IMPACT SHOW CASE

IMPACT
INSTITUTE FOR MENTAL AND PHYSICAL HEALTH AND CLINICAL TRANSLATION

DEAKIN UNIVERSITY

Barwon Health

IMPACT Research Showcase 2024 Digital Abstract Booklet

POSTERS

Evaluating the effectiveness of a comprehensive lifestyle therapy program versus psychological care for managing mood disorders (The HARMON-E Trial)

Jessica A Davis[1], Madeleine L Connolly[1], Lauren M Young[1,5], Megan Turner[1,7], Sophie Mahoney[1], Dean Saunders[1], Tayla John[1], Rachel Fiddes[1], Marita Bryan[1], Michael Berk[1], Indee Davids[1], Sanna Barrand[1,2], Felice N Jacka[1], Greg Murray[3], Eileen McDonald[4], Mary Lou Chatterton[5], Catherine Kaylor-Hughes[6], Catherine Mihalopoulos[5], Alison Yung[1], Neil Thomas[3], Richard Osborne[3], Ravi Iyer[3], Denny Meyer[3], Lara Radovic[1], Tabinda Jabeen[1], Wolfgang Marx[1], Melissa O'Shea[7], Niamh L Mundell[8], Elena S George[8], Tetyana Rocks[1], Anu Ruusunen[1,9,10], Samantha Russell[1], & Adrienne O'Neil[1]

1. Deakin University, IMPACT - the Institute for Mental and Physical Health and Clinical Translation, School of Medicine, Barwon Health, Geelong, Australia
2. School of Health and Social Development, Deakin University, Geelong, Australia
3. School of Health Sciences, Swinburne University of Technology, Melbourne, Australia
4. Bipolar Australia, Sydney, NSW, Australia
5. School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia
6. Dept of General Practice and Primary Care, MDHS, University of Melbourne, Melbourne, Australia
7. Deakin University, School of Psychology, Geelong, Australia
8. Institute for Physical Activity and Nutrition, School of Exercise and Nutrition Sciences, Deakin University, Geelong, Australia
9. Institute of Public Health and Clinical Nutrition, University of Eastern Finland, Kuopio, Finland
10. Department of Psychiatry, Kuopio University Hospital, Wellbeing Services County of North Savo, Kuopio, Finland

Evaluating the effectiveness of a comprehensive lifestyle therapy program versus psychological care for managing mood disorders (The HARMON-E Trial) Background: Despite compelling evidence for lifestyle interventions improving depressive symptoms in people with mental ill health, lifestyle-based mental health care is not available as part of mainstream mental health care. One reason for this is a lack of data from real world settings comparing its effectiveness to standard care psychotherapy. Using video-conferencing, the HARMON-E Trial aims to determine the effectiveness of an adjunctive group-based lifestyle program targeting diet, physical activity, sleep, and substance use for reducing depressive symptoms (primary outcome) compared to group-based psychotherapy in adults with major depressive or bipolar disorder. It is hypothesised that the lifestyle program will be non-inferior to psychotherapy at 8-weeks on the primary outcome. Methods: HARMON-E is a two-arm, parallel-group, individually randomised group treatment, non-inferiority trial. Three hundred and seventy-eight participants with moderate to severe depressive symptoms are being randomised to receive either the lifestyle or psychotherapy treatment. Participants attend seven sessions over an eight-week period. The primary outcome is depressive symptoms at 8 weeks compared to baseline, as measured by the Montgomery-Asberg Depression Rating Scale. Secondary outcomes encompassing mental health, lifestyle, and quality of life are collected at baseline, 8-week, 16-week, and 6 months. Results: From

September 2022 to June 2024 n=191 (50% of sample size) have been randomised into thirty-eight groups (19 to each arm). Recruitment is forecasted to continue until October 2025.

Hearts and Minds: A co-design study exploring mental health following a cardiac event.

Sarah Gauci[1,2], Susie Cartledge[2,3], Eslam M Bastawy[1], Wolfgang Marx[1], Nikky Gordon[4], Andrea Driscoll[5], Julie Redfern[6], Tom Briffa[4], Robyn Gallagher[3], Adrienne O'Neil[1]

1. IMPACT Institute, Deakin University
2. School of Public Health and Preventive Medicine, Monash University
3. Susan Wakil School of Nursing and Midwifery, The University of Sydney, Sydney, NSW, Australia
4. School of Population and Global Health, University of Western Australia
5. School of Nursing & Midwifery, Deakin University
6. Institute for Evidence-Based Healthcare, Faculty of Health Sciences and Medicine, Bond University

Background: Following an acute cardiac event, individuals commonly face emotional and mental health challenges. While many overcome these challenges within the first few weeks of recovery, one in five will develop major depressive disorder. This increases the risk of subsequent cardiac events and mortality. This project aimed to work with consumers and key stakeholders to (1) map the complex system influencing mental health after a cardiac event and (2) identify action ideas and key priority areas to better support mental health following a cardiac event. Methods: Two 1.5-hour co-design workshops using Deakin University's STICKE software were conducted with 12 participants (3 consumers and 9 healthcare professionals) recruited using convenience sampling from across Australia. Participants were asked to reflect on factors influencing mental health following a cardiac event. Results: The STICKE diagram developed demonstrates the interplay of various factors impacting mental health across the cardiac healthcare journey at both patient and system levels. Using the theoretical domains framework, eight domains were identified: knowledge, skills, health system context, personal context, emotional response, social influences, behavioural regulation, and beliefs. Stakeholders also identified the key priority areas, highlighting the need for additional support for staff and intervention to increase health literacy and knowledge around mental health. Conclusion/Impact: The findings from this workshop demonstrate that supporting mental health after cardiac events requires comprehensive intervention. The insights gained from these results will be used to apply for funding to develop a co-designed intervention to better support the mental health of Australians following a cardiac event.

Autologous constructs for muscle engineering and repair

Peiqi Yang[1,2,3], Ayushi Priyam[1,2], Gareth E. Boer[1,2], Lesthuruge. S. De Silva[1,2], David Nisbet[4] Anita Quigley[3,5], Rob Kapsa[3,5], Richard Williams[1,2,3*]

1. School of Medicine, Deakin University, Waurn Ponds, VIC 3216, Australia
2. Institute for Mental and Physical Health and Clinical Translation, School of Medicine, Deakin University, Geelong, VIC 3220, Australia.
3. ACMD, St Vincent's Hospital, Melbourne
4. Graeme Clark Institute, Department of Biomedical Engineering, The University of Melbourne
5. School of Engineering, RMIT Melbourne

Background When volumetric muscle injuries overwhelm self-repair systems, endogenous tissue restoration often malfunctions. Biofabrication as a promising pathway is urgently needed to effectively regenerate damaged skeletal muscles. The objective of biofabricated constructs is to intricately replicate muscle tissue with cellular interactions that ultimately restore tissue physiology. Naturally derived polysaccharide hydrogels are a promising material vector due to their outstanding biocompatibility, biodegradability and tunability. The constraint of adopting polysaccharide is the absence of bioactive cues, which considerably confine their ability to emulate the extracellular matrix (ECM) of muscle tissue. Methods Here, we combine chemically cross-linked polysaccharide hydrogels with self-assembling peptides (SAP) that comprise ECM-protein-fibrous motifs to form uniquely adjustable mechanical and physiological biocomposites. We investigate the mechanical and structural properties of these tailorable biocomposited hydrogels via rheology, cryo-scanning electron microscopy and Small-Angle-Xray-Scattering. We also examine the cytocompatibility of the designed biomaterials in terms of myoblasts viability, differentiation and migration behaviors. Results We achieve a biofunctional stiffness range, bioactive micro- and nano-topography, mechanical and structural integrity and consistent nanofibrous assemblies by incorporated SAP/polysaccharides networks. Our results show that SAP/polysaccharide hydrogel could mimic muscle tissue by tuning the individual component ratio within the biocomposites, hereby controlling muscular cell differentiation and migration responses. Impact This research would tailor the coassembled bioinks with the defined mechanic strength and bioactivity to recapitulate the native matrix with retaining ideal material printability and post-print shape fidelity. Furthermore, our work will open an opportunity for the development of reconstructed hybrid bioinks and improve the application for muscle printing.

Incorporating lived experience in a post-stroke return-to-work program

Alyna Turner[1], Heather Smith[1], Saran Chamberlain[1], Anna Wrobel[1], Alison Kennedy[2], Olivia Dean[1], Sarah Baker[3], Ian Kneebone[4]

1. IMPACT TRIALS, Deakin University, Geelong, Australia
2. National Centre for Farmer Health, Deakin University/Western District Health Service, Hamilton, Australia
3. South Australia Health, Adelaide, Australia
4. University of Technology Sydney, Sydney, Australia

Many stroke survivors do not receive vocational support, and when it is provided it is generally in the early phase of recovery. However, stroke symptoms can impact work ability over the long term. We designed and pilot tested a telehealth based vocational support service. A lived experience Advisory Group reinforced the need for vocational support over the longer term. Given the absence of such services we embarked on a co-creation project to fill this gap. A group of 12 stroke consumers, clinicians and carers met three times over 2021-2022. Following this, a sub-group attended up to 9 co-production sessions (1-hour sessions; approx. 5 attendees/session). Sessions were recorded, and viewed by an experienced stroke clinician, and the team was supported by a steering committee of experts, clinicians, lived experience experts and partners. First, perceived overall service gaps were elicited; these were then narrowed into intervention targets. A personalised action plan to manage stroke symptoms in the workplace was identified as an achievable and important target. Remaining sessions focused on developing a three-session workbook style module that could be used to create this work action plan. This module followed self-management principles, and was applicable to any time post-stroke, and at any stage of the work journey. Co-creation with people with lived experience resulted in not only a new work action plan, but also modifications to our full vocational intervention to support people any time post-stroke. Effectiveness of the full program will now be tested in an Australia wide clinical trial.

A population genomic model for measuring immune selection and predicting antigen serotypes

Myo T. Naung[1,2,3,4], Paolo Bareng[3,4], Zahra Razook[3], Balu Balan[1,2], Swapnil Tichkule[1,2], Andrew J. Guy[5], Somya Mehra[5,6], Somesh Mehra[5], Matthew Adams[7], Benson Kiniboro[8], Moses Laman[8], Inoni Betuela[8], Aaron Jex[1,2], Leanne Robinson[1,2,4,9], Shannon Takala-Harrison[7], Rory Bowden[10], Ivo Mueller[1,2,11], and Alyssa E. Barry[1,2,3,4]

1. Life Sciences, Burnet Institute, Melbourne, Victoria, Australia
2. Population Health and Immunity Division, Walter and Eliza Hall Institute of Medical Research, Parkville, Victoria, Australia
3. Department of Medical Biology, University of Melbourne, Parkville, Victoria, Australia
4. Centre for Innovation in Infectious Diseases and Immunology Research (CIIDIR), Institute of Mental and Physical Health and Clinical Translation (IMPACT) and School of Medicine, Deakin University, Geelong, Victoria, Australia
5. School of Science, RMIT University, Melbourne, Victoria, Australia
6. School of Mathematics and Statistics, University of Melbourne, Melbourne, Australia
7. Center for Vaccine Development and Global Health, University of Maryland School of Medicine, Baltimore, Maryland, United States of America
8. Vector Borne Diseases Unit, Papua New Guinea Institute of Medical Research, Madang, Papua New Guinea
9. Monash University, Melbourne, Australia
10. Advanced Genomics Facility, Walter and Eliza Hall Institute of Medical Research, Parkville, Victoria, Australia
11. Department of Parasites and Insect Vectors, Pasteur Institute, Paris, France

The design of efficacious malaria vaccines is hindered by the antigen diversity contributing to immune escape. To identify specific antigens and their polymorphisms driving immune escape, we developed a novel population genomic model that quantifies allelic turnover within a host. We used massively parallel long read targeted sequencing of P. falciparum antigen genes from clinical and asymptomatic infections of two longitudinal paediatric cohorts from Papua New Guinea. Genetic diversity was characterised in a total of 34 P. falciparum antigen genes across lifecycle stages in 2-4 consecutive infections for each of 240 children resulting in sequence data from 464 P. falciparum isolates. To identify immune escape polymorphisms, we applied a stringent variant calling pipeline, and a novel population genomic model to compare significant differences in the turnover rate of variant alleles within-hosts compared to the population. Positive hits at known immune escape polymorphisms in ama1 and the vaccine construct csp genes, in concordance with population genetic, biochemical, and structural predictions, were used to validate our model. Overall, blood-stage antigens had a higher proportion of immune escape polymorphisms (an average of 30%) than antigens expressed in other lifecycle stages (an average of 1%). Filtering the PNG sequence dataset for these polymorphisms allowed a 30-fold reduction of the diversity for each antigen gene converting an average of 124 (range: 6 - 485) genotypes to 4 (range: 1-8) predicted serotypes. This provides a framework for improving malaria vaccine design and providing a deeper understanding of immune escape in malaria.

Prevalence of orthorexia nervosa: A systematic review protocol

Tayla Eckley[1], Shae E Quirk[1], Julie A. Pasco[1,2,3,4], Mariel Messer[5], Lana J. Williams[1,2]

1. Deakin University, IMPACT - The Institute for Mental and Physical Health and Clinical Translation, Geelong, Victoria, Australia
2. University Hospital, Geelong, Victoria, Australia
3. Department of Medicine-Western Health, The University of Melbourne, St Albans, Victoria, Australia
4. Department of Epidemiology and Preventative Medicine, Monash University, Melbourne, Victoria, Australia
5. School of Psychology, Deakin University, Geelong, Victoria, Australia

Orthorexia is an emerging phenomenon characterised by a 'pervasive preoccupation with, and the consumption of a healthy diet'. While research is emerging, orthorexia is yet to be classified as a disorder in current diagnostic manuals; however, specific diagnostic criteria and several measurement tools have been developed. Existing research examined orthorexia amongst groups of 'high-risk' individuals, and currently little is known about the prevalence of orthorexia outside of these groups. We aim to review published literature on the prevalence of orthorexia in general and specialised/clinical populations. Studies will be considered eligible if they: i) report the prevalence and/or scale scores of orthorexia using existing self-report measures; and ii) are derived from a specialised (e.g., "high-risk"), clinical (e.g., acute/inpatient care), or population-based community setting. Eligible studies will be identified through a search of electronic databases. The methodological quality of eligible studies will be assessed using the JBI critical appraisal checklist for prevalence studies. If possible, a meta-analysis will be conducted. A preliminary search strategy was developed using Medical Subject Headings (MeSH) and keywords for Medline Complete, yielding 2,376 potentially relevant articles. Characteristics of eligible studies and descriptive synthesis of key findings will be presented in text and visually. Discussion of the literature will address review objectives, including discussion on potential variation of results due to any identified methodological factors. The proposed systematic review will highlight the extent to which orthorexia occurs among members of the general, and 'high-risk' populations. Findings will inform discussion regarding the classification of, and the methods used to measure this phenomenon.

Cumulative Incidence of Autism Spectrum Disorder with Longitudinal Evaluation of Neurocognition and Behaviour

Chloe Love[1, 2], Dr Katherine Drummond[4], Dr Christos Symeonides[3,6], Lada Holland[4], Dr Martin O'Hely[2, 3], Dr Samantha Dawson[3, 5], Dr Luba Sominsky[1, 2], Dr Lawrence Gray[1], Prof Peter Sly[3,7], Prof David Burgner[3,8], Prof Mimi LK Tang[3,8], Kristina Vacy[4], Prof Anne-Louise Ponsonby[3, 4, *], Prof Peter Vuillermin[1, 2, 3, *], the Barwon Infant Study Investigator Group

1. Child Health Research Unit, Barwon Health, Geelong, Australia
2. Institute of Mental and Physical Health and Clinical Translation, School of Medicine, Deakin University, Geelong, Australia
3. Murdoch Children's Research Institute, Parkville, Australia
4. Florey Institute for Neuroscience and Mental Health, Parkville, Australia
5. Food and Mood Centre, Deakin University, Geelong, Australia
6. The Minderoo Foundation, Perth, Australia
7. Child Health Research Centre, The University of Queensland, South Brisbane, Australia
8. Department of Paediatrics, University of Melbourne, Parkville, Australia
9. School of Medicine, Deakin University, Geelong, Australia

* Co-senior authors

Longitudinal data from well-defined populations incorporating prior objective and parent-reported neurodevelopmental measures are required to improve our understanding of child autism spectrum disorder (ASD). We aimed to estimate the cumulative incidence of ASD and co-occurrence with attention-deficit/hyperactivity disorder (ADHD) in the Barwon region, and estimate the prospective associations between childhood neurocognitive and behavioural measures and a subsequent ASD diagnosis. We used data from the Barwon Infant Study (BIS), a population-derived pre-birth cohort study with 1074 infants. Follow-ups occurred for 921 children at age two, 946 at age four, and 868 at age nine. Participants completed the Bayley Scale of Infant and Toddler Development and the Child Behaviour Checklist at age two, and the Strengths and Difficulties Questionnaire at age 4. At age nine, 80 parents reported that their child had been diagnosed with ASD or were under investigation. Two paediatricians verified parent-reported diagnoses using information abstracted from the participant's medical records (by CL) to confirm a paediatrician had diagnosed ASD against the DSM-5 (verification completed by October 31, 2023 (mean age 11.5 years)). The cumulative incidence of ASD in children by age 11.5 years was 74.8/1000 children, which is substantially higher than previous global estimates. Half of the children diagnosed with ASD also had ADHD. Neurodevelopmental measures at ages two and four were strongly associated with a subsequent ASD diagnosis. Now that we have defined the ASD case group within BIS, several studies are underway to understand ASD development, identify modifiable risk factors, and explore novel prevention strategies.

Drug repurposing to treat bipolar disorder using participant derived neural progenitor cells

Cassie Field[1], Bruna Panizzutti[1,] Chiara C Bortolasci[1], Briana Spolding[1], Srisaiyini Kidnapillai[1], Timothy Connor[1], Trang TT Truong[1], Zoe SJ Liu[1], Damián Hernández[1], Laura Gray[1,3], Jee Hyun Kim[1,3], Olivia M Dean[1,3,] Michael Berk[1,3,4,5,6], Ken Walder[1,].

1. Institute for Mental and Physical Health and Clinical Translation (IMPACT), School of Medicine, Deakin University, Geelong, VIC, Australia
2. Genomics Centre, School of Life and Environmental Sciences, Deakin University, Geelong, 3220, Australia.
3. Florey Institute for Neuroscience and Mental Health, University of Melbourne, Parkville, 3052, Australia.
4. Department of Psychiatry, Royal Melbourne Hospital, University of Melbourne, Parkville, 3052, Australia.

Bipolar disorder (BD) is a complex, chronic condition that impacts patients' quality of life and is difficult to manage. Most patients are prescribed multiple drugs as treatment, which has financial effects, challenges treatment adherence and increases the likelihood of side effects. The discovery of new treatments is critical to improve current options for BD. Peripheral blood mononuclear cells were obtained from participants with BD (n=8) and healthy controls (n=7) and were re-programmed into neural progenitor cells. RNA sequencing was conducted to measure global gene expression and a signature was created to describe the genes that best differentiated between participant groups. Gene expression signature data was input into Connectivity Map to identify drugs with the potential to treat BD. The gene expression signature identified 143 genes with significant differential expression between healthy controls and participants with BD (adj. $p < 0.05$). Gene set enrichment analysis identified pathways with differentially expressed genes between participant groups, including synaptic vesicle cycle, circadian entrainment, and the citric acid cycle. In-silico drug repurposing utilising Connectivity Map identified a range of drugs that affected the gene expression signature, with such effects expected to make the gene expression in BD cells look most similar to the healthy control cells. Drugs of interest from this analysis included diclofenac, pizotifen, nemonapride, resveratrol. We identified multiple drugs with the potential to be repurposed for BD. These could be promptly tested and streamlined for clinical trials, reducing time and cost in drug discovery to provide alternative treatment options for patients.

Parental mental health during preconception years and its association with offspring ADHD: A systematic review protocol

Ditty Ann Johns[1], Shae E Quirk[1], Julie A Pasco[1,2,3,4], Natalie K Hyde[1,2,5], Lana J Williams[1, 2]

1. Deakin University, IMPACT – The Institute for Mental and Physical Health and Clinical Translation, School of Medicine, Geelong VIC Australia.
2. University Hospital, Geelong VIC Australia
3. Department of Medicine -Western Health, The University of Melbourne, St. Albans, VIC, Australia
4. Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, VIC, Australia
5. Murdoch Children's Research Institute, Parkville, VIC, Australia

Attention deficit hyperactivity disorder (ADHD) is a neuropsychiatric condition prevalent in both child and adult populations, and has biomedical, psychological, and social etiological underpinnings. Currently, we are undertaking a systematic review of the available evidence on associations between parental mental health conditions and/or use of psychotropic medications and the risk of offspring ADHD. Our presentation will focus on the development of the protocol, and results to date. Studies were eligible if they were: i) population- or clinically-based cohort studies; ii) examined preconception parental mental health conditions and/or use of psychotropic medications; and iii) offspring ADHD. Relevant peer-reviewed literature was identified via electronic searching of research databases (Embase, CINAHL, Medline and PsychINFO) and grey literature was searched in ProQuest Dissertations & Theses Global. To date, a comprehensive search strategy was developed and implemented yielding a total of 20, 243 eligible records. After duplicate removal using a citation and reference management tool, a total of 15, 780 records were uploaded into Covidence for screening and full-text review. Prior to commencing screening, a pilot screening of the inclusion and exclusion criteria was undertaken. Following the screening process, critical appraisal and data extraction will be undertaken by two reviewers independently. The characteristics of the included studies, critical appraisal scores, and summary of findings (presented in text and visually) will presented in the ensuing review. This will be the first systematic review to collate and critically appraise the existing evidence investigating parental mental health conditions during the preconception years and its association with offspring ADHD.

The role of placental immune response in the origin of neurodevelopmental disorders

Md Ashik Imran[1], Craig Wright[2], Richard Williams[1], Garth Stephenson[1]

1. IMPACT Institute, School of Medicine, Faculty of Health, Deakin University, Geelong, VIC, Australia
2. School of Exercise and Nutrition Sciences, Faculty of Health, Deakin University, Geelong, VIC, Australia

Neurodevelopmental disorders encompass a diverse range of conditions characterized by atypical brain and neurological development. The early development of the fetal brain is significantly influenced by the uterine environment, primarily mediated by the placenta. Existing literature underscores the impact of maternal immune activation (MIA) on fetal neurodevelopment through inflammatory mediators such as proinflammatory cytokines. We hypothesized that MIA leads to elevated inflammatory cytokines, triggering an enhanced placental immune response that can adversely affects the developing fetal brain. To investigate the effects of MIA on placental immune response, we utilized four human placental cell models (HTR-8/SVneo, synch BeWo, BeWo, and JEG-3) exposed to IL-1a and IL-6, LPS, and Poly(I:C) for 6, 12, 24, and 48 hours. Gene expression analysis via qPCR evaluated the inflammatory response, while ELISA identified secreted cytokines. Results from BeWo and JEG-3 cells indicated that IL-1a significantly increased IL-6 mRNA expression in BeWo cells by threefold. JEG-3 cells showed a twofold increase, though this was not statistically significant. LPS triggered a 1.3-fold increase in NFkB mRNA expression, with IL-1a-treated cells showing a 1.5-fold increase, also not statistically significant. Expression of NFkb, TNFa, and IL-1a remained unchanged in IL-6 treated cells compared to controls in both cells. The findings suggest that specific proinflammatory cytokines can induce an inflammatory response in placental cells. The differential response among cell lines highlights the complexity of MIA's impact on placental function and underscores the need for further investigation into the mechanisms by which maternal inflammation influences offspring's neurodevelopmental outcomes through various inflammatory mediators.