (smaller. shorter, lighter) equipment that is used in junior sports. Tennis Australia has recently led the world into the effects of equipment scaling on motor skill acquisition and performance and we are extending this research to other sports. A key question here is what are the effects of systematically manipulating equipment and playing area on the acquisition of sport specific motor skills in children?

Collaborator(s): *Dr Machar Reid (Tennis Australia)*

Dr Nat Benjanuvatra

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Understanding asymmetry and its impact on function and performance

Asymmetry refers to the inherent and often subtle differences in motor control and movement patterns between the left and right sides of the body. Understanding the influence of asymmetry can have direct implication on performance and musculoskeletal health of the individual. This research theme is about trying to understand asymmetry and seeks to explore questions such as: How do asymmetries develop, and to what extent are they modifiable through training and interventions? What are the potential benefits and detriments of asymmetry in specific sports and activities? How can we leverage our understanding of asymmetry to design individualised training and rehabilitation programs?

Post-activation performance enhancement

Post-Activation Performance Enhancement (PAPE) is a phenomenon where a short bout of high-intensity exercise can temporarily boost a subsequent athletic performance. While this phenomenon is generally accepted, the mechanisms behind PAPE is not well understood. It is also unclear what activity types (i.e. (absolute strength, power and speed, endurance) benefit most from PAPE and what is the optimal PAPE protocols for different sports.

Aquatic sport/exercise & strength training research

If you have a keen interest in understanding the science behind strength training or aquatic sports like swimming, surfing, or surf lifesaving, let's discuss potential research projects.

Neuromuscular Adaptation to Exercise Under Hypoxic Conditions *(with Prof Olivier Girard)*

This line of research investigates how the neuromuscular system responds and adapts to exercise performed under both systemic hypoxia (where the entire body experiences reduced oxygen availability) and local hypoxia, induced through blood flow restriction (BFR) techniques. By examining the neuromuscular mechanisms involved, the study aims to deepen our understanding of how different forms of hypoxic stress impact muscle function, fatigue, and exercise performance. The findings could provide valuable insights for optimising training protocols for athletes, as well as informing rehabilitation strategies and interventions.

Health Behaviour and Performance Psychology

Professor Ben Jackson

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Any students with an interest in the psychology behind sport, exercise, physical activity, or other health issues (e.g., diet), please contact Ben for a chat. Similarly, Ben is also involved in the coordination and evaluation of several exercise, weight loss, and physical/mental health promotion programs – with a range of supportive community partners and agencies.

Psychology of active, healthy living group (PAHL)

"Our group focuses on applying psychological research to solve health problems. We work with a variety of populations and contexts. If students are interested in working on a specific health problem, we are happy to explore Honours project options. Otherwise, current projects we would like to work on include:

- **What role does competition play in men's weight loss?**

  This project would offer opportunities to conduct qualitative and / or quantitative research.

- **How do we promote creative movement and wellbeing?**

  This project would be exploratory in nature. We would like to investigate the perspectives and experiences of a range of movement practitioners who support creativity in movement (and, often, with the explicit objective of promoting well-being). This project would offer opportunities to conduct qualitative research and inform intervention development.

- **How do habitual exercisers describe their relationship with exercise?**

  We would like to explore how people use language to describe activities like exercise. This project would involve using LIWC-22, a software designed to analyse language. This project would be quantitative in nature.

Importantly, we would encourage students to contribute to and refine any of the projects outlined above. Alternatively, we also encourage students to bring their own ideas, and we can help identify a feasible and engaging project topic.

Dr Caitlin Liddelow

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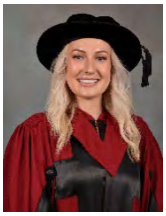

Project 1: Barriers and facilitators of team sport engagement in the postpartum: A qualitative study.

This project aims to develop a deeper understanding of what mothers experience in the extended postpartum period when attempting to participate in team sport. Previous research has explored the barriers and facilitators physical activity engagement, but team sport is different type of physical activity that often requires additional resources and physical readiness. I have pre-collected interview data with mothers with young children (<4 years of age) exploring their experiences of engaging in team sport, and the challenges they may experience. You will be required to develop an understanding of qualitative analysis, if you don't already, to successfully complete this project.

Project 2: The role of social support in women's ongoing sport participation.

This project aims to longitudinally (~8 weeks) investigate how teammates, family and partners support or hinder a women's involvement in community sport. Women's community/social sport participation often decreases due to time pressure, caregiving responsibilities, and club/sport culture. Social support, such as that from teammates, coaches, partners, friends, and the club itself may buffer these barriers by boosting belonging, self-efficacy, and enjoyment, which in turn sustain participation.

Co-supervisor: Dr Aaron Simpson

Project 3: Exploring psychological safety and gender in community sport clubs.

Psychological safety in sport refers to the "perception that one is protected from, or unlikely to be at risk of, psychological harm in sport" (Vella et al., 2021). Psychological safety often underpins help-seeking, speaking up about safety and wellbeing, and staying engaged in sport. In community sport in Australia, gendered norms, microaggressions, facilities and the club itself can significantly influence feelings of psychological safety, particularly for women and gender-diverse members. This project aims to understand how psychological safety differs by gender within community sport clubs, and if specific factors may predict greater feelings of psychological safety. This project will specifically focus on women playing traditionally male-dominated sports (e.g., AFL, NRL).

Co-supervisor: Dr Aaron Simpson

Project 4: Exploring the role of captains/leaders in supporting female teammates' wellbeing.

Captains and informal leaders in community sport teams are often the first line of support for teammates' wellbeing. Women playing sport often experience unique stressors (gendered barriers, body image pressures, balancing study/work/family, postpartum return, underrepresentation in leadership) compared to their male counterparts, yet little is known about how captains/leaders perceive their role in wellbeing support, how female athletes experience that support, and what behaviours make the most difference. Understanding this dynamic could shape captain training modules and club policies to foster mentally healthy environments. As such, this project aims to qualitatively explore the role of team sport captains in fostering mental health and wellbeing. You will be required to develop an understanding of qualitative analysis, if you don't already, to successfully complete this project.

Also open to having a discussion and developing other projects in this area (women in sport, women's/postpartum health, physical activity) that may be of interest to you.

Technology Based Sport Science and Health

Professor Michael Rosenberg

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Technological advances in the measurement of physical activity have created new opportunities to understand and influence how people engage in regular physical activity. Our research group has been involved in the development of several innovative technologies that have the potential to significantly improve the health of the population. If you have an interest in technology and its use in novel ways the following research opportunities might be of interest to you. We are always happy to discuss these and other research opportunities.

Project 1: The use of RFID technology to determine the effect of a simple experiment.

Remote Frequency Identification (RFID) technology provides accurate information on whether a person is inside or outside an established boundary (Such as their house). The RFID system can also tell the amount of time a person spends within the boundary in certain locations (lounge room). We have developed the first available ad-hoc RFID system to determine the length of time people spend in a boundary and the amount of energy expended.

For an honours project we are interested in understanding the impact of simple household modifications to the way screen based activities, such as Fixed and portable screen use influences family sedentary behaviours. For example, does removing screen use before sunset influence activity levels and where people locate within their house, or outside? There is surprisingly little objective evidence to help answer these questions, as until now the technology has been unavailable.

Project 2: FITBIT (tracking of children's physical activity).

Advances in relatively inexpensive user-friendly wearable activity trackers like the Fitbit® mean it is now realistic to continuously measure movement patterns of children over several months, without considerable participant burden. This level of data offers previously unavailable insights into daily, weekly, monthly and seasonal variations in physical activity (PA). Children's PA and sedentary behaviours influence a range of health, social and academic outcomes and children's development in the early years may influence the development of disease in later life. To date, patterns of PA have either relied on self-report surveys, or objective monitoring over at most two-weeks at any one time. Therefore, we propose to measure PA continuously over a six month period to develop the most comprehensive description of children's PA to date. If you want to be involved in internationally leading research around children's physical activity, please come and discuss this topic with us.

Project 3: Music based motor control development.

The link between music and physical movement is both entrained and observable in neurological development. There is perhaps no stronger behaviour to unite humans than coordinated rhythmic movement. This is because humans have the capacity to become entrained with one another or an external stimulus. Entrainment is a powerful adaptive process that indicates a mutual perceptual and social experience from the sharing in time and space of music and rhythm. Evidence of the benefits of music entrainment in the development of motor control in children and in rehabilitation is plentiful. Recent advances in wearable sensor technology have transformed rhythmic entrainment into a self-sustaining biofeedback mechanism.

We have developed the first music based rhythmic entrainment mobile phone app that incorporates Bluetooth enabled wearable sensors to provide real time feedback. This breakthrough technology uses a range of Bluetooth enabled accelerometers, Stretch Sense material and force place sensors in socks to entrain the user to move rhythmically. It is like learning to dance or run with wearable sensors that give you feedback on how to achieve this goal.

We are looking for interested students to conduct a range of experience with this new technology on typically developing children, children with delayed coordination, and children undergoing rehabilitation.

Project 4: Classification of movement during active video gaming.

For several years we have been capturing children's movement during active video game play. Our research team has developed software to classify fundamental movement skills of children to parse game play data and count the number of movements children perform within a 15 minute game play situation. The advancement of this system requires several experiments using the Vicon System to match movements captured by our system and the gold-standard Vicon System. If you are interested in this study, or any research related to the health impact of active video gaming please speak with us.

KIDDO – Improve your move

www.kiddo.edu.au

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KIDDO is offering a **$5000 Honours scholarship** to encourage and assist a student to undertake an Honours course with a thesis related to the KIDDO program.

KIDDO is a nationally significant, internationally recognised physical literacy program developed by the School of Human Sciences at UWA that has become a successful example of research translation and impact over the past decade. KIDDO is currently implemented in over 60% of Western Australian primary schools, 1,721 schools nationally, and 759 early childhood education and care services. The program supports a growing community of more than 16,000 registered educators and 9,000 parents, and has been used to assess the fundamental movement skills of over 120,000 children. KIDDO provides engaging, developmentally appropriate movement experiences for children aged 0–12 years, helping to build a strong foundation for lifelong physical activity.

KIDDO can provide extensive research opportunities across many different areas of interest. To find out more see our website: www.kiddo.edu.au

KIDDO has opportunities for students to work with existing data or collect new data and undertake projects across the following research topics:

1. Current state of children's Fundamental Movement Skill development – can children run, throw, catch & skip?
2. Implementation of a Fundamental Movement Skill program in the Special Education setting
3. Developing culturally appropriate resources and training for physical literacy
4. Engaging families in their children's physical literacy development
5. Can children's mental health and wellbeing be improved as part of a physical literacy program
6. Implementing KIDDO in remote schools across Australia – barriers and enablers
7. Mapping movement skill proficiency across metropolitan and rural areas

Musculoskeletal Rehabilitation and Clinical Exercise Physiology

Dr Jay Ebert

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Dr Ebert is currently involved in a range of research projects, largely focused in the fields of musculoskeletal and orthopaedic rehabilitation, and pertinent to the improvement of current clinical practice. These areas of research are varied and, while a number of smaller student research projects may be available, the primary areas of research include:

- Anterior cruciate ligament (ACL) and multi-ligament knee injury, surgical reconstruction methods, improving rehabilitation and return to activity/sport pathways.
- Lateral hip pain, including hip abductor pathology (tendinopathy and gluteal tendon tears), surgical intervention and rehabilitation.
- Hip pathology, including the investigation of conservative management, as well as improving outcomes after arthroscopic hip surgery.
- Proximal hamstring tendon injuries: improving surgical, rehabilitation and return to activity/sport pathways.
- Knee and hip osteoarthritis and joint replacement surgery.
- Shoulder injury, rehabilitation and return to sport.

Mental Health & Exercise Research Group (MHEX)

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Broadly, our research team explores the role of exercise to support physical and mental health outcomes for those living with, or at risk of, mental ill health. Physical activity and exercise can be health promoting across the lifespan, including physical, mental and psychosocial health benefits. But more work is needed to explore how to support people to be sustainably active, effectively improve health outcomes and build accessible exercise opportunities within health and community care pathways. Our work focuses on those who are at increased risk of inactivity, experience disadvantage and/or are underrepresented in research and care pathways.

Project 1: Recovery-focused exercise programs within mental health services for people with disordered eating + maladaptive exercise behaviours.

Eating Disorders | Mental Health | implementation | Health services

Over one million Australians live with an eating disorder, with 40 – 80% reported to undertake maladaptive exercise (e.g., compulsive exercise, exercise dependence or addiction). When present alongside disordered eating, maladaptive exercise leads to significantly worse outcomes including poorer prognosis, lower quality of life, increased suicidality, longer hospitalisation and increased risk of relapse. In contrast, supervised and non-compulsive exercise can serve as a valuable tool in recovery by supporting affect regulation and emotional resilience.

Therapeutic exercise has the potential to restore physical health, reduce compulsive exercise behaviours, and foster a positive relationship with one's body. Presently lacking are models of care for embedding exercise professionals within the multidisciplinary mental health team to support recovery for those with disordered eating and maladaptive exercise behaviours.

Project options include:

- Evaluation of an exercise physiology led program to support treatment outcomes and safe exercise participation for adults within mental health services with disordered eating and exercise behaviours
- Deliver and evaluate an advanced skills training module for AESs/AEPs working within private, public and community mental health services

Research Team: Bonnie Furzer, Kemi Wright, Exercise Physiology Team @Freo + collaborators

Collaborators: Fremantle Hospital Mental Health Service, and governance aspects of this project are in place.

Project 2: Chest binding, physical function, activity and health.

Exercise Physiology | Respiratory Physiology | Performance | Experimental

Chest binding is the practice of compressing breast tissue to create the appearance and sensation of a flat chest. This is a very common practice amongst trans people registered female at birth. Binding is beneficial to the mental health of trans and gender diverse people by assisting to alleviate gender dysphoria and affirm their experienced gender.

Globally trans and queer organisations recommend that exercise should not be undertaken in a chest binder due to concerns around safety – reducing willingness to be active and increasing concerns related to activity and exertion for those who chest bind. In 2025 the team has conducted one of the first global studies into the impact of chest binding during physical function and are looking to extend this work with future studies. The goal is to ensure there is robust evidence on which to base guidelines and recommendations in future.

Potential areas of investigation include:

- Long term impacts of chest binding on health, physical function and physical activity
- Thermoregulation response sand chest binding during exercise

Research Team: Bonnie Furzer (she/her), Brett Buist (he/him), Grant Landers (he/him), Peter Noble (he/him), Claire Munsie (she/her), Ben Kramer (he/him), Kai Schweizer (they/he), Felicity Austin (she/her), Ben Quick (they/he)

Collaborators: Thriving in Motion, Sock Drawer Heroes, The Kids Research Institute, Curtin University

Project 3: Youth Centred Exercise Recovery Program within Adult Transdiagnostic Mental Health Service.

Mental Illness | Youth | Clinical Exercise Physiology | Implementation

Mental health services are currently structured broadly based on ages, with 18-65 considered adult services. However, the needs and presentations of young people within services does not always align with that of adults who are older.

In collaboration with young people, objective/s include:

- Explore the needs and recommendations from young people and stakeholders for a youth-centred exercise recovery model within mental health care services
- Explore the feasibility of embedding and delivering a youth-centred recovery approach with adult mental health services

Research Team: Bonnie Furzer, Kemi Wright, Ben Kramer, Exercise Physiology Team @Freo + collaborators

Collaborators: Fremantle Hospital Mental Health Service

Project 4: Developing a Peer-Based Exercise Model in AYA Cancer Survivorship: A Co-Design Approach*.

Adolescent and young adult (AYA;15–25 years) cancer survivors often face long-term side effects post treatment including fatigue, physical deconditioning, and social isolation, which negatively affect recovery and quality of life (Adams et al. 2021). Exercise interventions have demonstrated efficacy in improving fitness, function and well-being across diverse cancer populations (Hayes et al. 2019). Emerging evidence now supports the role of exercise in AYA cancer survivorship; however, few programs are specifically designed by AYAs, with peer support is rarely embedded. Social connectedness is a critical motivator in this age group, with peer involvement shown to enhance engagement and psychosocial outcomes (Zebrack et al. 2014). Despite this, the optimal structure and acceptability of peer-based exercise models in AYAs remain unclear. Co-design approaches, such as experience-based co-design (EBCD), integrate survivor perspectives with clinical expertise to generate interventions that are contextually relevant, acceptable, and sustainable (Bate & Robert 2006). Applying co-design to exercise oncology in AYAs provides a developmentally appropriate strategy to establish peer-supported programs that address unmet survivorship needs and promote long-term health.

Objective/s: To co-design a peer-based exercise program with AYAs, and healthcare professionals, defining program content, structure, delivery methods, and peer roles.

Research Team: Claire Munsie, Bonnie Furzer + Collaborators

Collaborators: WA Youth Cancer Service, Curtin University, FightingFit

Project 5: Long-Term Exercise Adherence in AYA Cancer Survivors.

Adolescent and young adult (AYA;15–25 years) cancer survivors often experience significant physical and psychosocial challenges as a consequence of their treatment. Post treatment this cohort face increased risk of chronic disease, persistent fatigue, cardiovascular complications, and elevated psychological morbidity compared with their healthy peers. Structured, supervised programs such as the AYA Life Now Exercise Program have demonstrated significant benefits in AYA survivors with respect to cardiorespiratory fitness, muscular strength, and psychosocial well-being (Munsie et al., 2025). However, there is limited understanding of whether these improvements are sustained beyond program completion, once direct supervision and clinical support are withdrawn.

Evidence suggests that some survivors reduce activity levels post-intervention, leading to a decline in physical and psychosocial outcomes, while others maintain or even build upon initial gains (Midtgaard et al., 2013). Understanding long-term adherence rates and predictors is critical to designing survivorship models that promote lasting physical activity.

Objectives

1. Measure physical activity adherence rates at least 12 months after completion of the Fighting Fit program.
2. Assess sustained changes in fitness, strength, fatigue, and quality of life.
3. Identify predictors of long-term adherence using existing cohort data.

Research Team: Claire Munsie, Bonnie Furzer, Jo Collins + Collaborators

Collaborators: WA Youth Cancer Service, Curtin University, FightingFit

Project 6: Experiences of Exercise During Cancer Treatment in Adolescent and Young Adults.

Adolescent and young adults (AYA;15–25 years) diagnosed with cancer represent a distinct population with unique developmental, psychosocial, and clinical needs. During active treatment, AYAs often face fatigue, deconditioning, and disruptions to education, employment, and social networks, all of which can compromise quality of life (Zebrack et al., 2014). Exercise is recognised as safe and beneficial across cancer cohorts, improving physical function, fatigue, and mental health (Hayes et al., 2019), yet little is known about the lived experience of AYAs engaging in exercise during treatment. Understanding motivations, barriers, and perceived outcomes is critical to inform developmentally appropriate, acceptable interventions that address both physical and psychosocial needs during this vulnerable period.

Objectives

1. To explore the lived experiences of exercise during treatment in AYA cancer patients.
2. To examine perceived physical, psychological, and social outcomes of exercise participation during treatment.
3. To identify motivations, barriers, and facilitators influencing exercise behaviour during treatment.

Research Team: Claire Munsie, Bonnie Furzer, Jo Collins + Collaborators

Collaborators: WA Youth Cancer Service

Project 7: Bone, Muscle, and Balance (BoMB): Exploring high intensity and high impact training on health outcomes of community-based older adults.

Age-related changes in our body's physiology and function, including declines in balance and changes in neuro-musculoskeletal health, are known to predispose adults to higher risk of injurious falls, impact their ability to engage in activities of daily living, and lead to reductions in quality of life. High intensity resistance and impact training has been shown to result in improvements musculoskeletal health, but limited research has explored how this translates to broader health and wellbeing, or how feasible it is to implement within the community. Broadly, this study aims to examine the feasibility of such training in a community setting, as well as the impact that this form of training may have on rates of injurious falls, activities of daily living, neuromusculoskeletal function, and quality of life.

Project options include:

- How much 'impact' is impact training?
- Getting out of the gym: feasibility and outcomes of high intensity and impact training in community (non-gym) settings.
- Barriers and facilitators of high intensity impact training in older adults.
- Feasibility of play-based impact training?

Research Team: Brett Buist, Ben Kramer, Grant Landers, Bonnie Furzer, Kemi Wright + Collaborators

UWA Exercise and Performance Centre (EPC) & Collaborators

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The UWA Exercise and Performance Centre (EPC) is a community-based exercise physiology clinic based within the School of Human Sciences. The mission of the UWA EPC is to provide a gold standard education and clinical exercise physiology facility which directly engages the community and contributes to the development of the industry and the exercise physiology knowledge base.

The Bone, Muscle, and Balance (BOMB) study: Feasibility of a community-based high intensity resistance and impact training program for older adults.

In 2019-2020, injurious falls accounted for 224,000 hospitalisations, with the vast majority of these occurring in older adults (65+years). A number of age-related changes in our body's physiology are known to predispose adults to higher risk of injurious falls including declines in balance and musculoskeletal function. Participation in high intensity resistance and impact training has been shown to result in improvements in bone mineral density. However, this study aims to examine the feasibility of such an intervention in a community setting, as well as the impact that this form of training may have on rates of injurious falls and measures of balance.

Skills: You will acquire training on a range of different areas including power, strength and balance assessments; body composition scanning.

Supervisors: Brett Buist, Ben Kramer, Grant Landers and Bonnie Furzer (in collaboration with the EPC Team)