



**School of Science and Health  
Summer Scholarship Research Program 2019  
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## **Project 107: Aboriginal and Torres Strait Islander Peoples' Experiences in Sport: A Desktop Analysis of Sport Coaching Programs**

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### **Project description**

#### **Background**

Sport plays an important role for many people in terms of health, education, and employment. The International Olympic Committee's (IOC) 2015 position statement identified sport and physical activity as meaningful and cost-effective tools for achieving improved health, quality education, and advanced human capital. Sport has been used as a vehicle to establish Aboriginal and Torres Strait Islander success (Bamblett, 2011), and global audiences may be familiar with Aboriginal and Torres Strait Islander athletes that have succeeded on the world stage. For example, in 1960, Kevin Coombs became Australia's first Aboriginal representative (Paralympics or Olympics) in wheelchair basketball, while Cathy Freeman won gold in the 400 metres track and field race at the Sydney 2000 Summer Olympics (Creative Spirits, 2015). However, athletic achievements do not appear to have translated into ongoing coaching, officiating, or leadership positions for Indigenous people at the highest level of sport. In the AFL (Australian Rules Football), for example, Aboriginal and Torres Strait Islanders make up 11% of elite players, but are less than 1% of the total high performance coaches (Creative Spirits, 2014). Recent research suggests that systemic racism, and the prevalence of racialised stereotypes, may be preventing many talented Indigenous athletes from pursuing a career in sport coaching (Apoifis et al., 2017; Adair & Stronach, 2011; Bennie et al., 2017; Tynan & Briggs, 2013; Yu & Bairner, 2011). For instance, Adair and Stronach (2011) argue that a component of racialised stereotypes celebrates Aboriginal and Torres Strait Islander athletes as physically capable but lacking in the genetic abilities to coach, where an "overemphasis on athletic acumen to the exclusion of other qualities may pose risks beyond the playing field" (p. 124). These findings demonstrate the need to better understand the reasons why so few Aboriginal and Torres Strait Islander people are involved in coaching and other leadership positions in sport. Furthermore, limited research involves Aboriginal and Torres Strait Islander athletes, coaches and sport administrators despite the fact that sport has been identified as a key area for mentoring and providing leadership for Aboriginal and Torres Strait Islander athletes and young people.

#### **Project purpose**

The proposed summer research project aims to complete a desktop analysis of sporting organisation websites to explore what programs currently exist for Aboriginal and Torres Strait Islander peoples. The aim is to develop a time-relevant case by case analysis of what is currently available and where gaps exist. From this, there is potential for sport organisations to improve their current frameworks to better accommodate Aboriginal and Torres Strait Islander people in their long term planning and employment.

## **Significance**

This research will complement existing research completed in this space, which investigated facilitators and barriers for Aboriginal and Torres Strait Islander people gaining entry into, and progressing within, sport coaching roles. Over the past two years, the research team held conversations with 28 male and female Aboriginal coaches from a variety of team and individual sports about their positive and negative experiences in sport. Since then we have disseminated information in publicly accessible forums ([http://logincms.westernsydney.edu.au/sports/home/news/featured\\_stories/aboriginal\\_and\\_torres\\_strait\\_islander\\_sports\\_coaching\\_forum/\\_nocache](http://logincms.westernsydney.edu.au/sports/home/news/featured_stories/aboriginal_and_torres_strait_islander_sports_coaching_forum/_nocache)) and a variety of academic conferences. We have also established a coach education and leadership program called Coaching Unlimited which delivers formal coaching accreditation and health promotion workshops within Aboriginal and Torres Strait Islander Communities.

## **Project Aims**

The following are the central research questions guiding this project:

1. Why there are so few Aboriginal and Torres Strait Islander sport officials and administrators in high performance settings?
2. What programs to sport organisations currently provide for Aboriginal and Torres Strait Islander peoples?

## **Project Methods**

This project involves reviewing current opportunities for Aboriginal and Torres Strait Islander peoples by searching peak body websites, as well as the wider Internet. The aim is to describe a framework for how sport organisations integrating inclusive practices within their broader organisational structure.

The Western Sydney summer student involved in this project will be responsible for reviewing sport organisation websites as well as contacting sport organisation personnel (e.g., community engagement managers, general managers of participation) to create a database that tracks what opportunities are currently available and what gaps currently exist in Aboriginal and Torres Strait Islander programming within the sports industry. The student will also have the opportunity to be a part of HPE research group and collaborate with other students/staff carrying out research under the broader spectrum of health, physical education, physical activity and sport science. The interaction between the student and others involved in the research project will provide opportunity for the student to discuss research pathways in academic and other environments.

## **Opportunity for Skill Development**

This project suits a student who has a passion for sport and interest in working with Aboriginal and Torres Strait Islander populations. This project will enable students to extend their existing knowledge base about the sports industry as well as academic research. Students will gain experience planning, organizing, and managing a research project while communicating with academic staff and sport industry professionals. This project suits a student in Health Sciences, Psychology, Education, or Social Work who is interested in gaining research and project management skills required for further study in research degree programs (Masters/PhD). Aboriginal and Torres Strait Islander students are strongly encouraged to apply.

If the student is interested in pursuing a further degree (e.g., Honours, MRes, PhD) in this area, they will also have the opportunity to develop a research proposal under the guidance of the supervisors. The student may be included as a co-author on the peer-reviewed journal article resulting from this work.

**Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Students will have completed their second or third year of study and have experience or an interest in working within the sports industry or related fields (such as sport psychology, social work, athlete welfare, coach education). S/he should have excellent interpersonal, writing and organizational skills.

## **Project 108: Sensory Processing, Learning Styles and Educational Outcomes in Occupational Therapy Students**

**Supervisor(s):** Dr Caroline Mills (Principal Supervisor)  
Dr Kristy Coxon (Second Supervisor)

**Supervisor(s) contact information:** [Caroline.mills@westernsydney.edu.au](mailto:Caroline.mills@westernsydney.edu.au)  
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### **Project description**

Learning is a complex process involving intake and registration of sensory information, memory, executive functioning and behavioural output (Chapparo, 2010). The learning styles account is popular in literature and posits that individual students may benefit from particular types of instruction (Pashler, McDaniel, Rohrer & Bjork, (2008)). While Kolb's learning styles have been criticised in the literature (Pashler et al; Manolis, Burns, Assudani & Chinata, 2013), evidence supports the learning styles account (Manolis et al, 2013). It may be beneficial for educators to learn about student learning styles in order to design effective learning experiences. Executive functioning skills are involved in learning and comprise higher order cognitive processes including regulation of attention, planning and evaluating responses (Chapparo, 2010). These skills are utilised by tertiary students in order to successfully complete their studies. Sensory processing involves the intake and registration of information from the environment through the senses (Anzalone & Lane, 2011). Much has been published on sensory processing in relation to paediatric occupational therapy (Bodison & Parham, 2018) and mental health, (Machingura, Sum, Molineaux & Lloyd, 2018).

Although sensory processing differences have been related to difficulties with school participation in children (Ashburner, Ziviani & Rodger, 2008), no research to date has considered how sensory processing might relate to learning styles and educational outcomes in adult learners in a tertiary environment, including those studying occupational therapy. This has prompted researchers to conduct a research project investigating these factors in occupational therapy students over two years (2019-2020). Data from year one (2019) will be collected by researchers and the summer student will assist in collation of data, preliminary data analysis and conducting a background systematic literature review in preparation for publication.

### **Project Aims**

The overall aim of this research is to investigate the relationship between learning styles including executive function, sensory processing, and educational outcomes for practice and theory components of the occupational therapy course.

The overall research question is: What is the relationship between learning styles, sensory processing, executive functioning and educational outcomes in occupational therapy students?

## **Project Methods**

This research utilises survey methodology. Data was collected during semester time. Data collected by student participants comprises the following self-reported standardized assessment measures:

**Sensory Processing:** Adolescent Adult Sensory Profile (AASP) (Brown & Dunn, 2002) commonly used standardized assessment for self-assessment of adult sensory processing.

**Learning Styles:** KOLB Learning styles questionnaire (Kolb & Kolb, 2013) commonly used model of learning styles which will be used to assess student learning styles.

**Executive Functioning:** Dysexecutive Questionnaire (DEX) from the Behavioural Assessment of Dysexecutive Syndrome (BADS) This is a self-assessment of executive functioning which measures how well students organize and plan.

**Educational Outcome:** Final semester grades from Occupational Therapy Practice (OTP)-1 and Introduction to Occupational Therapy (IOT)-1 and first year GPA. Approval has been sought from the Office of Student Experience to access student grades. The summer student will not be given access to identifying information regarding student grades. This information will be de-identified by the Student Experience Office before being given to students.

**Demographic information:** will be collected from each participating student in IOT and OTP1

The student's role in this project will be to collate information collected from participants, learn the scoring of the professional assessment measures and work with researchers to conduct initial statistical analysis to determine preliminary findings.

In addition, the student's role on this project will be to work with supervisors to conduct a systematic literature review on this topic which will involve developing a systematic review protocol, conducting literature searches and working with supervisors to screen articles for inclusion, assess quality and extract the data. The student will be given an opportunity to be an author on the systematic review paper. A set data extraction tool will be used.

## **Opportunity for Skill Development**

Students will be given the opportunity to take part in scoring standardised assessments and collating the data onto a spreadsheet and to work with researchers to conduct preliminary statistical analysis using data. Students will be given the opportunity to work with supervisors to conduct a literature review on the topic and to link this with the data. Students will be given the opportunity to work on an initial draft for a journal article manuscript and will be given the opportunity to earn authorship on this peer reviewed paper.

**Students are required to have the following skills/meet the following pre-requisite(s) to apply**

This project would be ideally suited to a student in occupational therapy who has completed 3rd year. This project would suit a student who has an interest in quantitative research methodology.

## **Project 109: A scoping review of avoidable Emergency Department presentation and hospitalisation of people living with disability**

**Supervisor(s):** Dr David Lim (Principal Supervisor)  
Mr Stewart Alford (Second Supervisor)

**Supervisor(s) contact information:** d.lim3@westernsydney.edu.au  
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### **Project description**

The burden of disability and its impact on health services needs attention for rural Australians. The prevalence of disability in inner regional Australia and outer regional/remote Australia is higher than the national average of 18.5% (ABS 2009). Aboriginal and Torres Strait Islander people have further significant disability burden. Almost half (45%) of Aboriginal and Torres Strait Islander people aged 15 years and over were living with disability or a restrictive long-term health condition in 2014-15. Aboriginal and Torres Strait Islander people had higher rates of disability than non-Indigenous people across all age groups (Australian Health Ministers' Advisory Council, 2017). It is well understood that persons with disability seek more health care than people without disability and are consistently over-represented in admissions and face undesirable situations. Accurate and detailed information hospitalisation patterns and associated risk and protective factors for people with disabilities is essential for future planning and policy making. However, to date there is significant paucity of data and information on rural populations living with disability and the impact on health services.

The Australian Bureau of Statistics' (ABS) Survey of Disability, Ageing and Carers (SDAC) reports the use of mainstream health services by people with disability (AIHW 2015). In 2015, 93% of persons with disability engaged a General Practitioner (GP), while 26% and 22% visited a hospital Emergency Department (ED) and were admitted to hospital, respectively. Importantly, there was an evident rural-urban difference in the use of primary care services. People with disability below 65 years old living in the community in outer regional and remote areas used GPs, medical specialists, dentists and different types of health professionals' services less than people with those living in urban areas. However, they were more likely to visit a hospital ED for health issues that could potentially be dealt with by non-hospital primary care services (Lim & Geelhoed, 2015). People with disability living in outer regional and remote areas were 2.5 times as likely as those living in major cities to think that the care they needed could have been provided by a GP and admission to ED could potentially be prevented. It is difficult to fully understand the relatively high ED use and impact of preventable ED presentations and hospitalisation without comprehensive understanding of person level disability factors and complex systems level factors.

This proposed project is an extension of an externally funded project to examine the appropriate use of ED, and is intended to provide the pilot data for a further research grant.

## **Project Aims**

The overarching project aims is to understand factors that potentially influence the avoidable ED presentation and hospitalisation of people living with disabilities in rural and regional communities (NHMRC application APP1162660).

This pilot study focuses on two objectives:

1. To describe the burden of avoidable ED and hospitalisation of rural and regional people living with disability.
2. To explore ED presentation and hospitalisation to identify clinical and person level psychosocial factors and contextual risk factors.

## **Project Methods**

A Johanna Brigg Institute (JBI) systematic review of existing literature on the topic will be conducted. David is an active member of the Flinders University affiliated JBI centre for remote health, he will directly supervise the student on the systematic review. For JBI systematic review please see:

<https://wiki.joannabriggs.org/display/MANUAL/1.1+Introduction+to+JBI+Systematic+reviews>

## **Opportunity for Skill Development**

Publication for the student is intended: (i) protocol, see for example Pourmarzi, D., Hall, L., Rahman, T., Lim, D., & FitzGerald, G. (2017) Clinical effectiveness, cost-effectiveness and acceptability of community-based management of chronic hepatitis C: A mixed methods systematic review protocol. *JBI Database of Systematic Reviews and Implementation Reports*, 15(4), pp. 914-931.

(ii) manuscript for journals such as the Australian Journal of Rural Health.

Skills in systematic review: formulation of research question, systematic search, critical appraisal, data synthesis and writing for publication. Other foundation skills include team work, communication and critical thinking.

Exposure to a contemporaneous area of health service management.

## **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Willingness to learn and being receptive. Fundamental knowledge of health care system. Fundamental knowledge of database searches and computer literacy.

## **Project 110: Quantification of curcumin and curcumin metabolites in blood and brain tissue of chronically inflamed mice**

**Supervisor(s):** Dr Garry Niedermayer (Principal Supervisor)  
Dr Ritesh Raju (Second Supervisor)

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### **Project description**

Curcumin has a broad cytokine-suppressive anti-inflammatory action, down-regulating the expression of cyclooxygenase-2 (COX-2), inducible nitric oxide synthase (iNOS), TNF- $\alpha$ , IL-1, -2, -6, -8, and -12, making it an anti-inflammatory therapeutic candidate. A difficulty in its establishment in the field is its relatively low bioavailability. When administered in its naïve form, it is difficult to reach therapeutic concentrations in the bloodstream and brain. Various different formulations of curcumin have been generated in hopes of targeting not only peripheral inflammatory conditions, but central diseases. We have three different formulations of potentially “high bioavailable” curcumin that have been fed to normal and chronically neuroinflamed GFAP-IL6 mice. The GFAP-IL6 mouse is a model of chronic, sustained neuroinflammation and gliosis, which are features of a variety of neurodegenerative conditions such as Alzheimer’s, Parkinson’s, stroke and traumatic brain injury. We require a student to quantify curcumin and curcumin metabolites in blood and brain tissue from GFAP-IL6 mice fed various diets of “highly bioavailable” curcumin, normal (naïve) curcumin and normal diets (lacking curcuminoids). The blood and brain tissues have already been collected.

The successful applicant will work in the School of Medicine (Building 30 CTOWN campus) processing these tissue samples and quantifying various compounds via UV and Mass spec analysis. Training in the preparation and analysis of tissue will be provided. This work is very likely to be published in the near future, either standing alone, or as part of a larger project. Data generated in this project will be compared and correlated with biochemical, histological and behavioural data previously obtained from these cohorts. Additionally, this project will utilize a newly developed extraction technique that, once optimized, may be published as an additional publication in the form of a methods paper.

### **Project Aims**

We aim to answer the following questions:

- Determine the increased bioavailability of three unique formulations of curcumin.
- Compare biochemical, histological and behavioural data with measures of blood and brain curcuminoids.

### **Project Methods**

Blood and brain tissue will be homogenized, treated, and soluble fractions collected. These fractions will be analysed using the Liquid chromatography–mass spectrometer (LCMS) for the quantification of curcumin and curcumin metabolites across 8 cohorts of mice (totalling around 100 mice).

## **Opportunity for Skill Development**

The student who completes this project will gain specific training in the processing and protein extraction techniques of blood, plasma and brain tissue. Additionally, the student will gain experience in the use of the LCMS and UV probe. This equipment and associated software are used in many research and clinical laboratories. The student will also be trained in basic rodent neuroanatomy and landmark recognition in the brain. Data analysis and statistical processes will also be developed in the analysis of collected data.

### **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Students will need a basic knowledge of analytical chemistry.

## **Project 111: Measuring the partition coefficient of biologically active platinum complexes via HPLC**

**Supervisor(s):** Janice Aldrich-Wright (Principal Supervisor)

Dale Ang (Second Supervisor)

**Supervisor(s) contact information:** j.aldrich-wright@westernsydney.edu.au

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### **Project description**

The partition coefficient is an important factor to consider when developing bioactive molecules. It strongly affects how the molecule is absorbed and distributed within the body and its effect on the intended target. The octanol-water partition coefficient ( $\log P$ ) is one of the Lipinski's rule of 5 which states "The octanol-water partition coefficient  $\log P$  not greater than 5". Usually, measurement is by the shake flask method, but this method is tedious (can take >1 hr per sample), error prone, poorly reproducible, and requires a relatively large amount of compound. In contrast, a method based on reverse phase HPLC requires much smaller quantities of compound, is faster (20–30 minutes per sample) and reproducible.

This project aims to establish a method for the measurement of platinum complex partition coefficient by HPLC which is suitable for the platinum complexes developed within our research team.

### **Project Aims**

- Develop a method based on literature, for the determination of partition coefficient of metal complexes;
- Measure and catalogue the partition coefficient of a range of platinum complexes that have been developed at Western Sydney University.

### **Project Methods**

There are established method for the determination of partition coefficients using a water/methanol isocratic HPLC method.<sup>1,2</sup> These methods will be tested to establish suitability with our platinum complexes and modified where necessary.

1. C. M. Du, K. Valko, C. Bevan, D. Reynolds and M. H. Abraham, *Anal. Chem.*, 1998, 70, 4228– 4234.
2. J. A. Platts, S. P. Oldfield, M. M. Reif, A. Palmucci, E. Gabano and D. Osella, *J. Inorg. Biochem.*, 2006, 100, 1199–1207.

### **Opportunity for Skill Development**

The student will develop skills and experience in the following areas:

- Developing methods and running samples on a HPLC machine
- Data interpretation, analysis, and presentation
- Working with and contributing to an active research team

**Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Minimum of completing a first year undergraduate chemistry unit.

## **Project 112: Quantifying the total platinum uptake of treated cells by inductively coupled plasma mass spectrometry (ICP-MS)**

**Supervisor(s):** Janice Aldrich-Wright (Principal Supervisor)  
Dale Ang (Second Supervisor)

**Supervisor(s) contact information:** j.aldrich-wright@westernsydney.edu.au  
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### **Project description**

Quantifying the uptake of a biologically active molecule in treated cells is a complex task. The ability to discern one specific atom from a complex biological sample is only possible where that atom is unique to the system. This is certainly true when it comes to platinum complexes as there is no natural biological role for platinum. With the application of inductively coupled plasma mass spectrometry (ICP-MS) it is possible to quantify the amount of platinum in a sample down to the parts per billion level (or more). This project aims to develop a method for preparing cell samples that have been treated with platinum complexes and quantifying the uptake, based on literature methods.

### **Project Aims**

- To develop a method for preparing cell samples that have been treated with a platinum complex to be suitable injection into the ICP-MS.
- To quantify the total platinum uptake in a range of treated cell lines.

### **Project Methods**

The literature contains several methods for application of ICP-MS to total metal uptake.<sup>1,2</sup> These will be reviewed and adapted to the equipment we have available. The cell cultures will be supplied by the groups post-graduate research students.

1. A. Ghezzi, M. Aceto, C. Cassino, E. Gabano and D. Osella, *J. Inorg. Biochem.*, 2004, 98, 73–78.
2. E. E. M. Brouwers, M. Tibben, H. Rosing, J. H. M. Schellens and J. H. Beijnen, *Mass Spectrom. Rev.*, 2008, 27, 67–100.

### **Opportunity for Skill Development**

- Experience developing and operating an ICP-MS.
- Preparing standard curves and serial dilutions for quantification purposes.
- Handling and preparing cell cultures for analysis.
- Working with and contributing within an active research team.

**Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Minimum of one first-year chemistry undergraduate unit.

## **Project 113: Self-regulation and imagery ability of children with spinal cord injury or disease**

**Supervisor(s):** Karen Liu (Principal Supervisor)  
Dr Caroline Mills (Second Supervisor)  
Kristy Coxon (Third Supervisor)

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### **Project description**

The effectiveness of cognitive strategies including self-regulation and mental imagery in achieving better functional outcomes for adults who have had a stroke [1-8] and children with autism [9] has been established.

Self-regulation assists an individual in learning behaviours more effectively by increasing self-awareness through active, independent and reflective learning [10]. Mental imagery is a process in which a function, behaviour, or performance is rehearsed mentally as if the person is performing it [11]. Self-regulation together with mental imagery can enhance problem identification, improve the planning and execution of task performance and increase a person's ability to learn [5, 8, 12]. Besides promoting active learning, these cognitive strategies have also shown improvement in one's generalisation of learnt behaviours [8, 12]. A larger project will investigate the use of self-regulation and mental imagery in promoting daily task performance in children with spinal cord injury or disease.

This project involving a student in the Summer Scholarships Program will serve as a pilot study to explore the self-regulation and mental imagery ability of children with spinal cord injury or disease. This will provide data to prepare for the use of the two strategies in promoting their daily task performance in the larger project.

### **Project Aims**

To explore the self-regulation and imagery ability of children with spinal cord injuries or disease.

### **Project Methods**

The student in this Summer Scholarships Program will join the research team and participate in this research.

A total of 28 children with spinal cord injury or disease aged 6 to 18 will be recruited. For a correlation study with 90% power and two-sided 5% significance, it is recommended the sample size of 28 for standardised effect sizes that are medium (0.5) [13].

The participants will be recruited through the networks of the SpineCare Foundation, Northcott (the funding body of the larger project).

Besides collecting the participants' demographic data, the participating children will be assessed on the followings to review their self-regulation and imagery ability:

- Self-Regulation of Learning Self-Report Scale - It is a self-reporting assessment tool containing 50 items. It measures the areas of planning, self-monitoring, evaluation, reflection, effort and self-efficacy within multiple learning domains.
- Vividness of Movement Imagery Questionnaire-2 (VMIQ-2) – It assesses vividness while using different forms of imagery in motor tasks. A five-point scale (1 = perfectly clear and vivid; 5 = no image at all) is used by the participants to rate their vividness for each task.
- Imagery perspective preference - The participants will rate their perspective preferences by visually imagining the tasks in the VMIQ-2. Preferences are anchored at 0 (strong internal visual preference), 3 (moderate internal visual preference), 5 (no preference), 7 (moderate external visual preference) and 10 (strong external visual preference).
- Kinaesthetic and Visual Imagery Questionnaire (KVIQ) – It is a motor imagery questionnaire adapted for persons who have to be guided in the rating of their imagery and who are not able to stand or to perform complex movements. It is used to assess both the visual and kinaesthetic dimensions of motor imagery.

It takes approximately 45 minutes to complete all assessments.

Descriptive statistics will be reported. Pearson correlations will be used to reveal the relationship of self-regulation and imagery ability of children of different ages and genders.

Together with the project team including the academic staff, the casual research assistant and the occupational therapy honours student, the student in this Summer Scholarships Program will be involved in recruiting, liaising with and gaining written consent from the participants' parents or guardians. The student will also be involved in collecting data, assisting in data entry and analysis. The project will result in a manuscript to be submitted for journal publication. The student will be involved in the writing of the manuscript.

## Opportunity for Skill Development

### Skill development

The student will learn:

- the research design of a correlational study and the clinical study of the larger project,
- the recruitment, procedure of getting consent and engaging participants in research study,
- the input of data into a statistical package, analysis of the data set using basic quantitative analysis methods and its interpretation,
- to interact with children with spinal cord injury or disease and their parents or guardians,
- to liaise with industrial partners.

These skills are necessary for his/her further development in research (e.g. honours, MRes or HDR study) and health care service provision.

### Research environment

The student will receive daily supervision/guidance from the supervisors. The student will be co-located with other occupational therapy HDR and honours students in building 21/24. Fortnightly meetings with this group will be held to share ideas and their research work if possible. The student in this program will also gain peer support during the process.

### **Other outcomes**

Based on the findings in this project, the student is expected to participate in the writing of a manuscript for journal submission under the guidance of the supervisors. He/she will be the author of the manuscript. The results will also form part of a larger project investigating the use of self-regulation and mental imagery in promoting daily task performance for children with spinal cord injury or disease.

### **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

There are no specific skills required. Students in all years of their study who are interested in clinical research and working with children are welcome to join the project.

## **Project 114: Growing health: The role of community gardens in health and wellbeing**

**Supervisor(s):** Nicki Taylor (Principal Supervisor)

Tony Rossi (Second Supervisor)

**Supervisor(s) contact information:** Nicole.taylor@westernsydney.edu.au

T.Rossi@westernsydney.edu.au

### **Project description**

This project is concerned with the investigation of community gardens as environmental sites of ‘health work’.

Current research points to the ‘use’ of community gardens as an initiative that often draws on discourses of healthism and sustainability. For example, gardens have been described as a health and obesity intervention to encourage children to eat more fruit and vegetables (Duncan et al., 2015; Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009) or as a tool to increase physical activity so that young people ‘move more and sit less’ (Wells, Myers, & Henderson, 2014). As a link to ‘sustainability’, community gardens are now often promoted as a tool to encourage ‘good’ environmental citizen behaviours, such as growing your own food, composting, and ‘doing your bit for the environment’ (NSW Government Office of Environment and Heritage, 2017). This project is concerned with identifying examples of community gardens in the wider Sydney area, that are purposefully connected to ideas of health and wellbeing.

### **Project Aims**

The aims of this project are to:

- Develop a review of literature related to community gardening in the wider Sydney area. More specifically, this review would include a focus on how community gardens in this area are connected to ideas of health and wellbeing.
- Identify unique examples of community gardens in the wider Sydney area. These gardens will in some way be connected to ideas of human health and wellbeing. These cases can be sourced through community connections, or even through online links and social media sites.
- Design and develop a database of these community garden sites, including location, purpose, demographic for engagement, health and wellbeing connections.
- Make contact with the sites in the database, and potentially visit some of the community gardens.
- Interview some key participants or stakeholders about their involvement in the garden. Take photos and make field notes regarding details of the gardens visited.

### **Project Methods**

The methods used to conduct this research will include:

- Literature Review: Reviewing existing literature on community gardens as they are connected to ideas of health and wellbeing. This will give the student background knowledge before embarking on the ethnographic sections of the study.
- Case Study: The student will be involved in the early stages of a case study. They will be assisting the supervisory team with identifying and documenting potential cases for future ethnographic research. This will include designing a database for information related to community garden sites in Sydney, making contact with the community garden programs and visiting some of the key sites identified to speak with stakeholders.

## **Opportunity for Skill Development**

As a result of participating in this project students will have the opportunity to begin developing skills related to:

- Searching and reviewing academic literature
- Writing up official research notes related to literature
- Identifying cases for research
- The design and development of a database and organising information
- Interpersonal skills through interactions with key stakeholders
- Verbal communication and networking skills through speaking with and visiting identified sites

## **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

The student should have strong (relative to opportunity) skills related to:

- Interpersonal communication: a large part of this project requires the student to make direct contact with stakeholders who we would like to conduct further ethnographic research with in the future. Communication and interpersonal skills will be essential to the development of initial relationships with these key sites.

## **Project 115: Characterization of the radiotracer [18F]PBR111 as an in vivo marker for neuroinflammation in GFAP-IL6 mice**

**Supervisor(s):** Dr Garry Niedermayer (Principal Supervisor)

Dr Erika Gyenges (Second Supervisor)

**Supervisor(s) contact information:** g.niedermayer@westernsydney.edu.au

E.Gyengesi@westernsydney.edu.au

### **Project description**

As part of a larger project, we want to monitor chronic neuroinflammation in the living mouse using a PET tracer for a marker of activated microglia, the 18 kDa translocator protein (TSPO). TSPO is a marker of activated microglia (similar to Iba1) and can be detected in mice by in vivo imaging using PET. In order to validate this new tool, it must be compared with conventional methods of inflammatory marker quantification. This project contains 3 cohorts, a group of wild-type mice (normal controls), a group of GFAP-IL6 mice (a genetic model of neuroinflammation) and a group of GFAP-IL6 mice which have been fed with a curcumin formulation. We have already collected the PET scan data and processed the brain tissue from these groups. The PET scans revealed a significantly larger TSPO signal in GFAP-IL6 mice compared to that of the Wild-type (normal) mice. There was a slightly lower TSPO signal in the curcumin fed GFAP-IL6 mice compared with the unfed GFAP-IL6 mice. We require a student to quantify the neuroinflammatory markers in the processed tissue from these mice. The whole brains from these mice have been sectioned and immunohistochemically stained for various inflammatory markers (IBa1, TSPO and GFAP).

We require a student to use the microscope set up in the School of Medicine (Building 30 CTOWN campus) with the neurolucida software and count IBA1, TSPO and GFAP positive cells in the cerebellum of these mice. Training on the microscope and the software will be provided. Training will take approximately a week.

This work is very likely to be published in the near future, either standing alone, or as part of a larger project.

### **Project Aims**

We aim to answer the following questions:

- Is the radiotracer [18F]PBR111 an effective in vivo marker of neuroinflammation (microglial activation) in a mouse model of chronic neuroinflammation (GFAP-IL6)?
- Is the radiotracer [18F]PBR111 sensitive enough to detect the reduction of neuroinflammation achieved by application of the CSAIDs: apigenin and curcumin?
- Are the levels of neuroinflammation quantified by TSPO and Iba1 immunohistochemistry comparable to those observed by PET imaging?

### **Project Methods**

The methods employed will be the stereological quantification of IBA1, TSPO and GFAP positive cells in the cerebellum of three cohorts of mice (15 total). Briefly, the student will use the software “neurolucida” to accurately estimate the number of immunohistochemically positive cells within defined regions of the brains of various mice. Once data is obtained, the student will statistically analyse the group differences via SPSS or graph pad, and correlate various measures with independent variables.

## **Opportunity for Skill Development**

The student who completes this project will gain specific training in the use of a Leica inverted microscope, including the optical fractionator attachment. Additionally, the student will gain experience in the use of neurolucida software and its stereological capacity. This equipment and software are used in many research and clinical laboratories. The student will also be trained in basic rodent neuroanatomy and landmark recognition in the brain. Data analysis and statistical processes will also be developed in the analysis of collected data. Furthermore, the student will develop scientific writing skills with contribution to the resultant publication.

## **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Students will need a basic knowledge of anatomy of the brain as well as a basic understanding of optical microscope use.

## **Project 116: Embarrassment in physical education**

**Supervisor(s):** Dr Rhiannon Lee White (Principal Supervisor)  
Professor Tony Rossi (Second Supervisor)

**Supervisor(s) contact information:** Rhiannon.White@westernsydney.edu.au  
T.Rossi@westernsydney.edu.au

### **Project description**

Physical Education is more than an educational subject or an opportunity for exercise at school. Physical Education is a vital public health tool. Not only does Physical Education provide an opportunity for children and adolescents to participate in physical activity but, Physical Education also has the potential to create positive attitudes towards physical activity. Evidence shows that positive Physical Education experiences at school are associated with positive attitudes towards exercise and intentions to exercise as adults (Ladwig, Vazou, & Ekkekakis, 2018). Therefore, not only does Physical Education account for a large portion of adolescents' weekly physical activity (Carlson et al., 2016), but, quality Physical Education classes also have the potential to develop positive lifelong attitudes towards exercise (Ladwig et al., 2018). Conversely, negative Physical Education experiences are associated with negative attitudes towards exercise in adulthood, and consequently, increased sedentary behaviour (Ladwig et al., 2018). A recent study of 1,028 adults revealed that embarrassment was the most commonly reported negative experience in Physical Education. As such, experiences of embarrassment during high school Physical Education are counterproductive to the purpose of physical education (i.e., develop lifelong engagement in physical activity). However, no study has examined embarrassment in physical education. This project will aid in the development of a valid measure of embarrassment so future work can assess the quantitative relationships between embarrassment and different teaching strategies and activities.

### **Project Aims**

- To collect survey data at a small number of school PE lessons
- To assist with Stage 2 of the validation process required to finalise the development of a measure of embarrassment in physical education.
- To code and summarise qualitative data on embarrassment in PE.

### **Project Methods**

This project involves collecting data on embarrassment in PE lessons at two schools in Western Sydney. School students will complete a short survey during the last 5-minutes of their PDHPE practical class. This data will add to data collected earlier this year to provide a cross-validation sample to conduct the 2nd phase of testing to validate a measure of embarrassment. The student will be involved in preparing the surveys (e.g., formatting, proofing, printing or uploading to iPads, administering, and checking for completion on site) and communicating with the school teachers and students. The student will also scan, enter, and/or check the data. The student will learn to process and clean and dataset and calculate simple descriptive statistics including Means and SDs and conduct Pearson r correlations in January. The student can also gain preliminary experience with qualitative data by coding open-ended questionnaire data previously collected. This coding will lead to

the development of interview questions for 2020 and will provide the student with ownership over the project and results to present at the Presentation Day.

### **Opportunity for Skill Development**

Upon completing this project, the student will have exemplary skills in survey data collection. The student will also have gained experience in reviewing literature, communicating with school staff and students, managing data, and conducting introductory analyses. The student will also gain practical organisational and time management skills. The project will provide an understanding of research in the health, physical activity, and physical education field, as well as practical knowledge to improve their ability as a future PDHPE teacher if they do not go down the research path.

### **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Able to travel to schools for data collection.

The project would be especially suitable for a 2nd year Health and Physical Education, Sport and Exercise Science, or Health Promotion student. But, this is not required.

## **Project 117: How do different types of exercise at the gym affect wellbeing?**

**Supervisor(s):** Dr Rhiannon Lee White (Principal Supervisor)  
Professor Tony Rossi (Second Supervisor)

**Supervisor(s) contact information:** Rhiannon.White@westernsydney.edu.au  
T.Rossi@westernsydney.edu.au

### **Project description**

Mental health disorders are the largest contributor to burden of disease, and the largest cause of disability worldwide (Begg et al., 2007; Prince et al., 2007; Whiteford et al., 2013). The impact of mental health disorders is so extensive that a 14-year gap in life expectancy exists between those with a mental health disorder and the general population (Lawrence, Hancock, & Kisely, 2013). Not only is positive mental wellbeing a protective factor against the onset of a mental health disorder (Saxena, Jané Llopis, & Hosman, 2006), but it is also associated with self-esteem; and the ability to maintain positive interpersonal relationships, work productively, and contribute to society (Herrman, Saxena, & Moodie, 2005). Abundant evidence supports a positive relationship between physical activity and mental health and wellbeing (Bize, Johnson, & Plotnikoff, 2007; Thompson-Coon et al., 2011). However, findings regarding the optimal duration, frequency, and intensity of physical activity for mental health benefits remain inconsistent.

According to self-determination theory, all human beings have three basic psychological needs that must be fulfilled to experience optimal wellbeing (Deci & Ryan, 1985). These needs are autonomy (i.e., the need to self-regulate one's behaviour), competence (i.e., the need to feel effectance and mastery), and relatedness (i.e., the need to feel part of a group) (Ryan & Deci, 2000, 2017). Environments that satisfy these needs often lead to better quality motivation (Ryan & Deci, 2000, 2017), and more positive wellbeing. The vast majority of studies examining these relationships have been conducted in the physical education context or in sport-specific exercise settings. However, for people over 15 years or older, fitness-related exercise at Gyms is the second most common physical activity, participated in by 17.4% of the population (Australian Bureau of Statistics, 2013).

A small number of studies have shown that needs satisfaction in exercise is associated with positive wellbeing (Behzadnia, Adachi, Deci, & Mohammadzadeh, 2018; McDonough & Crocker, 2007)(Wilson, Longley, Muon, Rodgers, & Murray, 2006)(Teixeira, Silva, & Palmeira, 2018). However, all of these studies report on cross-sectional relationships between contextual needs satisfaction (i.e., in relation to exercise generally) and wellbeing, at any given point. This is problematic because individuals may be engaged in a number of different exercise types within their regular week, and they may experience different levels of motivation, needs satisfaction, and affect towards different exercises and on different days. As such, this study aims to measure situational motivation and needs satisfaction (i.e., in relation to one specific exercise session) to better understand how motivation and needs satisfaction influence post-exercise affect.

## **Project Aims**

The overarching aim of the proposed project is to determine if the satisfaction of basic psychological needs (i.e., autonomy, competence, and relatedness) is associated with post-exercise affect (i.e., a general psychological construct referring to mental states where people feel either good or bad) (Gray & Watson, 2001).

Specific research questions include:

1. Do changes in positive and negative affect from before to after exercise vary systematically with autonomous motivation and the satisfaction of psychological needs?
2. Do the above relationships occur among group classes and individual training alike, and across all exercise intensities?
3. What is the strongest predictor of post-exercise affect – exercise duration, exercise intensity, or needs satisfaction (i.e., in terms of mental wellbeing outcomes, is it more important how much exercise you do, how intense it is, or that the exercise itself satisfies psychological needs)?

## **Project Methods**

Participants in the proposed study will be clients of Western Sydney University's Bankstown and Hawkesbury Gym. All clients who attend the Gym while data collection is taking place will be invited to participate, unless they are under the age of 18 years. As clients arrive at the Gym, research assistants will invite them to participate in the study. Participants that agree will complete a 3-minute questionnaire to wear during the period in which the client is at the Gym. Upon exiting the Gym, the participants will complete another short survey (3-minutes). The Positive and Negative Affect Schedule will be used to measure post-exercise affect, and determine any change in affect from pre to post exercise. The Situational Motivation Scale (SIMS) will be used to measure participants' motivation towards the exercise they are about to complete, and the Psychological Need Satisfaction in Exercise Scale will be used to measure autonomy, competence, and relatedness satisfaction during participants' exercise sessions.

The Summer Scholarship student will be involved in the organisation of questionnaires and liaise with Gym staff to organise data collection times. The Summer Scholarship student will be responsible for engaging with Gym clients and collecting data from participants. This will involve setting up iPads, collecting consent, and uploading data through Qualtrics. The student will then have the opportunity to run basic statistics on the data collected to present results in his or her final report. The lead supervisor will then estimate a series of path models in Mplus to determine the unique contribution of each psychological need, and of motivation, to post-exercise affect, as well as the combined influence of both motivation and psychological needs satisfaction. Finally, we will add exercise duration and intensity, and type of exercise, to the model as moderators to determine if the pattern of results vary by exercise duration, intensity (light, moderate, or vigorous), or type (individual training versus group class).

## **Opportunity for Skill Development**

Upon completing this project, the student will have exemplary skills in survey and physical activity data collection. The student will also have gained experience in reviewing literature, communicating with staff in the exercise and sport sectors, managing data, and conducting introductory analyses. The student will also gain practical organisational and time management skills. The project will provide an understanding of research in the physical activity field, as well as practical knowledge to improve their ability as a future PDHPE teacher if they do not go down the research path.

## **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Able to travel to gyms for data collection. The project would be especially suitable for a 2nd year Health and Physical Education, Sport and Exercise Science, or Health Promotion student. But, this is not required.

## **Project 118: Dung beetles, a solution to canine faeces in urban green spaces, landfill and waterways?**

**Supervisor(s):** Dr Clarissa House (Principal Supervisor)  
Assoc. Prof Robert Spooner-Hart (Second Supervisor)

**Supervisor(s) contact information:** c.house@westernsydney.edu.au  
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### **Project description**

Australia has a population of 24 million (<https://www.worldometers.info/world-population/australia-population/>) and a staggering 85% of these people live in urban areas. With the increase in human populations there is an increase in the number of companion animals with an estimated 9 million companion dogs in Australia in 2018 (<https://www.healthydoggreats.com.au/australian-dog-cat-population-2018/>). The continuing trend towards high density living and small yards increases the importance of green spaces, which are known to be important for human health and their dog companions (Miller & Howell 2008; James et al. 2015). For instance, green spaces provide locations for social interactions and physical activities for owners and their dogs and is associated with positive physical effects such as lower blood pressure and cholesterol and psychological benefits such as reduced loneliness and stress (Miller & Howell 2008).

However, despite the positive benefits of dog ownership the issue of removing dog faeces is problematic. The removal of faeces from public spaces by their owners is socially expected (Miller & Howell 2008) but is an unsatisfactory solution when faeces are entombed in plastic that persists in landfill and pollutes our environment. Furthermore, dog faeces that are left in public urban areas may pose a health hazard to the public via contact with zoonoses (i.e. E. coli and Toxacara canis) and pollute bodies of natural water when rainfall run-off picks up the pollutants (Instone & Sweeney 2014; Wallace & Richardson 2005).

Dung beetles utilize dung resources for food and reproduction and may provide a solution to dog faeces. Dung beetles were introduced into Australia by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in the 1970's to control the polluting effects of cattle dung (Bornemissza 1969, 1970). Dung beetles feed on micro-organisms in the liquid component of dung and bury and package the fibrous component into brood masses that provide the resources for the growth and development of beetles during the larval stage of the life cycle (Bornemissza 1970). Australia has 437 native dung beetle species that are endemic and feed on native mammal dung (Ridsdill-Smith & Edwards 2011) and fifty-five species that were imported from Africa, Hawaii and Europe (CSIRO 2003).

The use of dung beetles to remove bovine dung has been highly successful and several enterprises continue to supply populations of dung beetles to agriculturalists at a price!  
(<http://www.dungbeetlesolutions.com.au/>;

<https://dungbeetleexpert.com.au/purchase-dung-beetles/>). In contrast, few researchers have investigated the utility of dung beetles to use dog faeces as a food resource and these findings are mixed and no studies have used an experimental approach (i.e. correlational, field studies only; Cave 2005; Carpaneto et al. 2005; Wallace and Richardson 2005).

Table 1. The propensity of three exotic species of dung beetle to bury and construct brood masses using bovine dung or canine faeces. (Experimental work was conducted by 2nd and 3rd year students and supervised by C. house)

Dung beetle species	Buried bovine dung	Buried canine faeces	Constructed brood masses from bovine dung	Constructed brood masses from canine faeces
<i>Bubas bison</i>	✓	✗	✓	✗
<i>Onthophagus sagittarius</i>	✓	✗	✓	✗
<i>Onthophagus gazella</i>	✓	✓	✓	✓

## Project Aims

This project aims to:

1. Quantify the efficiency of dung beetle species to bury bovine dung compared to dog faeces.
2. In species that are found to bury dog faeces, we will also:  
Quantify the numbers of brood masses that are produced and the numbers and size of the offspring that reach adulthood.

This is part of a long term aspiration to develop 'beetle bio bins' that contain self-supporting beetle populations that break-down dog faeces. So far, I have tested 3 species of dung beetle and have found that 1 species buries dog faeces and reproduces on dog faeces (Table 1). However, the success of this initiative requires that many dung beetle species are tested and the most efficient and reproductive users of dog faeces are identified.

## Project Methods

The student will engage in the following activities:

- Field caught dung beetles will be collected from dairy pastures (<https://www.aussiefarms.org.au/facilities/food/dairy?state=NSW>) and brought back to the laboratory.
- Beetle species will be identified and placed in single sex colonies (i.e. male or female only) and fed for 1 week.
- Mixed sex pairs (of the same dung beetle species) will be placed in replicate, individual containers (PVC tubes; 30L x 9D cm) with yellow, brick sand, topped with ~30g of bovine OR dog faeces (standardized weight) (30 reps/per dung type). As

beetle size has been found to influence breeding success, beetle pronotum width (i.e. proxy of size) will also be measured before the beetles are placed in the tube.

- After 7 days, the dung/faeces that remain on the surface of the sand will be re-weighed and the dung/faeces mass recorded to quantify if dung beetles sp. bury both dung types equally. (This is easy as the dung dries and can be picked up with tweezers)
- If brood balls (i.e. eggs and dung resources) are present, they will be sieved from the sand and incubated until the developing larvae hatch as adult offspring
- The number and size of the offspring will be recorded.

An analysis of covariance (ANCOVA) will be used to determine whether dung beetle species, dung type (dependent variables in the model) and body size (i.e. covariate) influence the mass of dung (independent variable) that remains on the surface of the soil after 7 days (independent variable) and/or the number of brood masses that are produced and the size of the offspring. This data will be written up by the student in the form of a conventional scientific report.

### **Opportunity for Skill Development**

The student will develop their problem solving and organizational skills and further their skills in working under a tight deadline. The candidate will also develop expertise in experimental design and numeracy (i.e. understanding of statistics and the use of IBM SPSS statistic package or R if applicable) and written communication. If the research is executed to a professional standard there is the potential to submit the work to a scientific journal (For example, ‘People and Nature’) and therefore the student will be exposed to the rigors of scientific writing to a professional standard and the peer review process.

### **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

We are seeking a student who is self-motivated and can use their initiative. They must be capable of working with a team and independently and be proficient in communicating the findings of their research and any issues that may arise in a professional manner.

## **Project 119: Oxygen and Breathlessness During Exercise in Pulmonary Arterial Hypertension**

**Supervisor(s):** Associate Professor Simon Green (Principal Supervisor)  
Dr Chloe Taylor (Second Supervisor)

**Supervisor(s) contact information:** simon.green@westernsydney.edu.au  
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### **Project description**

Pulmonary arterial hypertension (PAH) is a rapidly progressive and fatal disease that is more prevalent in females than males. Treatments are limited to pulmonary vasodilator drugs which have variable and modest effectiveness, whereas oxygen therapy is generally not used to treat this disease. However, there is sufficient evidence to suggest that oxygen might be an effective treatment for PAH and so, over the next few years, we will explore the possibility that supplemental oxygen is at least as effective as these drugs by studying acute physiological effects of oxygen in PAH and also conducting studies of long-term oxygen therapy.

The primary symptom of PAH is extreme breathlessness during exercise. This project is focused on the acute effect of oxygen supplementation on breathlessness and breathing limitations during exercise. The summer scholarship project will involve the development of a new experimental protocol using a small number of healthy subjects that will then be used in a larger study also involving patients with pulmonary arterial hypertension (PAH) in 2020. The new experimental protocol includes an exercise protocol and use of a specialised technique for assessing breathing limitations – inspiratory and expiratory flow-volume loops - applied several times during exercise while pulmonary gas exchange is also being assessed. As the experimental subject performs exercise, the air being breathed will be switched from normal air to O<sub>2</sub>-enriched air. We expect that the sense of breathlessness and accompanying limitations to breathing will decrease within the first 2-3 breaths of O<sub>2</sub>-enriched air. Demonstration of this rapid effect will suggest a fast-acting mechanism of oxygen mediated by the lungs that is not widely appreciated in cardiology and respiratory medicine. It will also add to the slowly-growing evidence of the potency of oxygen supplementation and therapy in PAH. The summer scholarship student will be guided along a careful learning journey where he or she will begin to learn and apply experimental techniques, analyse some data, and be exposed to the use of science to advance a cause in medicine.

### **Project Aims**

The scientific aim of this project is to develop an experimental protocol that will be used to test the hypothesis that acute oxygen supplementation reduces breathlessness and breathing limitations in patients with pulmonary arterial hypertension (see above for more details). The academic aims of this project are to 1) introduce an undergraduate student to scientific research and an important area of clinical exercise physiology, 2) teach the student new laboratory and data analytical skills, and 3) hopefully help the student make an informed decision about studying in the Masters (Research) program. Several of the experimental techniques require a substantial theoretical and technical background which

the vast majority of undergraduate students do not have. The student involved in this project will also be engaged in some learning of this background.

### **Project Methods**

To test the experimental hypothesis, we need to develop an experimental protocol and then use it to test the hypothesis in healthy subjects for whom oxygen supplementation will not reduce breathlessness and breathing limitations. Since PAH is more prevalent in females (children and adults), we will use 2-4 healthy female participants in the summer scholarship project and later increase this sample size when we accelerate work on this experiment in 2020. The experimental protocol includes a two-phase protocol of exercise – initial exercise test followed by an experimental exercise test – and measurements of pulmonary gas exchange (O<sub>2</sub> consumption, CO<sub>2</sub> production), breathing (ventilation), limitations to breathing (inspiratory/expiratory flow-volume loops) and self-reported ratings of breathlessness. We have not yet assessed limitations to breathing in our laboratory, but have the equipment to do so. Developing the technique for assessing breathing limitations will be a special focus of the summer project. The summer scholarship student will be introduced to all of these experimental techniques but will focus mainly on the measurement of limitations to breathing. O<sub>2</sub>-enriched air will be used in the experiment and made up by the primary supervisor and student. The student will perform some basic analyses of data to present in their final report and oral presentation (if required).

### **Opportunity for Skill Development**

The summer scholarship student will be guided carefully along a journey of developing basic scientific skills (e.g., rigorous note-keeping, ‘quality’ control), preliminary learning of experimental techniques related to exercise testing and assessment of breathing, working with human subjects, as well as a constrained analysis of data. The focus of learning will be on careful reading and clarity of thinking, patience and discipline of behaviour, and experimental rigour. The ‘size’ of the experiment will be kept small so that these scientific virtues can be better appreciated and developed by the student.

### **Students are required to have the following skills/meet the following pre-requisite(s) to apply**

Eligible students must be in the third year of a Sports and Exercise Science degree OR third year of a Medical Sciences degree and have studied exercise physiology.

## **Project 120: Walking football for the over 65s – a physical activity initiative for Football Federation of Australia**

**Supervisor(s):**

Tony Rossi (Principal Supervisor)

Dr Rhiannon White (Second Supervisor)

**Supervisor(s) contact information:**

t.rossi@westernsydney.edu.au

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### **Project description**

Despite popular beliefs that Australia is an active sporting nation, only 44.5% of Australian adults between 65 and 74 years of age are sufficiently active, with the rate declining to just 32.4% for Australians over 74 years of age (Chau et al., 2008). Evidence suggests that fostering relationships, and providing physical activity options at little-to-no cost, can enhance physical activity participation among older adults (Belza, Walwick, Shui-Thornton, Schwartz, Taylor, and LeGerfo, 2004). Walking football, an initiative of Football Federation Australia, is a non-competitive football program specifically for adults over 65 years of age. The walking football program promotes social connectedness and enforces walking as opposed to running, in order to provide a safer and less intense version of football. The findings of this study will not only guide future football programs and interventions but, will also provide valuable research findings which will contribute to the physical activity literature in terms of aspects of physical activity programs which enhance participation.

This aspect of the study will focus primarily on a review of the literature to prepare the research team for report writing and presentation of data to the Football Federation but will also involve elementary data management and some early stages of textual analysis.

### **Project Aims**

The broader project is addressing the following Key Research Questions:

- Is walking football perceived as a safe, inclusive, and enjoyable type of physical activity for older adults?
- Does walking football increase participants' weekly physical activity?
- Does participation in a 12-week walking football program improve motivation, mental health, social support, and physical health?

The aim for this aspect of the project (supported by the summer scholarship) is to develop a comprehensive review of the literature, across key headings:

- Physical activity engagement in older adults (>65)
- Use of traditionally competitive team (invasion) games to increase physical activity in older adults (>65)
- Football as a viable team game for older adults (>65)
- Games and other group exercise schemes for over 65s as a tool for the development of social capital and connectedness

Other tasks will include data sorting and organization, listening to interview data and reading and re-reading transcripts, and with the support and under the supervision of the supervisors, the development of an article for submission to a peer reviewed journal.

## **Project Methods**

For this aspect of the study, the key methods will be:

- Search methods (using large data bases)
- Summary and precis methods
- Categorising literature
- Development of key patterns of interventions and contemporary discourses associated with physical activity of older Australians
- Preliminary Inductive analysis of interview data already gathered (under the auspices of the main project) and to be used as a further training opportunity particularly in learning how to code textual data.

## **Opportunity for Skill Development**

- Search and categorisations skills
- Search management skills
- Elementary data management
- Introductory coding and Inductive analysis and
- Writing skills

**Students are required to have the following skills/meet the following pre-requisite(s) to apply**

- Novice search capabilities
- Developing data management skills
- Developing categorisation skills/logic

## **Project 120A: Mapping the binding interface between the proteins Nbs1 and INTS3 by mutational analysis**

**Supervisor(s):** Dr Roland Gamsjaeger (Principal Supervisor)

A/Prof Liza Cubeddu (Second Supervisor)

**Supervisor(s) contact information:** R.gamsjaeger@westernsydney.edu.au

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### **Project description**

The double-stranded nature of DNA is essential for DNA protection and stabilisation allowing the genetic code to be preserved and protected against both enzymatic and chemical degradation (Ashton, N.W., et al., Human single- stranded DNA binding proteins are essential for maintaining genomic stability. *BMC Mol Biol*, 2013. 14: p. 9). However, natural cellular mechanisms including replication, exogenous damage such as cigarette smoke and radiotherapy treatments as well as DNA-damaging cancer treatments can result in breaks in the DNA (double- stranded breaks, DSB). These DSB are highly lethal, potentially leading to apoptosis (cell death). Thus, to counteract an accumulation of DNA damage, cells have evolved mechanisms to both detect and repair DSBs. DSB repair mechanisms can be divided into two types, non-homologous end joining (NHEJ) and homologous recombination (HR) (Pardo, B., B. Gomez-Gonzalez, and A. Aguilera, DNA repair in mammalian cells: DNA double- strand break repair: how to fix a broken relationship. *Cell Mol Life Sci*, 2009. 66(6): p. 1039-56).

The MRN protein complex is mainly responsible for the HR pathway and is comprised of three major proteins; Mre11, Rad50 and Nbs1. Meiotic recombination 11 (Mre11) has a structure consisting of a C-terminal, which contains two DNA-binding domains, and an N-terminal consisting of a manganese-dependent nuclease domain. The Mre11 protein has the ability to induce both DNA exonuclease activity and single stranded endonuclease activity (Stracker, T.H. and J.H. Petrini, The MRE11 complex: starting from the ends. *Nat Rev Mol Cell Biol*, 2011. 12(2): p. 90-103). Rad50 consists of a high-affinity DNA-binding domain, which is believed to assist in keeping the damaged DNA ends in close proximity to promote both DNA pairing and ligation (Pardo, B., B. Gomez-Gonzalez, and A. Aguilera, DNA repair in mammalian cells: DNA double-strand break repair: how to fix a broken relationship. *Cell Mol Life Sci*, 2009. 66(6): p. 1039-56). Nbs1, the third protein of the MRN complex, has been shown to interact with ataxia telangiectasia mutated (ATM) kinase (Falck, J., J. Coates, and S.P. Jackson, Conserved modes of recruitment of ATM, ATR and DNA-PKcs to sites of DNA damage. *Nature*, 2005. 434(7033): p. 605-11) as well as bind to Mre11 through the C-terminus (Lloyd, J., et al., A supramodular FHA/BRCT-repeat architecture mediates Nbs1 adaptor function in response to DNA damage. *Cell*, 2009. 139(1): p. 100-11). The N-terminus of Nbs1 consists of a fork head-associated domain (FHA) and two BRCA1 C-terminus (BRCT) domains, which both mediate and recruit repair factors and proteins to the site of double stranded breaks. Both BRCT and FHA domains are also found in various other proteins associated with DNA repair mechanisms and have been shown to bind to phosphorylated proteins (Reinhardt, H.C. and M.B. Yaffe, Phospho-Ser/Thr-binding

domains: navigating the cell cycle and DNA damage response. Nat Rev Mol Cell Biol, 2013. 14(9): p. 563-80).

Recent research has uncovered the presence of a new protein, termed hSSB1 (human single-stranded binding protein 1) that plays an important role in the DSB repair mediated by the MRN complex (Richard, D.J., et al., Single- stranded DNA-binding protein hSSB1 is critical for genomic stability. Nature, 2008. 453(7195): p. 677-81).

### Project Aims

While the involvement of hSSB1 in HR has been established over many years, it is not clear how hSSB1 recruits the MRN complex to DSBs. One study revealed that Nbs1 (of the MRN complex) recognises the C-terminus of hSSB1 (Richard, D.J., et al., hSSB1 rapidly binds at the sites of DNA double-strand breaks and is required for the efficient recruitment of the MRN complex. Nucleic Acids Res, 2011. 39). This interaction may be mediated by phosphorylation as hSSB1 contains seven predicted phosphorylation sites within the flexible C-terminus. In contrast, another study proposes that Ints3, a protein that exist within a complex with hSSB1 in cells (SOSS complex; made up by hSSB1, Ints3, Ints6 and an uncharacterised protein C9orf80 (Ren, W., et al., Structural basis of SOSS1 complex assembly and recognition of ssDNA. Cell Rep, 2014. 6(6): p. 982-91.; Skaar, J.R., et al., INTS3 controls the hSSB1-mediated DNA damage response. J Cell Biol, 2009. 187(1): p. 25-32; Yang, S.H., et al., The SOSS1 single-stranded DNA binding complex promotes DNA end resection in concert with Exo1. EMBO J, 2013. 32; Huang, J., et al., SOSS complexes participate in the maintenance of genomic stability. Mol Cell, 2009. 35(3): p. 384-93) binds the MRN complex via Nbs1 (Huang, J., et al., SOSS complexes participate in the maintenance of genomic stability. Mol Cell, 2009. 35(3): p. 384-93).

This project aims to test the direct interaction of Nbs1 with INTS3 (Huang paper, see above) by making specific Nbs1 mutants and determine binding to INTS3.

### Project Methods

The successful candidate will use a combination of molecular biology (to clone the proposed mutants, approximately 3 weeks), NMR spectroscopy (to test for proper folding of the expressed protein constructs, approximately 3 weeks) and ITC (to test for binding, approximately 2 weeks) to determine the interaction interface of the Nbs1-INTS3 complex.

### Opportunity for Skill Development

- Student will develop a wide range of laboratory skills using cutting edge equipment.
- Student will learn how to work independently and as part of a team.
- Skills relevant to further research studies such as Masters, PhD will be acquired.

### Students are required to have the following skills/meet the following pre-requisite(s) to apply

- Student is expected to be pro-active and diligent.
- Student is required to have basic molecular biology and protein knowledge.
- Student should have completed Functional Proteins and Genes as well as Molecular Biology.

- A final year student is desirable due to the high-level equipment being used and the potential to carry out further research studies (Masters).