What contributes to a faster agility performance?

Dr Tania Spiteri joined the School of Health Sciences in April 2015 and is a lecturer in Exercise and Sports Science. Here Tania describes the outcomes of her doctoral studies examining athletic agility and performance.

My PhD was a series of three unique studies investigating agility neuro-mechanics, assessing muscle characteristics, kinetic profile (force), strength profile and decision-making ability to better understand the underlying components that contribute to a faster multidirectional agility performance.

The first study aimed to investigate which component of strength showed the strongest correlation to agility performance. This was the first study to isolate and dynamically assess each strength component (dynamic, eccentric, concentric, isometric and power) during a multi-joint movement, determining the relationship and percentage contribution to an agility. It was discovered that while no individual strength measure correlated with agility performance, eccentric strength (muscle lengthening under tension) was identified as the sole predictor of change of direction performance. While this finding supported that of previous research, the study highlighted the importance that an athlete’s eccentric strength is developed effectively as the often over-emphasized concentric strength capacity.

The second study expanded on the first study by comparing mechanical mechanisms (body composition, force and strength) between faster and slower athletes during a multidirectional agility test to determine what factors contribute to a faster performance.
Agility and performance (contd)

It was noted that differences between faster and slower athletes were attributed to both their strength capacity and decision making ability, with faster athletes possessing greater lean mass and producing greater propulsive impulse (greater force application over a short time period) and reduced ground contact times during each directional change.

These findings highlighted the importance of developing an athlete's strength capacity and cognitive ability to enable greater mechanical adjustments via force application to increase agility performance.

The final study investigated differences in the neuromuscular strategy employed to change direction between faster and slower athletes. Faster agility performance was characterized by greater muscle activity in the quadriceps and hamstrings both before and during each directional change, enabling greater hip and knee extension increasing propulsive ability during the agility movement. This study also compared differences in the neuromuscular strategy employed between an athlete's first and second directional change to determine the influence of decision-making on movement execution. It was noted that differences between directional changes appear to result from processing speed, where a greater delay in decision-making time during the second directional change resulted in greater anterior muscle activation, to decelerate the body sooner whilst movement direction was determined.

Publications arising from the thesis:


Going for Gold - how to measure an athlete’s match performance

Ben Piggott is a Lecturer in the School of Health Science and is undertaking his PhD in Sports Science. Here he describes the outline of his research project.

The PhD project that I am undertaking is in the field of applied sports science. Traditionally, in this field, research involves looking at one dimension such as motor control or sports psychology. It is my belief that successful performance in sport is influenced by a variety of factors from different dimensions including fitness (strength and conditioning), skill (motor control) and mental toughness (sports psychology). My project is going to focus on performance in Australian Rules Football.

Hence my PhD is multidimensional in design and the title is: “The relationship between physical capacity, perceptual motor skill, mental toughness and individual match performance in a semi-professional Australian Rules Football Team”.

Participants will be recruited from East Fremantle Football Club and will undertake testing during the upcoming pre-season. Match performance measures will be gathered during the 2016 playing season.

This study will be significant as it will be the first research that investigates how performance in a variety of dimensions in fields of sports science relates with match performance measures. In addition, it will also provide a multidimensional theoretical model that other sports could adopt when investigating influencing factors on competition performances.

---

Honours’ students in 2015

In 2015 there were 4 students who completed their Honours degrees in Exercise and Sports Science. The outcomes are shown below.

**Bradley Goddard** BESS Hons
“Do similar physical predictors of number of games played exists between different-aged playing groups in Rugby Union”
Supervisors Mr Ben Piggott, Dr Chris Joyce

**Ysabel Jacobs** BESS Hons
“Investigating the influence of genes on the maturation and performance of junior players at a West Australian Football League club”
Supervisors Dr Ryan Anderton, Mr Ashley Cripps

**Blake Taylor** BESS Hons
“Impact of training loads on performance in mountain bike competitive racing”
Supervisors Dr Chris Joyce, Mr Rob Merrells

**Toby Edwards** BESS Hons
“The relationship between two tests of physical capacity and match performance measures in Western Australian Football League (WAFFL) players”
Supervisors Mr Ben Piggott, Dr Chris Joyce

**Emma Ackland** B PhysEd Hons
“A culture of inclusion: Exploring how an Integrated Football Team builds social capital.”
Supervisors Assoc Prof Fiona Farringdon, Dr Fleur McIntyre
Postgraduate Students in Health Sciences 2015

Dr Diego Milani  Doctor of Philosophy (Biomedical Science)
“Neuroprotective potential of poly-arginine peptides in focal cerebral ischaemia models”
Supervisors: Dr Ryan Anderton, Assoc Prof. Bruno Meloni (WA Neuroscience Research Institute)

Tegan Grace  Doctor of Philosophy Institute for Health Research
“Determinants of motor coordination in children and adolescents: A longitudinal study”
Supervisor Prof Beth Hands

Amanda Timler  Doctor of Philosophy, Institute of Health Research
“The Who am I study: Identity formation and motor competence among adolescents”
Supervisors: Prof Hands (UNDA)

Jacob Joseph  Master of Ex Sci.
“The effect of fatigue on the kicking performance of Australian Rules footballers”
Supervisors: Dr Chris Joyce,

Carmen Papaluca  Doctor of Philosophy (Exercise and Sports Science)
“Pictures of #me: does Instagram and Facebook use influence body image and depressive symptoms in university aged females?”
Supervisors: A/Prof F Farringdon and Dr F McIntyre.

School of Health Sciences

The School of Health Sciences was established in 1999 as the College of Health. The mission of the School is to graduate young professionals who will be working at the cutting edge of health sciences knowledge, research and practice to further personal and community health. The healthcare industry has diverse needs and we provide through our various courses, professionals who will work across a spectrum of approaches to improving health. We aim to produce graduates who have a strong service ethos and a human-centred focus.
Postgraduate student update: Investigating eating behaviors in young adults

Michelle Lambert is a Lecturer in the School of Health Science who is undertaking her of Philosophy in the area of Preventive Health. Here she describes the outline of her M. Phil research project.

The Master’s project I am undertaking has a public health focus and is entitled - Where do emerging adults get their nutrition knowledge and how does that knowledge influence their eating behaviour? Emerging adults, aged between 18-25 years, are an in-between age where individuals begin to accept responsibility for self and start making independent decisions. This is a significant time of transitioning from school to work or tertiary education and from living with parents to living independently.

While there is a significant volume of work that focuses on influences and eating behaviours of children and adolescents there is limited work focusing on emerging adults and even less on Australian emerging adults. The research that has been done is mostly focused on emerging adults’ attitudes to food and eating, changes to dietary habits during university years and actual food intake. My project aims to fill the gap in the research by focusing on the interpersonal and social influences, quantifying nutrition knowledge and identifying sources of nutrition knowledge. Given the current obesity rates, and diet related disease that are putting huge pressure on the public health system and the public purse, prevention needs to be addressed. This study will help us better understand the influences on knowledge and food intake to inform the future creation of relevant nutrition messages for emerging adults regarding the preventive health benefit of healthy eating.

The study is a mixed methods design that will recruit students from the all school within University of Notre Dame Fremantle campus. Stage one of the project will involve focus group interviews to gain an insight into level and sources of nutrition knowledge as well as influences on eating behaviours and nutrition knowledge. Stage two will involve survey questionnaires developed from the information gathered from the focus groups. Recruitment for the focus groups will begin in October. If you would like to participate or you would like more information regarding this project please contact me michelle.lambert@nd.edu.au.

Figure 1. Conceptual framework for the proposed study.
Staff Research Publications 2015


Summer Vacation Research Projects

The major Research Institutes in Perth offer a number of Summer Vacation Research Scholarships (SVRS) and they are a great way to prepare students for an Honours program in the Biomedical Sciences.

We have had students undertake SVRS’s with Harry Perkins Institute of Medical Research and the Institute of Respiratory Health (formerly known as the Lung Institute of WA).

The Cancer Council offers a limited number of scholarships. These awards are highly competitive and are given to students:

(i) with a strong academic background,
(ii) who are in their final year of study,
(iii) who are looking at undertaking an Honours project in the following year.

2 students awarded Scholarships in recent years were:

Claire McLaughlin B Biomed Sc 2012/13
Sarah Howarth BExSc/BBiomed 2013/14

The SVRS’s normally run for 6-10 weeks over the summer period.

Students who are interested in applying for a summer vacation project in 2015/2016 should speak to Gerard Hoyne or Ryan Anderton.

Developing new treatments for Stroke patients

Dr. Diego Milani completed his medical training in Italy before deciding to move to Perth in 2014 to undertake his PhD with Assoc Prof Bruno Meloni & Dr Ryan Anderton at the WA Neuroscience Research Institute at the QEII Medical Centre.

Here Dr Milani describes the outline of his PhD project.

Stroke alone causes more than 8,000 deaths in Australia every year and is responsible for 6% of all deaths (Australian Institute of Health and Welfare, 2013). Currently, the most effective stroke therapy is to restore cerebral blood flow to a blocked artery using tPA (tissue plasminogen activator) and thrombectomy. However, to be effective this treatment needs to be administered within 4.5 hours after the stroke onset and is only suitable for patients having ready access to a hospital that has the facilities for performing the procedures. For these reasons is only available for 5-15% of patients and is also associated with a 7% risk of intracranial hemorrhage.

Hence, due to the lack of neuroprotective stroke treatments there is an urgent need to find new treatments that are effective clinically and widely applicable to stroke patients early by ambulance paramedics, in hospital emergency departments, and in remote locations away from tertiary hospitals.
School of Health Science Research Seminars

The School of Health Sciences holds a seminar series each semester that examines contemporary topics in Health Science research encompassing Exercise and Sports Science, Biomedical Science and Preventive Health.

Speakers include Health Science staff members and external speakers from other Universities, Research Institutes and Government and Non-Government Organizations around Perth.

This is a great way to learn about the latest developments in scientific research across the Health Science disciplines.

Time: Friday 4-5pm
Venue: ND46-302 School of Health Sciences Seminar series

Highlights of Seminar topics from 2015 included:

Dr Marc Sim WAIS
“Insights into operations and applied research”

Dr Tania Spiteri UNDA
“The influence of cognitive skills and movement mechanics on agility performance”

Dr Peter Peeling UWA
“Iron metabolism in athletes: hormonal influences on iron deficiency”

Dr Phil Stumbles, Murdoch University
“The role of dendritic cells in allergic disease”

Developing new treatments for Stroke patients (contd)

Recent work in A/Prof Meloni’s laboratory has demonstrated that poly-arginine and arginine-rich peptides are highly neuroprotective agents in in vitro stroke models. In addition, recent in vitro data show that neuroprotective potency is enhanced with increasing arginine content. However, before potential neuroprotective agents can be trialed in humans, further assessment in different animal stroke models is required. Therefore, my project aims to assess the efficacy of different poly-arginine peptides in rat stroke models. The experiments will employ both transient and permanent middle cerebral artery occlusion (MCAO) stroke models. Methods for performing the surgery to induce stroke, as well as, techniques for both the histological and behavioural assessment of brain injury following stroke will be used in my studies.