Edith Cowan University

Innovation in the School of Medical & Health Sciences

Contents

ECU is committed to reconciliation and recognises and respects the significance of Aboriginal and Torres Strait Islander peoples' communities, cultures and histories. ECU acknowledges and respects the Aboriginal and Torres Strait Islander peoples, as the traditional custodians of the land. ECU acknowledges and respects its continuing association with Nyoongar people, the traditional custodians of the land upon which its campuses stand.

An Introduction to Research in the School of Medical and Health Sciences

Thank you for taking the time to learn about our research in the School.

We invite you to take a journey with us through our diverse and innovative research foci. Here we showcase areas of significant strength as well as new and explorative research areas. We also introduce you to our world renowned researchers as well as our early career researchers who are keen to demonstrate their exciting ideas.

The aim is not only to showcase our research and our world class facilities, but also to provide an ongoing focus for discussions that will lead to future collaborations, forge new pathways of research translation, and lead to improvements in the health and wellbeing of Western Australian and Australian communities.

The School of Medical and Health Sciences is the lead research school at Edith Cowan University. We have three research centres and over 100 researchers. Together we have brought in over $40 million in funding to ECU, published over 1000 peer reviewed papers, and completed 100 postgraduate students over the last five years.

The research encompasses medical science, biomedical science, human biology, human genetics, paramedical science, nutrition and dietetics, speech pathology, occupational therapy, exercise and sports science, public health, occupational health and safety, health promotion, addiction studies, and occupational and environmental health.

With such diversity I am certain that together we can discover new and stimulating partnerships that will play an enormous role in driving innovation in Western Australia! A sincere welcome. I hope you enjoy your journey through the research booklet from the School of Medical and Health Sciences.

If there are any questions, or you wish to have additional information, please contact me.

With thanks,
Mel

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Risk Factors for the Early Diagnosis of Alzheimer's Disease

The Centre of Excellence for Alzheimer's Disease Research and Care is based at ECU's Joondalup Campus and the McCusker Alzheimer's Research Foundation at Hollywood Private Hospital, Perth. This State Government funded centre is proudly supported by ECU, and partners include UWA, Murdoch University, Hall and Prior Aged Care Group, McCusker Learning and Development, Hollywood Private Hospital, the Australian Neuromuscular Research Institute, the McCusker Alzheimer's Research Foundation, and Amana Living. The Centre's research seeks to advance understanding of risk factors for the development of Alzheimer's Disease as an outcome of translational research into diagnostics and biomarkers, and enabling research into population-based health outcomes.

Cooperative Research Centre (CRC) for Mental Health

The CRC for Mental Health is an Australian Government Initiative, supported by the Cooperative Research Program. The CRC represents an investment of some $70 million into Australia's mental health research effort over 7 years. The CRC for Mental Health is a collaboration of 20 different organisations including ECU, all working together to find early diagnosis and treatments for mental health illnesses. It undertakes research into the prevention, early diagnosis and treatment of neurodegenerative diseases and psychoses.

The CRC's research projects include:

- Biomarkers for early diagnosis of Alzheimer's and Parkinson's Disease.
- Molecular imaging markers for early diagnosis of Alzheimer's and Parkinson's Disease.
- Structural characterisation for design of Alzheimer's disease diagnostics and therapeutics.
- Novel therapeutics for Parkinson's Disease, Alzheimer's disease and schizophrenia.
- Biomarkers for schizophrenia sub-types, other psychiatric disorders and intervention of oxidative stress.

Dominantly Inherited Alzheimer Network (DIAN) study

The Dominantly Inherited Alzheimer Network (DIAN) study examines dominantly inherited Alzheimer's disease in individuals for whom the diagnosis is certain (mutation carriers) in comparison with their non-carrier siblings, who serve as a naturally occurring control group. Advantages of this cohort include the collection of relevant information and specimens from pre-symptomatic stages through symptomatic stages and the absence of confounding age-associated illnesses that may influence the onset and course of Dementia of the Alzheimer's Type (DAT).

The DIAN cohort will provide a sample size that no other site alone can achieve and all DIAN participants will be assessed longitudinally with comprehensive and state-of-the-art clinical, cognitive, genetic, imaging, and biomarker protocols.

Australian Imaging, Biomarkers and Lifestyle (AIBL) study on Ageing

The AIBL study is a foremost multi-centre prospective longitudinal study initiated in 2006, and has brought together Australia's leading researchers in Alzheimer's disease in partnership with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and places Australia at the forefront of the field globally. The study is aimed at improving awareness of the causes of Alzheimer's disease and understanding its diagnosis, in order to develop preventative strategies. The study of ageing comprises of three groups of patients: those with Alzheimer's disease (AD), Mild Cognitive Impairment (MCI) and healthy volunteers.

AIBL has collected up to 5 time-points of data at 18 month intervals in over 1000 participants. The multi-centre, multidisciplinary approach and the engagement of beta amyloid PET imaging from the outset have enabled AIBL researchers to make world-first, world-class contributions to understanding the progression of AD. These have translated into prevention trials in persons in the asymptomatic AD and identified genetic and environmental factors that influence the development and rate of cognitive decline in preclinical and prodromal AD. AIBL includes the implementation and evaluation of a lifestyle–based intervention program for the prevention of AD.

Forward Statement

Our research will continue to be at the forefront globally in developing non-invasive and cost-effective early diagnostics for pre-clinical AD. We are also progressing a highly innovative program of therapeutic strategies and preventative interventions in pre-clinical AD.

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Genetic and Epigenetic Architecture of Alzheimer's Disease

The Collaborative Genomics Group (led by Associate Professor Simon Laws) works within the Centre of Excellence for Alzheimer's Disease Research and Care which is part of ECU's School of Medical and Health Sciences. The group undertake research with a primary focus on understanding the genetic and epigenetic architecture of Alzheimer's Disease and related phenotypes, such as changes in memory performance and pathologic features.

The group utilizes an integrative "omic" approach to Alzheimer's Disease research through combining genetic, epigenetic and comprehensive longitudinal phenotype data.

Understanding the Genomic Architecture of Rates of Change in AD-related Phenotypes:

- Develop genetic/epigenetic risk profiles for rates of change
- Determine if peripheral methylation patterns track with AD phenotypes

The interaction of genomics and modifiable lifestyle factors and the impact on rates of change in AD-related phenotypes:

- Understanding the genetic basis of differential effects of lifestyle patterns/choices
- Determine the impact of positive lifestyle choices on peripheral methylation patterns

The group currently has ongoing projects with international industry partners, of particular note are large scale genomic approaches with Pfizer International and Cytox Ltd. As part of the Cooperative Research Centre (CRC) for Mental Health, the group is ideally situated to engage with industry for new initiatives and commercialization projects. Technology partners include Agena Biosciences (genetics/epigenetics) and Thermo Fisher Scientific (genetics).

In addition to providing genetic profiles for potential risk stratification and prognosis, understanding the genetic and epigenetic architecture that underpins Alzheimer's Disease and its complex relationship with lifestyle patterns will provide a translatable outcome that will enable the exploration of the potential for lifestyle advice to be tailored to the individual to decrease risk of cognitive decline and Alzheimer's Disease. Epigenetics also has the potential to provide guidance towards the downstream identification of non-invasive (i.e. peripheral) dynamic genomic biomarkers with both prognostic and theragnostic (treatment effect monitoring) applications.

The Collaborative Genomics Group's objective is to develop an all-encompassing epigenetic dataset to compliment that in the genomic space.

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Huntington's Disease Research Group: Non-pharmaceutical treatment applications and novel clinical tests for people living with Huntington's disease

The ECU Huntington's Disease Research Team focuses on the development of novel non-pharmaceutical treatment strategies aimed at delaying the onset and slowing the progression of Huntington's disease (HD). The team also develops tests for monitoring the clinical and biological course of the disease.

The team's current projects include:

- The effect of multidisciplinary therapy on neural and clinical deterioration in HD
- The diagnostic and prognostic utility of new brain imaging methods for HD
- The biological underpinnings of sleep-wake disturbances in HD
- The neural and biological underpinnings of social cognitive problems in HD
- The development of novel, sensitive assessments for characterisation of functional impairments in HD

The ECU Huntington's Disease Research Team is supported by Lotterywest and works collaboratively with Huntington's Western Australia and leading international, national and local universities including the Universities of Cambridge, Birmingham, Monash, Sydney and Western Australia, along with the Florey Institute of Neuroscience and Mental Health in Melbourne.

The future aim of the ECU Huntington's Disease Research Team is to explore the effects of multidisciplinary therapy in Huntington's disease and other neurodegenerative and acute neurological disorders, such as Parkinson's disease and stroke, and to progress the multidisciplinary therapy program to a stage where it can be delivered as an internet-based platform for global use.

The team also aims to develop novel, sensitive clinical tests that have the potential to be translated to other neurodegenerative conditions.

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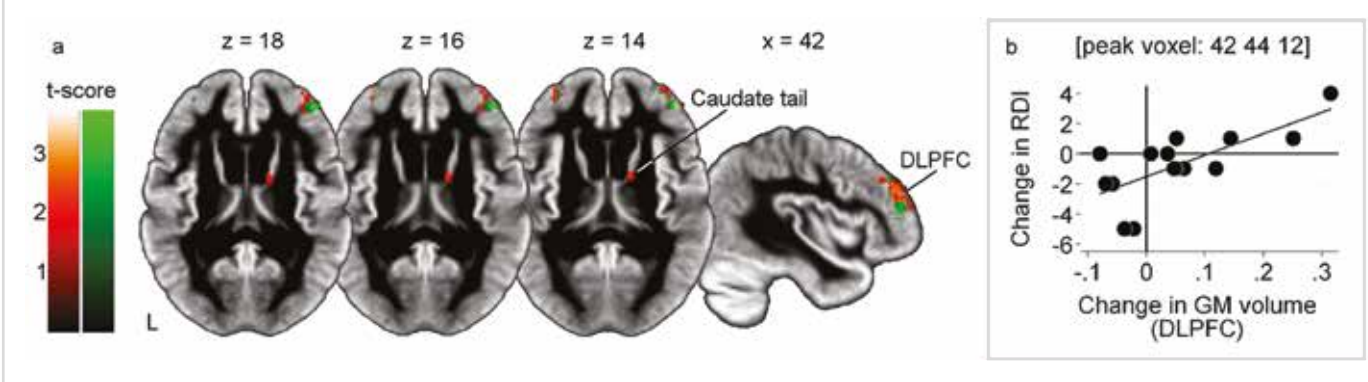

Clinical Neuroscience and Adjuncts to Rehabilitation Robotics

Existing strategies to enhance motor function following brain and spinal cord injury are poor, leaving patients with considerable disability. A greater understanding of motor recovery, refinement of existing strategies, and development of new methods is needed. Evidence suggests that motor training can improve function, greater than spontaneous recovery alone. The mechanisms underlying brain plasticity can also be specifically targeted, using non-invasive brain stimulation and pharmacologic intervention.

Rehabilitation Robotics research led by Professor Dylan Edwards incorporates emerging technologies of transcranial magnetic stimulation, and rehabilitation robotics to study motor recovery after neurological damage including adult stroke, spinal cord injury, and cerebral palsy. The robotic movement devices represent the most sophisticated interactive rehabilitation systems available, and are able to quantify various aspects of movement. Transcranial Magnetic Stimulation (TMS) is an accepted tool to probe changes in the brain that might occur with training. Both TMS and Transcranial Direct Current Stimulation (tDCS), are promising neuromodulation methods that can independently lead to transient improvements in motor behaviour. Professor Edwards' research further focuses on examining efficacy and biomarkers of recovery, as well as investigating novel combination therapies such as with new drugs or dietary modification.

Professor Edwards' goal is to develop ECU as a leader in clinical neuroscience by closely working with clinicians and academics, as well as partnering with Harry Perkins Institute, Joondalup Health Campus, Midland Health Campus, Osborne Park Hospitals and Perron Institute in WA.

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Motor Impairment: Weakness and Fatigue

Motor impairment is an umbrella term to describe a reduced ability to make controlled, coordinated and/or forceful voluntary movements. Impaired control of muscles underlies disability across a wide range of disorders such as stroke, spinal cord injury, multiple sclerosis, cerebral palsy, Parkinson's disease, after immobilisation and in ageing. Each disorder has its own pathology, but there are also factors in common. Weakness and fatigue are two important factors that contribute to disability across disorders and can potentially be improved.

Professor Taylor's research studies human participants to understand how the nervous system contributes to weakness and muscle fatigue in health and disease, and to identify effective interventions to counter these impairments. The work is funded through the NHMRC Program, Motor Impairment, which is based at Neuroscience Research Australia in Sydney. The Program focuses on three aspects of motor impairment: weakness and fatigue, impaired sensation and balance, and muscle contracture. Its overall aims are to understand the physiology of human movement in health and its impairment in disease, to understand the mechanisms of potential interventions to improve voluntary movement in people with impairment, and to test the clinical effects of such interventions.

Future research at ECU will investigate whether changes within the spinal cord are important in the development of fatigue with exercise, and in improvements in strength with training. We hope to extend this work from healthy volunteers to clinical populations.

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Missing Voices: Communication disorders in Aboriginal Australians with brain injury

Aboriginal and Torres Strait Islander Australians experience stroke and traumatic brain injury (TBI) with much greater frequency than non-Aboriginal Australians. Acquired communication disorders (ACD) can result from TBI and stroke and significantly impacts the everyday living of both the person involved and their family/community. Yet few Aboriginal people access rehabilitation services and little is known about Aboriginal peoples' experiences of ACD and short or long term outcomes.

ECU's Missing Voices research program aims to:

- Investigate the extent and impact of ACD in urban and rural Aboriginal and Torres Strait Islander populations following stroke or TBI.
- Develop and validate a culturally appropriate communication disorder assessment tool for screening by health professionals working with Aboriginal people after stroke and TBI.
- Describe the current status of communication rehabilitation services for Aboriginal and Torres Strait Islander peoples.
- Develop accessible and culturally appropriate service delivery models for the individuals and their families experiencing ACD.

Missing Voices will provide the first report on adult Aboriginal Australians diagnosed with acquired communication disorders and study health delivery services and interventions for Aboriginal and Torres Strait Islander peoples.

Industry partners include the University of Western Australia (the WA Centre for Rural Health and the Centre for Medical Research) and Geraldton Regional Aboriginal Medical Service, the University of Notre Dame, the Western Australian Country Health Service, Headwest, the Western Australian Department of Health, the National Stroke Foundation, Neurological Council of WA, Western Australian Neurological Research Institute, the North, East and South Metropolitan Health Services, and St John of God Health services.

In a world first, the Missing Voices project has 'given voice' to and identified needs and wants of Aboriginal people with ACD and their families, in respect to rehabilitation and daily life after stroke and traumatic brain injury. The project also increases awareness of the extent and impact of ACDs in the Aboriginal community of WA, increasing the profile of stroke, TBI and rehabilitation in the Aboriginal community and Aboriginal health services, and creates a screening tool for the identification of ACD in Aboriginal people.

Going forward, the Missing Voices project will trial culturally secure models of service delivery in stroke and traumatic brain injury rehabilitation with Aboriginal people, families, communities and health services.

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VERSE: Very early aphasia rehabilitation after stroke and the early rehabilitation hospital environment

Aphasia is a devastating condition following stroke which negatively impacts all aspects of communication including speech, comprehension, reading and writing. The opportunity to harness spontaneous brain recovery to achieve communication independence occurs in the early recovery phase following stroke. Research undertaken by ECU has shown that more than 80% of people with aphasia after stroke cannot access early, intensive aphasia therapy. This research has also revealed that people treated with daily, intensive aphasia therapy commenced within 14 days of stroke onset have greater communication independence than those who receive less intensive or no therapy. However, the longer-term effects of very early aphasia therapy are unknown.

The VERSE project aims to determine:

- The optimal amount and type of aphasia intervention
- The relationship between early aphasia therapy and depression
- The effect of early, intensive aphasia therapy and quality of life at six months after recovery
- The cost-effectiveness of aphasia therapy in the long term, as recommended by the Cochrane Review for Speech and Language Therapy After Stroke

Burgeoning healthcare costs and an aging population dictate that finite aphasia resources must deliver the right type of therapy, provided in the right amount, at the right time to the right person.

The VERSE project collaborates with the University of Melbourne and Florey Institute of neuroscience and mental health. VERSE aims to assist in the understanding of the relationship between aphasia, stroke brain recovery patterns by using a novel 'brain mapping' technique to help identify people who will respond well to early, intensive treatment. VERSE will provide Australia's first full evaluation of the costs of aphasia on the healthcare systems across the country.

In addition, the project will provide the first prescribed aphasia therapy package for people with aphasia following stroke. This therapy package will assist healthcare workers and speech pathologists across Australia to deliver the best services available to improve communication for people after stroke. VERSE has led international collaborations with aphasia researchers in over 14 countries. A European Horizon 2020 grant was submitted in September 2016 to investigate international aphasia services after stroke.

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Circulating Melanoma Tumour Cells

Melanoma is one of Australia's most common cancers with over 13,000 new diagnoses per year. In one out of ten patients, the melanoma diagnosis comes too late, as the melanoma has already spread throughout the body, drastically diminishing the chances of survival. With more than 1,700 Australians dying every year from melanoma -one every five hours – we urgently require a better understanding of how the melanoma spreads and why certain tumours respond to current treatments while others do not.

In this project, researchers aim to capture and study the cells responsible for melanoma spreading. These cells, circulating tumour cells (CTCs) are released from the tumour into the blood stream. By studying the cells and the DNA and RNA of these cells, researchers will increase their understanding of how melanoma tumours spread and why some tumours respond to treatment. Using CTCs removes the need for highly invasive tumour biopsies.

This project is supported by a dynamic interdisciplinary team of high calibre scientists and clinicians across prestigious research institutions and hospitals in Western Australia, Australia and worldwide. This team includes a network of research-focused clinicians including Winthrop Professor Michael Millward at Sir Charles Gairdner Hospital, Dr Adnan Khattak and Professor Christobel Saunders at Fiona Stanley Hospital, Dr Tarek Meniawy at St John of God Hospital and Dr Sam Bowyer at Rockingham General. In addition, the research team has established a research collaboration with PathWest for acquisition of tumour tissue samples and DNA sequencing.

ECU's melanoma research centre has become a reference research centre for the study of CTCs in melanoma, and it has now begun to expand the research to include breast and prostate cancers.

Identifying the patients that will or will not respond to treatment is the goal of the research project moving forward. The team have developed technologies and tools to isolate single melanoma cells from blood and are collaborating with world leaders to sequence DNA from single cells to gain an understanding of the genetic makeup of these tumour-derived cells. The research will indicate how melanoma tumours spread allowing development of further strategies aimed at inhibiting melanoma dissemination.

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Blood based biomarkers: Assessing melanoma through a blood test

ECU's melanoma research team has developed blood based biomarkers for early diagnosis, prognosis and personalisation of treatment in melanoma. Through the implementation of cutting-edge technologies and next generation sequencing the team scrutinise novel biomarkers such as Circulating Tumour Cells (CTCs) and Circulating Tumour DNA (ctDNA). In addition, the program expands to the study of miRNA, exosomes and autoantibodies for improved specificity and sensitivity. The technologies are now being expanded to include prostate, breast and lung cancers.

The program has engaged a team of clinicians at all major Oncology Centres at public and private hospitals both locally and nationally. Dermatologists and Skin Check WA, Level 1 Melanoma, and other skin cancer clinics are also engaged in the project. ECU's research team is now working closely with PathWest and clinicians to translate these tests into key clinical applications with significant impact. The projects have been enhanced through partnerships with industry leaders such as Merck Sharp & Dohme, Sengenics (www.sengenics.com/) and Bio-Rad (www.bio-rad.com/).

Implementation of these novel blood based biomarkers will revolutionise the diagnosis, monitoring and treatment of melanoma patients, by allowing the implementation of more regular, informative tests at increased sensitivity, with significantly reduced costs, while reducing radiation exposure.

This research is funded by the NHMRC, Cancer Council of WA, MSD, Cancer Trust WA, DoH WA, and the ARC.

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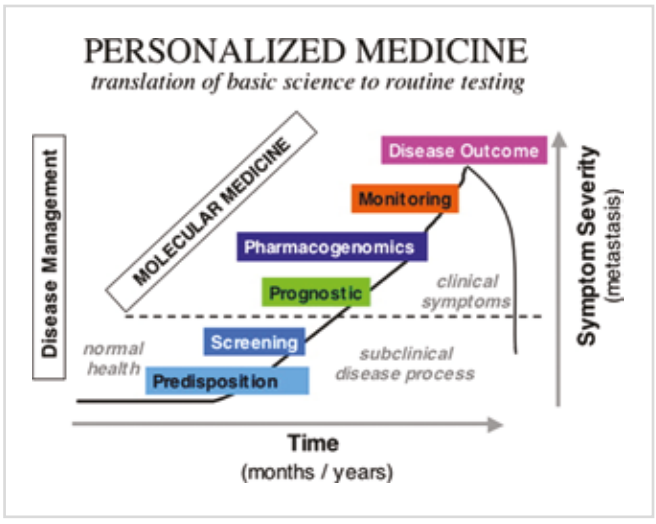

Uveal Melanoma: Bypassing an invasive eye biopsy through development of a novel blood test

Melanoma of the eye (uveal melanoma) is the most common cancer of the eye, and the leading cause of eye cancer related death. Of those diagnosed with uveal melanoma, 50% will have the cancer spread (metastasise) to other parts of the body and of those with detectable spread, 92% will die within two years. Therefore, it is important to determine which patients fall within this 50% for closer clinical follow-up and early treatment to prevent the spread of the cancer. Fortunately, those who sit within this 50% have specific genetic mutations that can be observed, enabling early intervention.

At present, the classification of uveal melanoma types is achieved by obtaining a sample from the tumour in the eye prior to radiation treatment. The procedure is risky, with complications that can totally or partially impair vision of the affected eye. In addition, in cases where the test has been deemed inconclusive, due to insufficient sample or degradation, no repeat test can be performed. Considering their risk-benefits many patients declined the test. After treatment of the primary tumour, and unknowing of the patient's specific risk, patients are monitored irregularly and clinical practices significantly vary. The test that the ECU uveal melanoma research team is developing will provide a less invasive alternative that can be performed routinely, repeatedly and rapidly in real time when treatment decisions need to be made.

This project originated from a collaboration with ophthalmologists at the Lion Eyes Institute, Perth and has been enhanced by collaboration with anatomical and molecular pathologists at PathWest. The next step is to roll out a national clinical study in partnership with oncologists at the Kinghorn Cancer Centre and ophthalmologists at the Chatswood Grove Eye Clinic and Sydney Eye Hospital in New South Wales. This research has been funded by the Raine Foundation.

The research team's goal is to see the blood test become a routine test in clinics worldwide where it can be used as a liquid biopsy to accompany current pathology tests for prognosis of uveal melanoma.

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Glycomics Research Group

Glycan Ageing Study

Collaborating with Genos in Croatia, and supported by a Connecting Australian-European Science and Innovation (CAESIE) Priming Grant, world renowned researchers from the Glycomics Group have advanced the identification of changes in the profiles of 11 IgG N-glycans seen with advancing chronological age, proving their hypothesis that N-plasma glycan profiling can be utilized as a real-time indicator for the interaction between glycosylation, the environment and behaviours, with glycans serving as extremely important biomarkers in ageing.

This project aims to develop a novel GlycanAgeKit by comparing the Australian glycan profiles with the existing Genos' N-glycan data bank (African, Chinese, and European cohorts), and establish N-Glycan as a generic biomarker for inflammatory studies of chronic diseases and ageing among Australians.

Already established local collaborations with the Busselton Health Ageing Study Cohort will provide both retrospective and prospective samples from participants for the GlycanAgeKit validation. Genos has agreed to provide matching funds that include in-kind contributions through the use of their facilities (Nano-LC-MS/MS) for glycan analyses. A GlycanAgeKit will be developed for the first time in Australia by this collaborative initiative between the Australian team and Genos in Croatia.

Suboptimal health Questionnaire

In partnership with BioYoung Ltd, China, the research group has described a subclinical, reversible stage of pre-chronic disease, coined by the project as the 'Suboptimal Health Status' (SHS). It is a physical state between health and disease, characterised by the perception of health complaints, general weakness, chronic fatigue and low energy levels.

The researchers have now developed a tool, the Suboptimal Health Status Questionnaire-25 (SHSQ-25), to assess five components of health. To date, the SHSQ-25 has been validated as a self-reported survey tool in various populations and it thus generates an unprecedented opportunity for the early detection of chronic disease.

This project is seeking Australian partners to collaborate on investigating the reliability and validity of this tool in an Australian context.

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Exercise Medicine Research Institute

Established in 2003, the Exercise Medicine Research Institute (EMRI) is an initiative that builds collaboration between researchers, educators, industry and government to optimise health and improve quality of life for people of all ages, within differing social, cultural, political and environmental contexts.

The team's clinical oncology work focuses on the ability of exercise to change tumour biology as a mechanism to interfere with tumour formation, growth and invasion in advanced prostate and breast cancer patients with bone metastatic lesions. EMRI is also examining the safety and efficacy of delivering targeted exercise directly to lesion sites in these populations, with the aim to provide meaningful improvements to the health, well-being and survivorship of men and women with cancer.

Current research includes;

- Improving sexual health in men with prostate cancer
- Intense exercise for survival among men with metastatic castrate-resistant prostate cancer (INTERVAL – MCRPC) (GAP4)
- Mechanical modulation of bone metastases in advanced prostate cancer patients: Can targeted exercise suppress sclerotic tumour progression? (pilot study)
- Mechanical modulation of bone metastases in advanced breast cancer patients: Can targeted exercise suppress osteolytic tumour progression?
- Exercise medicine for all cancer survivors: Implementation and evaluation of a national intervention program
- Exercise and lifestyle, local and remote support for men with prostate cancer (TrueNTH)
- Prostate cancer active surveillance (pilot study)

The Institute's work developing the Exercise and Sports Science Australia Position Statement on Exercise for Cancer Survivors has led to an increase in the number of accredited exercise physiologists trained in this clinical area, with cancer patients nationally benefiting from the research. The Institute has co-authored Guidelines and Consensus Statements for a number of national and international organisations.

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The Vario Health Clinic: Translation of Research

The Vario Health Clinic (VHC) provides an ideal setting to implement and trial clinical research findings into practice. This research informs clinical practice as well as teaching and learning. By measuring outcomes for the clients and patients of the VHC, further knowledge is gained and best practice further refined.

At the VHC, specialist consultants are available in a range of allied health areas. All consultants are highly qualified and accredited. Services include exercise physiology, dietetics, clinical psychology, and physiotherapy with patients referred from their general practitioner (GP). In the individual component the qualified consultants conduct a health assessment and gather important medical information to design a personalised program to suit the individual's needs and ability. The group component of the program then progresses the participant to be more independent with small group sessions fully supervised by an accredited exercise physiologist.

The VHC was established with three objectives in mind;

- Teaching and Learning: The Clinic provides practicum placements to students from the allied health disciplines of Dietetics, Exercise Physiology and Psychology.
- Research: The Clinic aligns with ECU's goal of prioritising and pursuing research which has immediate impact. The Clinic provides a setting for extensive and high quality clinical research including cross sectional and clinical trial designs.
- Engagement: ECU values engagement with the community, industry and government. In 2015 the Clinic recorded over 25,000 client visits. Each week the clinic provides integrative health services to some 500 people, most attending two or more sessions per week. This is clearly a valuable resource for the community.

VHC acts as the vehicle to deliver the following specialised programs to the community;

- Diabetes Program
- Cancer Survivor Program
- Veterans
- Cardiac Rehab Program
- Living Longer Living Stronger
- Osteoporosis Program
- Parkinson's Program
- Weigh 2 Go Kids
- Weight Loss for Wellness
- Motor Vehicle and Work Injury Rehabilitation

For further information visit:
www.exercisemedicine.org.au/overview

NeuroMoves WalkOn

ECU's Exercise Medicine Research Institute's NeuroMoves WalkOn is an individually designed intensive activity based exercise program to assist a person with a spinal cord injury to improve and maximise their functional ability and lead a more independent life.

The program involves intense, dynamic, weight-bearing exercises all performed out of the wheelchair one-on-one with a qualified exercise physiologist or physiotherapist.

NeuroMoves is a community based exercise program available to people following their discharge from hospital. A pilot study conducted with the program's clients demonstrated improvements in general mobility, quality of life, muscle strength, psychological wellbeing and independence. Clients report other benefits including improved general health, greater positivity, increased confidence to participate in the community and a reduction in care hours.

For further information visit:
www.exercisemedicine.org.au/overview

Survey Research Centre

Established in 2008, the purpose of the Survey Research Centre (SRC) is to conduct high quality health survey research for the Exercise Medicine Research Institute, other areas in the university, government departments and health-related organisations and universities. The SRC boasts state-of-the-art technology to conduct telephone and field surveys and staff trained in general research methods as well as the specific techniques related to their area of expertise.

The focus of the SRC is to work with organisations, groups and individuals across the education, medical and health sector. The team also undertakes commissioned surveys for other organisations such as university departments, public sector agencies, non-government organisations and private companies.

The SRC specialises in offering surveys that are deemed to have a community benefit and SRC understands the importance of research rigour and adherence to research protocols. All staff are trained in achieving high response rates, dealing with sensitive issues and reporting variations in data collection.

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Centre for Exercise and Sports Science Research (CESSR)

Thermoregulation and Adaptations to Temperature

This research examines the physiological response and adaptations to environmental stress. In particular, the research team examines the effects of hot and cold environmental conditions on cardiovascular function, health and exercise capacity. Additionally, the research examines methods to enhance heat tolerance and minimise heat stress in a variety of situations. Such research includes the use of heat acclimatisation or heat loss strategies in clinical, exercise or occupational settings.

Researchers are currently collaborating with the Australian Institute of Sport, Singapore Sports Council and Princess Margaret Hospital.

This research aims to minimise the negative effects of heat stress and has aided the preparation of athletes for elite competition including events such as the Olympic Games. This research has also assisted in better understanding of how hot and cold stress may be used to maximise the metabolic adaptations to physical activity. A similar project is currently examining methods to augment body temperature in order to improve sleep quality and quality of life in children with cerebral palsy.

Further research is needed in order to better understand the metabolic adaptations associated with altered thermal stress, particularly following exercise. This research involves understanding of the complex interactions between cardiovascular, metabolic and cellular adaptations to body heat and exercise. The team is also looking to expand its research into the methods aimed at enhancing thermoregulation, sleep and quality of life in clinical populations.

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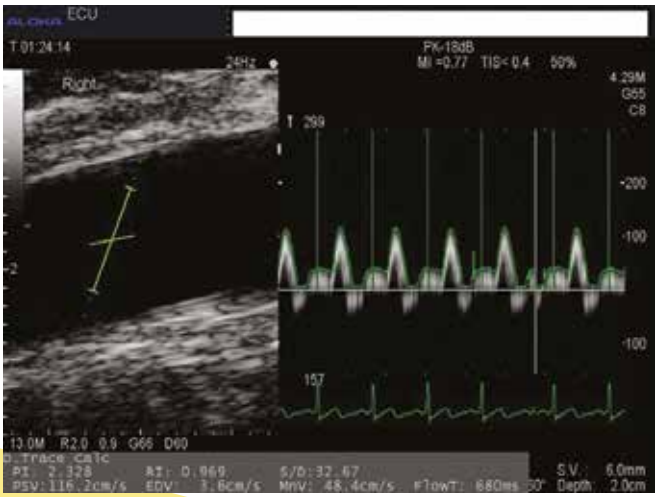

Cycling Science

This research examines various aspects of cycling, ranging from studies aimed at understanding the general health adaptations through to specific mechanisms by which to enhance elite cycling performance. The research examines the health benefits of such exercise, and uses cycling as a training modality to induce cardiovascular adaptations in clinical, general and elite athlete populations. The research in elite cycling performance examines mechanisms and training interventions to assist in preparation of elite cyclists for performing within a range of cycling disciplines, including BMX, mountain bike, road and track cycling.

The team is currently collaborating with several professional sport and cycling organisations including Orica BikeExchange, Cycling Australia and the Australian Institute of Sport. Several of the researchers within Associate Professor Chris Abbiss's team are providing sports science support to elite sporting organisations while conducting their research. Collaboration with such organisations allows the outcomes of this research to assist in the preparation of the world's best athletes.

Cycling performance research would benefit from expertise in a range of disciplines including physiology, engineering, physics, nutrition, psychology and other disciplines. An integrated approach is required to further the research team's understanding of elite cycling performance.

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Australian A League Soccer

Developing guidelines for the technical, tactical, physical and physiological demands of football players in the Australian A League.

While some data exists describing the technical, physical, and physiological demands of football matches, no guidelines have been developed to help coaches reflect on these demands in the training environment. ECU researchers have now developed guidelines that will provide an evidence-based approach to coaching fitness that can be applied to skills development, tactics training, and match analysis for coaches of football.

Dr Fadi Ma'ayah from ECU works in close collaboration with Perth Glory and is funded in part by an ECU Industry's Engagement PhD Scholarship in Sports Science (Football Science).

The project will ultimately provide football coaches with insights and guidelines for designing training drills that will prepare players for matches in a match-specific way. The research group is seeking to increase its research focus on the impact of recreational football games on people with disabilities, investigating how their research can impact on Paralympic football teams.

Study Hard Play Hard: Using elite sporting role models to inspire youth from low SES backgrounds in WA to undertake higher education

Researchers have highlighted financial issues, language competence, and cultural and family experiences as issues affecting the aspirations of low SES students to attend higher education (HE). Furthermore, this is exacerbated by a lack of support networks, information and understanding of HE pathways and opportunities. Mentors who impart skills and promote self-confidence increase adolescents' aspirations for academic achievement resulting in an increased positive attitude towards education. Research also highlights the influence of elite sportsmen as role models for adolescents regarding consumer choices. It is therefore hypothesized that if elite athletes can impact adolescents' consumer choices, they could also have the ability to impact adolescents' decisions to attend university.

With this in mind, Dr Fadi Ma'ayah devised a program that combines these strategies – namely the provision of information, on campus interactive activities and interaction between elite professional athletes as role models and low SES students. Study Hard Play Hard is an outreach program that targets schools in low SES areas in order to break the cycle of disadvantage associated with low SES.

Industry partners include the West Coast Eagles, Perth Glory and schools and communities from low SES areas in Perth. The research group is seeking opportunities to work with other elite clubs and a wider range of schools.

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Strengthening Future Champions: Reducing injury rates and increasing performance of youth athletes

It is becoming abundantly clear that there is an increasing injury rate in youth athletes in Australia. This research group is seeking to develop the optimal long-term athlete resistance training development pathway. In collaboration with international partners at Cardiff Metropolitan University, ECU's researchers have been exploring how resistance training impacts markers of lower limb injury risk in youth netball players in Australia. To accomplish these goals for the first series of projects in this area, the research team engaged with local youth netball clubs in order to address an area of critical need in Australia.

The first project *"Neuromuscular training improves movement competency and physical performance measures in 11-13 year old female netball athletes"* provided the opportunity for the team to be the first research group to demonstrate that using a comprehensive resistance training program based upon international standards improves movement competency as well as athletic performance.

The second project *"Neuromuscular training improves lower extremity biomechanics associated with knee injury during landing in 11-13 year old female netball athletes"* allowed the researchers to further explore the ability of resistance training to reduce known lower limb injury risk factors. Impressively, the results of this study demonstrated that incorporating resistance training into the youth netball player's training regime significantly reduced biomechanical markers of injury risk associated with the knee and ankle.

In the long-term the research group plans to develop a world class research centre exploring the long-term benefits of resistance training for the youth athletes of Western Australia. The team will explore areas related to optimisation of resistance training with minimal time commitment to increase the involvement of females in Western Australia. Now the researchers intend to explore different resistance training methods and their impact on injury risk factors and more importantly the youth athlete's psychological sense of wellbeing.

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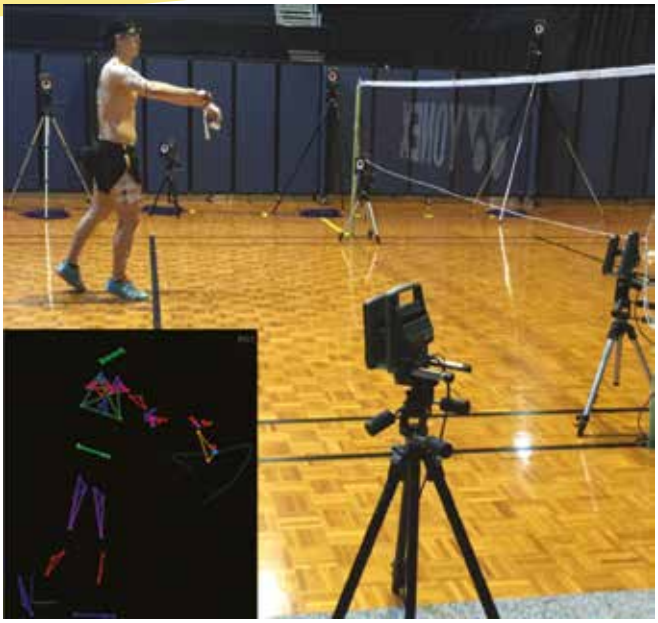

Factors underpinning successful human movement performance

The ability to move successfully (i.e. with speed, efficiency and dexterity) within sporting, clinical, occupational and urban environments is highly prized. To achieve this, humans need to be able to make decisions as to the most effective movement strategy to adopt within their environment, and then select and execute that strategy. The two key aims of our research are to define the "best strategy" for an individual, and then determine how they might improve their ability to select and then execute this strategy.

Our research indicates that both the selection and the execution of a strategy is critically dependent on a person's specific physical attributes (e.g. their strength, flexibility, balance, body dimensions, etc.) and their perception of their capabilities. Furthermore, the influence of these attributes, as well as the effects of alterations in them (e.g. through exercise training), significantly impact on strategy selection and execution.

In our ongoing research, we intend to create a detailed "map" of the relationships between changes in physical attributes, movement strategy selection and movement execution accuracy with the ultimate aim of being able to provide technical movement and physical training interventions that optimise movement ability in a range of populations.

ECU has one of the largest biomechanics research laboratories in Australia and a technological platform to undertake high-quality biomechanical analysis. We are interested in extending our work with sporting organisations, as well as clinical populations, the defence force and occupational organisations who have an interest in understanding how to improve movement effectiveness in their environment.

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Eccentric Exercise

Professor Ken Nosaka's main research topic is 'eccentric exercise' in which contracting muscles are lengthened. Eccentric exercise, when it is performed for the first time or after a long interval from the previous bout, induces muscle damage characterised by delayed onset muscle soreness (DOMS) and prolonged decreases in muscle function.

Professor Nosaka has been investigating the mechanisms underpinning DOMS and other aspects of muscle damage, neuromuscular adaptations to eccentric exercise, interventions to minimise muscle damage and enhance recovery, and the use of eccentric exercise training to improve fitness and athletic performance and to prevent and treat chronic diseases. He is also interested in the development of assessments of muscle damage versus muscle fatigue.

Further investigations in this area include anti-ageing effects of eccentric exercise, the effect of eccentric exercise training on diabetes and dementia, a comparison between the cognitive demands required for eccentric and concentric cycling, the effect of eccentric training on athletic performance and assessments of muscle damage vs fatigue.

Previous and current industry collaborations include;

- Effect of amino acid supplement on delayed onset muscle soreness and symptoms associated with exercise-induced muscle damage
- Development of methods to assess standing fatigue
- Effect of ambient temperature on muscle and joint stiffness
- Effects of dynamic transdermal stimulation on delayed-onset muscle soreness (DOMS) and symptoms associated with eccentric exercise-induced muscle damage
- Effects of 'e-cell' on symptoms associated with eccentric exercise-induced muscle damage
- Effect of dehydration level on calf muscle cramp induced by electrical train stimulation after exercise in the heat

Professor Nosaka's research team has advanced knowledge and cutting-edge equipment/techniques to assess muscle pain, muscle damage, fatigue, muscle cramp, athletic performance, musculoskeletal injuries, health and physical fitness, and training effects. This project is interested in developing new collaborations with industry partners.

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Improving sports and exercise performance and reducing injury through pre-activity physical preparations

Whilst we might train for months or years to improve our sports and exercise performances by a few percent, what we do immediately prior to sport or exercise participation can have a dramatic effect, perhaps influencing performance by 10-20%.

We are using the latest in neurophysiological (magnetic and electrical brain, spinal, nerve and muscle stimulation; electromyography), biomechanical (3-D real-time and high-speed motion analyses, force platform measurements), medical imaging (MRI, CT, pQCT and ultrasound imaging), and performance monitoring techniques (strength and power testing, isokinetic dynamometry, force-velocity profiling) to discover how individuals respond to muscle stretching, muscular work, and other aspects of pre-sports and pre-exercise preparation routines.

We have probed new mechanisms by which our nervous system controls muscular strength and power output (in particular the development of persistent inward currents in motor neurones) and how practices such as muscle stretching might affect these under specific conditions. We have also determined how the use of particular pre-exercise muscle contractions can improve the calcium-dependent muscle contraction process during subsequent muscular efforts (i.e. the 'post-activation potentiation' effect), allowing us to pin point which types of muscular efforts might be performed by an individual to produce their best exercise or sports performances.

By minimising injury and improving performance we aim not only to increase sporting success, but also to increase the likelihood that people exercise safely and with a greater chance of improvement, which is a vital aspect of maintaining the motivation to exercise.

Using our world-class laboratory- and field-based techniques we have developed an ongoing program of research to understand the role of muscle stretching as well as muscular contractions (to elicit the 'post-activation potentiation' response) on subsequent muscular force and power, and ultimately whole-body physical performance. We look forward to inquiries from potential research students and organisations who are interested in this area of research.

Using exercise training to optimise human physical function

The improvement of human movement performance in athletic, rehabilitation, ageing and other populations requires: (1) a detailed understanding of how we move and how different muscle, tendon and nervous system properties affect our movement capacity, as well as (2) a description of how different exercise training practices influence muscle, tendon and nervous system properties, and thus how we move.

Our research uses a multi-method approach, borrowing techniques from the areas of biomechanics (3-D and high-speed motion capture, force recordings, computer modelling), neurophysiology (magnetic and electrical brain, spinal cord, peripheral nerve and muscle stimulation; electromyography), exercise physiology (blood and muscle tissue sampling for gene- and protein-level adaptation analyses; energy consumption measurements) and motor learning (muscle activation timing analyses), to improve human movement performance. We do this by first altering the body's neuromuscular properties through the use of strength, plyometric, flexibility and other exercise training practices to determine how these changes influence performance, and then defining how these training practices influence nerve, muscle and tendon function.

Using this approach, we hope to learn how to 'engineer' the human body to perform physical tasks with the greatest ability. We currently work closely with athletes, people with spinal cord injury, ageing individuals, and children and youth, and therefore can use information gained from the study of one population to inform practices in other populations.

We are particularly interested in discussing research possibilities with organisations who represent clinical populations as well as high-performance athletes. Because the synergies between different populations are numerous, we aim to test a broad range of populations in order to gain the greatest insight into the adaptive process to exercise and its influence on movement performance.

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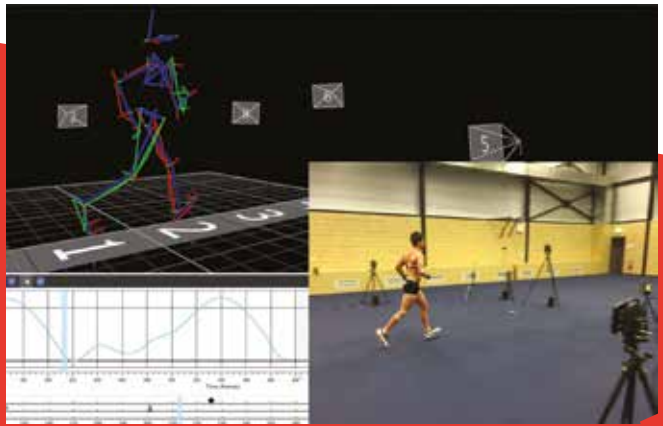

Systems and Intervention Research Centre for Health

The Systems and Intervention Research Centre for Health (SIRCH) brings together scientists and clinicians to promote better health, improve early disease detection and enhance intervention using appropriate workforce education and systems. SIRCH develops and tests approaches that aim to improve equity, access, safety and quality in healthcare. SIRCH is a trans-disciplinary research group committed to inter-professional learning.

The Centre's activities cover three broad domains;

- Suboptimal Health including health promotion, health intervention, environmental health, global health and public health genomics
- Workforce Education including health education, e-learning, safety and quality in health, communication in healthcare and testing new models of service delivery
- Indigenous Health including working with community on developing and evaluating innovative models of care, and challenging attitudes of healthcare providers

The objectives of the Centre are to facilitate the translation of research and policy to enhance healthcare practice, to increase pure and applied research outputs from the diverse range of researchers in the Centre, to improve the quality and sustainability of the workforce and apply innovative education initiatives.

Current SIRCH projects include;

- Better access to home hospital for residents in Aged Care facilities
- Hepatitis B and C online training programs
- Hepatitis Education Project
- HoT 'n' Deadly! Health 'n' Science at ECU
- Provision of a medical practitioner for advice and consultancy
- Sexually transmitted infections (STI) online training program
- STI Education Project website
- Trachoma treatment on-line training

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HoT 'n' Deadly! First Aid Training

Targeted at rural Aboriginal high school students in Western Australia and the Northern Territory, HoT 'n' Deadly! First Aid Training provides hands on training for young people. It is a partner program of the long running biennial HoT 'n' Deadly! Health 'n' Science @ ECU, which targets Aboriginal high school students in the Perth metropolitan area.

HoT 'n' Deadly! First Aid Training provides high school students with an opportunity to develop first aid skills, to build their aspirations for higher education and a career in health care. Current ECU paramedic students assist with the first aid training, giving them the opportunity to engage with young Aboriginal people living in rural areas.

To date, 101 Aboriginal people have participated in HoT 'n' Deadly! First Aid Training.

The program hopes to continue to provide opportunities for Aboriginal young people to learn first aid skills. HoT 'n' Deadly! First Aid Training is seeking to establish partnerships with organisations to develop and implement a mentoring program to support Aboriginal students who have completed the training towards achieving their career goals.

"I really enjoyed the whole day, loved it all! Really interesting."

"I valued gaining the confidence to use CPR."

"The training was hands on and interactive, which I thought was very good."

Better Access to Home Hospital for Residents in Aged Care Facilities

Research suggests that residents from Residential Aged Care Facilities (RACFs) who are sent to hospital are more likely to experience stress, confusion, infections, falls, pressure injuries, delirium, medication errors and other complications. Where treatment can be provided in the facility, survival rates are just as good, if not better than if treated in a hospital. Satisfaction levels are also much higher for residents when remaining at the facility.

This SIRCH research group aims to;

- Implement a model of care which assists residents of aged care facilities to increase the use of Home Hospital and reduce hospital admission, length of stay and costs associated with admission to tertiary cares settings.
- Facilitate discussions (and documentation of these discussions) with residents and their families about ceilings of care/advance care planning.
- Development of a booklet to assist with and document advance care planning discussions.

Industry Partners include;

Residential Aged Care Facilities: Gracehaven & David Buttfield Centre (Baptistcare), Western Lodge (Regis), Woodlake (Aegis), Royal Australian Air Force Association (RAAFA), Silver Chain (WA), St John Ambulance Australia (WA), The Department of Health (WA), Alzheimer's Australia (WA), Metropolitan Palliative Care Consultancy Service, Hospital Discharge Planners (Joondalup Health Campus, Fiona Stanley Hospital & Fremantle Hospital), Office of the Public Advocate, Residential Care Line, Clinical Nurse Consultant in advance care planning (Prince of Wales Hospital, Sydney)

A highly valued new resource, called the Values & Wishes for Living Well and Healthcare Choices booklet was developed by the project and found to assist with advance care planning discussions. Moving forward the project aims to conduct research into preventing unnecessary hospitalisation by promoting early awareness and use of treatment options in the community.

Grandparents 24/7: Examining and meeting the needs of grandcarer families in Western Australia

Grandparents raising their grandchildren experience diverse challenges and are often hidden from government and services statistics. The 2014 Senate Inquiry into grandcarers called for research to quantify these challenges. In response, a pioneering study was conducted in partnership between ECU and Community Vision Inc. With guidance from our critical reference group, in-depth interviews and detailed surveys were completed and identified the service needs and experiences of grandcarers in Western Australia. Future care of their grandchildren, and financial, legal and behavioural issues were seen as the highest priority for grandcarers. The majority (76%) of grandcarers surveyed by this research team identified respite as a high priority issue.

In collaboration with the project's stakeholders and Community Vision Inc., a novel pilot respite program was developed called Take a Break Camp for Grandkids. Both grandparents and grandchildren felt the respite camp gave them time to engage in activities and socialise with peers, 'normalising' a week in their challenging lives.

The next exciting step in this research program is to hear the 'voices of grandchildren' raised by their grandparents identifying their experiences, mental and physical health and service needs. This has been funded in partnership with a new industry collaborator Wanslea.

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Factors Influencing the Reunification of Children with their Substance-Using Parents Subsequent to Placement in Out-Of-Home Care

Sixty-five per cent of child removals from the family home occur for reasons relating to parental substance use. Removed children are placed in almost equal numbers in foster or grandparent full-time custodial care. While both foster and grandparent caregivers are often heroic in fulfilling their caregiving role, they often do so (particularly in the case of grandparents), under the burden of significant self-sacrifices. Current rehabilitation services and state and federal governments lack quality research on which to base their family reunification decisions. The impact of this innovative project for WA policy makers and service providers is that the research will translate directly into improved practice guidance in assessment techniques for OT clinicians and, importantly will establish the evidence-based parameters for parent-child reunifications.

This project is partially funded by our industry partner, the Commissioner for Children and Young People, with in-kind support from four organizations involved in working with people with substance use issues.

Given that this is the first research project in WA researching the inhibitors and enabling factors influencing family reunifications among removed children and their parents with significant substance abuse issues, the findings from this research will form the basis for a large grant application to devise, pilot, and implement a child-safety intervention for drug affected families. The need for such an intervention is pressing given the prevalence of drug-taking among young adults in Australia. This research group is actively seeking additional research partners to tackle this widespread social phenomenon.

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Refresh.ED: An online food and nutrition teaching resource for WA school children

Nutrition is a single area in a crowded health curriculum taught in Australian schools and teachers may not have the necessary skill set or time to learn contemporary nutrition science to teach to students. As a response to this challenge, ECU has developed Refresh.ED, which is an online nutrition teaching resource for school children in Western Australia.

Refresh.ED industry partners include the Department of Health and the Western Australian Health Promotion Foundation (Healthway).

Teachers reported that Refresh.ED units gave structure to their food and nutrition lessons, and were especially helpful for new or practicum teachers. Many teachers reported being time poor, and thus having relevant material to provide information to add to discussions and activities in class was of value to them.

The Refresh.ED team is seeking opportunities to develop a transformational game to be used alongside Refresh.ED to consolidate learning in food and nutrition in schoolchildren. To find out more see www.refreshedschools.health.wa.gov.au/.

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Responses from 143 Refresh.ED users (88% in Western Australia, 65% in Government schools and 57% being secondary school teachers) indicated that nutrition education was critical for improved student health and should be incorporated into the curriculum. Refresh.ED users reported that:

- Refresh.ED provided content knowledge, confidence and skills for teaching healthy eating
- Healthy food and nutrition was not a high priority in schools
- Many participants used one or more modules in classes (predominantly secondary schools)
- Most participants agreed that Refresh.ED had improved food and nutrition lessons
- Most found that Refresh.ED had increased classroom activities related to food choice, nutrition and the impact of food on health
- Most found their confidence to encourage children's healthy eating had increased.

"I love what Refresh are doing for teachers and truly believe that all educators must have a role in educating our kids about healthy eating."

Christine Williamson (Teacher)

SNACPlus: Online program to build knowledge and confidence to improve healthy eating environments in the childcare sector

The childcare industry is a growth market and >1 million children spend on average 27 hours per week in care. Eating habits are formed at a young age, therefore provision of healthy eating options and appropriate food environment policies whilst at childcare, is an effective early intervention point to address the current concerns relating to childhood obesity.

The SNACPlus research group has developed an engaging and relevant online curriculum to provide childcare staff with professional development and resources to teach healthy eating to two to five year old children and build a healthy food environment in their centre. Resources are accessible by parents/carers and are available on the SNACPlus website www.snacwa.com.au free of charge. The Australian Health Promotion Foundation (Healthway) is an industry partner of SNACPlus.

More than 800 centres and more than 1,900 childcare staff use the website nationally. Use of the SNACPlus website improved knowledge, behaviour and attitudes towards building a healthy food environment and food literacy skills including food labelling reading and use of credible websites and helped health professionals to gain nutrition knowledge. Staff reported SNACPlus positively influenced changes to food service, role modelling, staff behaviour and dietary improvements in their centres.

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The Milky Way Study

Current Australian dietary guidelines recommend that children, from the age of two, consume mostly reduced-fat dairy products. However, there is a lack of good evidence to support this. In fact, recent research suggests that full-fat dairy may also have health benefits.

Dr O'Sullivan and colleagues from ECU, Telethon Kids Institute and University of Western Australia will now embark on a 3 month controlled double-blind trial that will compare consumption of full-fat dairy produce to consumption of reduced-fat dairy. Known as the Milky Way study, the project will involve a sample size of about 50 children, aged between four years and six years who will be assigned to either full-fat or reduced-fat dairy products.

This study will assess the impact of full fat and reduced fat dairy products across three main areas including obesity, gut health and cardiovascular health. If the results of the research are promising, the team will look at replicating the study on a much larger scale, to provide good quality evidence for future dietary guidelines.

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Examining the long term health impacts of the Paleolithic diet and the effects on gut health

The Paleo research group is comparing the long-term (>1yr) health impact of a Paleolithic diet, high intake of protein, fat, fruits and vegetables but avoidance of dairy, grains and legumes, with a diet that follows the AGHE guidelines, via a cross sectional, case-control study.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is an industry partner assisting with the project aimed at determining how total long-term dietary patterns, inclusive and exclusive of grains and legumes, contribute to changes in gut health that impact the risk of non-communicable chronic diseases.

The group is seeking opportunities to work with food companies to determine the best foods that are high in resistant starch and provide these to Australians who avoid or cannot tolerate grains and legumes. In addition, the group will develop a laboratory for optimizing microbial identification and evaluation of microbial metabolites. This initiative will build capacity for future clinical nutrition and dietetic staff and students to undertake research in this area.

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Dietary approaches to enhance vascular health

Cardiovascular disease (CVD) is the number one cause of death world-wide. It kills over 17 million people annually, and in Australia, close to one third of all deaths are due to CVD. Most of these deaths can be prevented or delayed. Lifestyle change could reduce risk of CVD by more than 70%, and even small lifestyle changes have the potential to lead to substantial benefits.

Increasing the intake of fruits, vegetables and whole grains remains the foundation of dietary approaches to prevent CVD. This alone has the potential to cut CVD risk and associated costs by up to 25%. Surprisingly little is known about the components of these foods that contribute to blood vessel health, or the mechanisms involved. Identifying these specific components and mechanisms will enhance targeted dietary approaches for CVD prevention.

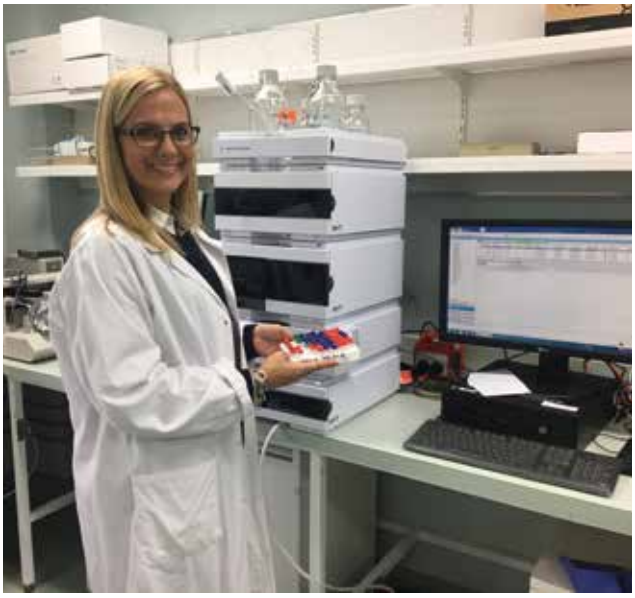
Our research program aims to investigate how specific components present in plant foods could prevent CVD. It also aims to develop and evaluate new foods targeted at CVD prevention.

Within this research program, research projects are designed to establish how components of fruits, vegetables and legumes improve blood vessel health. The projects fall under several themes including:

1. Understanding how flavonoids from fruit and tea can enhance blood vessel health;
2. Development and health evaluation of new flavonoid-rich fruit;
3. Determining the importance of the nitrate derived from vegetables for cardiovascular health; and
4. Development and health evaluation of foods and diets enriched in grain legumes

The conduct of randomised controlled trials is the foundation of the research program. Further mechanistic insights are provided by laboratory-based studies, studies using animal models and observational epidemiological studies.

The research is supported by National Health and Medical Research Council project grants and industry grants. It also involves wide-ranging collaboration with industry partners.



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Clostridium difficile infection and the "One Health" paradigm

Clostridium difficile is an anaerobic Gram positive spore-forming bacterium and is the leading cause of infectious diarrhoea (C. difficile infection, CDI) in hospitalised humans world-wide.

The assumption that CDI is primarily a hospital-acquired infection is being questioned. Community-acquired CDI (CA-CDI) is increasing particularly in groups previously considered at low risk. In Australia, CA-CDI rates doubled during 2011 and increased by 24% between 2011 and 2012, and in the USA C. difficile is the number 1 healthcare-related infection. Two potentially high-risk practices in Australian food animal husbandry may present a risk for CA-CDI: slaughtering of young animals for food, and effluent recycling to agriculture and other land use. The overarching concept for all this is One Health. The One Health concept recognizes that the health of humans is connected to the health of animals and the environment.

This research has several partners including Government Health and Agriculture Departments, pharmaceutical companies, microbiology laboratory diagnostic companies, veterinary diagnostic companies, food producers.

The aim of the project is to investigate the changing epidemiology and molecular epidemiology of CDI. This will help in identifying and ultimately reducing risk factors for disease and therefore reducing the disease burden. We also aim to improved the detection of C. difficile in humans and animals using whole genome sequencing.

Various projects are being undertaken under this umbrella including:

- Investigating C. difficile contamination of food.
- Reducing CDI in production animals.
- Evaluating new diagnostic tests and treatment options.
- Understanding the epidemiology of infection in man and animals.
- Using whole genome sequencing (WGS) to accurately follow transmission of disease.

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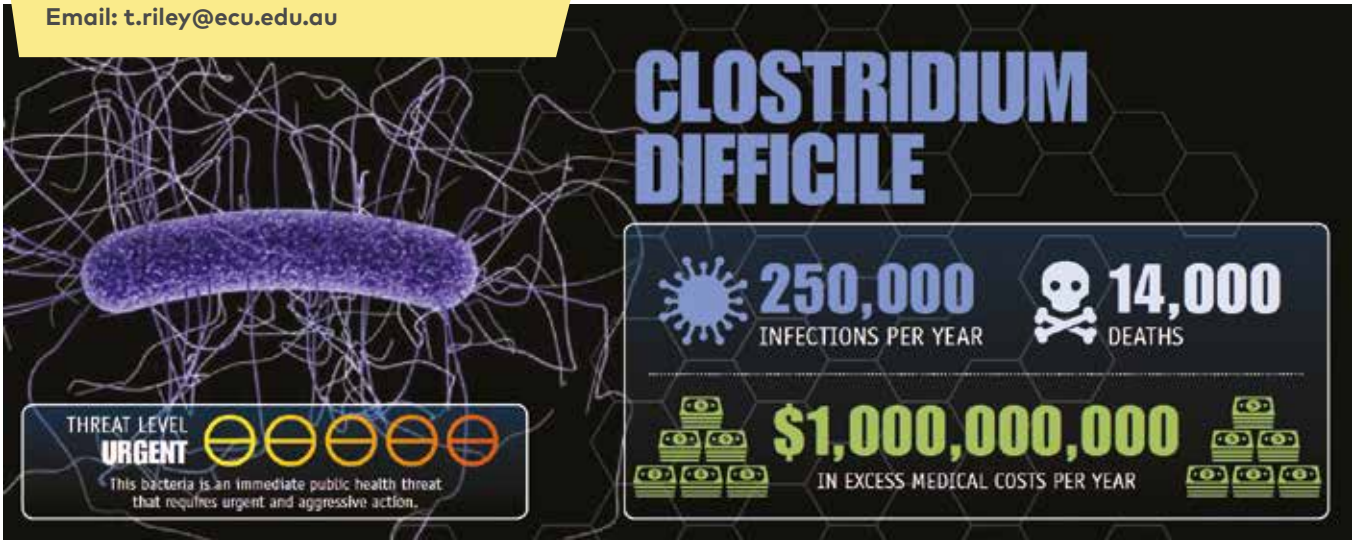

Liver Disease and Iron Overload Disorder Research Group: Translating knowledge into clinical practice

One in every 190 Australians of northern European descent suffers with the inherited iron-overload disorder Hereditary Haemochromatosis. Early detection prevents the development of iron-related organ injury effecting the liver, pancreas, musculoskeletal and endocrine systems. Chronic liver diseases effect up to 30% of the population, with the most common cause, nonalcoholic fatty liver disease, representing the liver complication of the disturbed metabolic state which is seen in obesity and diabetes mellitus.

The research work undertaken by Professor Olynyk aims to improve the ability of:

1. scientists to understand the injury mechanisms leading to these disorders,
2. clinicians to detect, diagnose and treat individuals with these conditions to improve health outcomes, and;
3. consumers to better understand their conditions.

Professor Olynyk partners with Universities (Edith Cowan University, Curtin University, The University of Western Australia, Murdoch University), the Australian Red Cross Blood Service, industry (Resonance Health), The WA Department of Health and consumers.

In a world first, research knowledge related to Hereditary Haemochromatosis was formulated into an online referral system (https://highferritin.transfusion.com.au/) which has now become the national standard of care for referral and management of the disease in Australia. It has substantially improved access, timeframes and referral practices to the Australian Red Cross Blood Service, with significant productivity gains.

Going forward, Professor Olynyk is now examining the role of disturbed iron metabolism in cancer, development of nonalcoholic fatty liver disease and the processes which occur in the liver as a result of injury which lead to cirrhosis and liver cancer.

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Heat Stress: Reduction of core body temperature

The occupational health team led by Associate Professor Jacques Oosthuizen and Dr Joseph Maté developed an ice slurry drink that was shown to significantly decrease core body temperature under laboratory conditions. These findings were subsequently validated under field conditions on an off shore oil and gas platform. Woodside and the Australia – China Natural Gas Technology Partnership Fund have provided support for the project.

Achieving a lowered core temperature not only protects workers from heat stress, but also reduces fatigue, enhances comfort and improves workers concentration and safety performance.

Development of methods to assess workers heat tolerance and to enhance acclimation before deployment to hot work environments must be a priority, particularly among fly-in-fly out workers, who often work in extreme conditions.

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Coal Miners Pneumoconiosis

The Occupational Health team Associate Professors Jacques Oosthuizen and Sue Reed together with Professor Wei Wang, Dr Margaret Davidson and Dr Martyn Cross, in collaboration with researchers from the School of Engineering are assessing exposure to coal dust. Industry partners include the coal industry and government regulators.

Current health surveillance focuses on assessment of pulmonary function and chest x-rays which only identify disease after irreversible damage has already occurred. There is a need to explore emerging information and identify new biological markers that will aid in the early, pre-symptomatic diagnosis of disease onset and identification of susceptible sub-groups within the mine workers population.

ECU's research team believes there is an urgent need to change traditional health surveillance in the coal mining industry. The technology is available to develop a state-of-the-art approach for evaluating the toxicology of coal dusts by simultaneous monitoring of particle composition and in vitro approaches to modelling cellular response to insult and injury.

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Mosquito Vector Control

The Environmental Health team led by Associate Professors Jacques Oosthuizen, Peter Neville, Dr Kim Clark and Kerry Staples have conducted a number of projects in the Perth area assessing breeding habitat and cycles of various disease vector mosquitos.

Project partners include local government councils and the Western Australian Department of Health.

Through this research project the effectiveness of various mosquito control methods will be assessed and recommendations for the design of street drains and the use of larvicides implemented. Backyard breeding patterns of mosquitos in the Swan flood plain have been established and used to plan mosquito control initiatives. Current research is focused on the depletion of egg banks in tidal flood plains which will inform the responsible and effective use of chemical control in environmentally sensitive habitat.

There is an urgent need to develop cost effective and environmentally responsible mosquito control measures, particularly with increased mobility of populations between Australia and Asia.

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Health Simulation Centre

ECU's Health Simulation Centre (HSC) is a world-class, purpose-built facility, based at the Joondalup Campus. The HSC delivers high quality simulation training and pursues a thriving research program – with a focus on improving patient safety and clinical outcomes.

Industry partners include:

- TraumaSim, which includes realistic moulage in simulation-based learning environments and how this impacts on learning outcomes amongst health students and professionals.
- WA Police, investigating the novel use of virtual displays of eye-tracking behaviours as a feedback mechanism to improve pistol marksmanship.
- Shawsett Training and Safety, to develop and validate a screen-based driver safety training protocol which compares eye gaze patterns on a virtual simulator with actual driving gaze patterns.
- The Department of Health, Western Australia (DOHWA) works together with the simulation centre as the sole WA Accredited Provider of the Emergency Management of Anaesthetic Crisis (EMAC) Course. The Health Simulation Centre, in partnership with DOHWA also hosted and helped facilitate the intensive four-day internationally-recognised Institute for Medical Simulation (IMS) instructor training course Simulation as a Teaching Tool, taught by the Center for Medical Simulation's Harvard Medical School renowned staff. This world-class course was offered to healthcare professionals in 2015 for the first time in WA.
- Australian Resuscitation Council (ARC) has accredited ECU to deliver its 1-day and 2-day Advanced Life Support courses, offered multiple times a year.
- National Disability Insurance Agency (NDIA) training resource has been developed to introduce NDIA disability care workers to core concepts in effective communication.

Research undertaken in the HSC has contributed to changes in health curricula and policy demonstrating the value of simulation-based learning to improve capacity amongst health students and professionals.

The ECU Health Simulation Centre is interested in developing research capacity in:

- Enhanced scenario fidelity and cognitive load on performance and learning in simulation
- Utilising eye-tracking technology as a novel method of evaluation in simulation
- Development of a tool to standardise understanding and interpretation of simulation 'fidelity' (i.e. realism)
- Exploring how simulation is best utilised to improve clinical competence and confidence
- How simulation can augment or replace clinical practicum amongst healthcare students
- The extent to which simulation performance translates in real world settings.

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The Royal Flying Doctor Service

This research is a collaboration between ECU's Emergency Services Research Group and the Royal Flying Doctor Service (RFDS). The projects include a review of the last 10 years of RFDS records with a focus on identifying which treatments worked best and why. Outcomes are used to optimise and inform current and future medical practice to the benefit of the 55,000 patients flown by the RFDS each year.

As part of this project, the Emergency Services Research Group is seeking partners interested in supporting a review of 10 years of clinical records with a focus on emergency treatment of heart disease, coronary care, Aboriginal health, and/or diabetes.

The project team is specifically interested in partnerships with philanthropic organisations, pharmaceutical companies, or companies that manufacture aeromedical retrieval equipment.

Reducing Injuries and Fatalities within the Mining, Oil and Gas Sectors

This project is reviewing 13 years of injury and fatality data from across resource sector operations in Western Australia through a collaboration between ECU's Emergency Services Research Group and the Department of Mining and Petroleum (DMP). The nature and specifics of injuries identified will be used to develop the precise knowledge, skills and equipment required by emergency service providers when responding to an accident

ECU's Emergency Services Research Group is seeking partners interested in identifying the specific personnel and emergency response equipment required to reduce the severity of injuries and to reduce avoidable fatalities in mining, oil and gas operations.

Reducing Stress, Depression and Anxiety within Paramedics and Emergency Response Personnel

An important, urgently needed project is being undertaken by the Emergency Services Research Group to identify the precursors of depression and anxiety within paramedics. Importantly, this research project is aimed at identifying and developing coping mechanisms for paramedics and other emergency services personnel to proactively address stress before it becomes harmful.

The research team is seeking partners interested in using this knowledge to produce educational tools to allow paramedics and other emergency services personnel to proactively address stress before it becomes harmful, and to identify the precursors of depression and anxiety.

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ECU is committed to reconciliation and recognises and respects the significance of Aboriginal and Torres Strait Islander peoples' communities, cultures and histories. ECU acknowledges and respects the Aboriginal and Torres Strait Islander peoples, as the traditional custodians of the land. ECU acknowledges and respects its continuing association with Nyoongar people, the traditional custodians of the land upon which its campuses stand.

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