Contents

Chapter 1

Saudi Research Idol 2021

1.1   *Vision*

Saudi Arabian Cultural Mission (SACM) in Australia is organizing this competition to provide an opportunity for Saudi students to showcase their thesis, enhance their presentation skills and gain experience to participate in future similar competitions.

1.2   *Target*

A 3-minute competition where PhD candidates and research Master students shall professionally present a snapshot about their thesis in front of referees and non-specialist audience aiming at winning the competition.

Chapter 2

Medicine and Medical Science

2.1   *Sami Khaloufah Alahmari*

PhD Student, Queensland University of Technology

Effects Of Three Different Neuromuscular Electrical Stimulation Methods On Training Volume And Neuromuscular Function

The PhD project aims to identify which NMES method (stimulation with narrow pulse duration or stimulation with wide pulse duration or stimulation with wide pulse duration plus tendon vibration) is the most effective to increase training volume (i.e. evoke the largest increase in muscular strength responses and lowest responses to fatigue) of Triceps surae muscles that can be performed during a session. This investigation will evaluate the loss of voluntary muscle strength of plantar flexion muscles after each NMES method. To achieve this, twelve healthy participants (age: 18 – 35 y), without a history of ankle injury or neurological conditions, will each be exposed to three different methods of NMES in

a random order. The experimental protocols will be introduced to each participant in three different sessions. All participants will be tested immediately before (PRE), and immediately after (POST) each condition. At the commencement of every session, four to six submaximal isometric contractions of ankle plantar flexion will be as a warm-up for the maximal voluntary isometric contractions (MVICs) (i.e., Triceps surae muscles are firing/or activating with a maximal force and tension, but there is no movement at the ankle joint). Participants will be instructed to possibly generate a force against the dynamometer arm by quickly and rigidly extending the ankle for three seconds in order to quantify rate of torque development (RTD) and peak isometric ankle plantar flexion torque (i.e., moment of a force) during MVICs before and after each condition. The area under the curve of the torque signal obtained during each NMES condition will be quantified as a measure of training volume. Triceps surae muscle excitation will be measured with high density electromyography (EMG).

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2.2   *Samaher Mohammed Alowaydhah*

<p style="text-align:center;">PhD Student, The University of Newcastle</p>

Effects Of Three Different Neuromuscular Electrical Stimulation Methods On Training Volume And Neuromuscular Function

There is an extensive body of research investigating the effects of PE across the lifespan. However, this research is disparate regarding types of exercise, including independent, supervised and group therapy,

dosage of exercise including frequency and intensity, and specific recommendations for different disease conditions. Therefore, in this systematic review we aim to collate available evidence to formulate exercise recommendations for healthy elderly and those with diseases like neurological , cognitive , depression and musculoskeletal conditions . Also, in this study we will aim to evaluate the current activity levels in retirement villages using accelerometers. This study will provide objective and reliable information about the amount of time spent engaged in various levels of activity compared to sedentary behavior. This will be complimented with qualitative information obtained from residents regarding their perceptions of their activity levels. Finally, We will use our findings from study 1 to develop an evidence-based exercise program for residents of retirement villages . We will deliver this program via a telehealth platform to ensure viability and feasibility due to the recent COVID-19 personal contact restrictions. The importance and relevance of this model of service delivery has become increasingly apparent during the lock down of aged care homes.

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2.3   *Mosa Ali Shubayr*

PhD Student, The University of Western Australia

Factors Associated With The Infection Control Behaviour Of The Dental Health Care Workers In Saudi Arabia During The COVID-19 Pandemic: Application Of The Theory Of Planned Behaviour

Objective. Dental settings could be a potential source of cross-infection. The objective of this study was to identify the important

predictors of the dental health care workers (DHCW's) intention towards COVID-19 Infection Prevention and Control (IPC) in Saudi Arabia.

Methods. An online cross-sectional questionnaire was sent to DHCW's in Saudi Arabia using convenience sampling technique. The questionnaire collected data on demographic characteristics and the 43 items from TPB construct. One-way ANOVA and t-test were used to establish factors associated with TPB construct scores. Multiple regression analyses with adjusted effects to identify the significant predictors for the intention, from the attitude, subjective norm, and perceived behavioural control variables. The significance level was set at 0.05.

Results. 324 study participants had completed the questionnaire with a response rate of 40.5%. Majority of respondents were male (59.8%), aged 25 -30 years (32.7%), followed by 31-35 years (31.2%). Only 28.4% had reported to have participated in infection control activities. With the mean of 41.60 (SD = 6.26) it was evident that the study participants had a favourable attitude towards COVID-19 IPC. The subjective norm and perceived behavioural control subscales scores were low with the mean values of 28.95 (SD=5.44) and 34.89 (SD = 6.49), respectively. The constructs of attitude towards behaviour (p < 0.001), and subjective norm (p < 0.001) significantly predicted the DHCW's intention to COVID-19 IPC behaviour and they accounted for 44.3

Conclusion. The current study suggests that the attitudes and subjective norms of DHCW's significantly predicted their intentions of COVID-19 IPC behaviour. Hence, it is recommended that comprehensive educational and training programs on infection control pertaining to COVID-19 be implemented among the DHCW's in Saudi Arabia so that their attitude and behaviour towards infection prevention be amplified.

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2.4 Ibrahim Hussian Khormi

PhD Student, University of Newcastle

Using Amide Proton Transfer To Investigate And Characterize Lesions And Normal-Appearing White Matter In Multiple Sclerosis

Conventional MRI evaluates and monitors multiple sclerosis (MS) disease that include progression, lesion load and brain atrophy. The standard MRI protocols use gadolinium contrast to differentiate between active and non-active MS lesions. Also, T2-FLAIR hyper-intensities are non-specific and might miss areas of disease activity. However, there is a safety concern with the use of gadolinium due to accumulation in the patient's brain. Amide proton transfer (APT) is a novel MRI technique capable of detecting metabolites in the brain in vivo. APT contrast relies on the exchange of mobile hydrogen of protein amide with the hydrogen contained in water. Our aim is to establish a novel MRI protocol to effectively and safely study of the MS brain.

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2.5 Sumaiah Alasmari

PhD Student, Monash University

An Investigation Of The Engagement Of Cgas-STING Signaling Upon DNA Damage In Cancer Cells

There is mounting evidence that the cGAS-STING pathway plays a critical role in the detection of DNA damage. While initially presented as an anti-tumor response, recent reports indicate that DNA damage can

lead to intrinsic STING-dependent NF-kB activation and IL-6 production, rather driving survival of the cancer cells. What differentiates these distinct STING programs and their relative occurrence across cancer cells is however poorly defined. Here, we show that DNA-damage driven by low-dose Camptothecin (CPT) results in potent STING-dependent IL-6 induction in half the cGAS-STING responsive cell lines tested, aligning with in silico analyses of the NCI-60 cell line panel. Mechanistically, we observed two distinct STING-dependent IL-6 responses to CPT. The first response was cGAS-dependent (d-cGAS), and was concurrent with limited type-I IFN response, contrasting to the response observed with transfected DNA. The second response was independent of cGAS (i-cGAS), but also associated with limited type-I IFN response. Importantly, while reducing STING-dependent IL-6 responses to CPT in both models, concurrent p38 inhibition selectively restored type-I IFN induction in cells relying on i-cGAS responses. Finally, pharmacological inhibition of STING during CPT treatment reduced colony formation in soft agar assays. Collectively, our findings demonstrate that STING plays an essential role in IL-6 production driven by mild DNA damage in STING-positive cancer cells, but that cGAS can be dispensable in some cells. Aligning with the known pro-tumorigenic effects of IL-6, our results support that STING signaling can promote survival of cancer cells exposed to DNA damage. Relying on our in vitro and in silico analyses, our findings suggest that pharmacological inhibition of STING could provide a significant therapeutic advantage when used concurrently with DNA damage therapies in up to 30% of tumors

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2.6 *Arwaf Alharbi*

PhD Student, Monash University

Defining The Immune-Modulatory Effects Of Therapeutic Oligonucleotides

Oligonucleotide-based therapeutics have become a reality, and are set to transform management of many diseases. Nevertheless, the modulatory activities of these molecules on immune responses remain incompletely defined. Here, we show that gene targeting 2-O-methyl (2OMe) gapmer antisense oligonucleotides (ASOs) can have opposing activities on Toll-Like Receptors 7 and 8 (TLR7/8), leading to divergent suppression of TLR7 and activation of TLR8, in a sequence-dependent manner. Through a screen of 192 2OMe ASOs and sequence mutants, we characterized the structural and sequence determinants of these activities. Importantly, we identified core motifs preventing the immunosuppressive activities of 2OMe ASOs on TLR7. Based on these observations, we designed oligonucleotides strongly potentiating TLR8 sensing of Resiquimod, which preserve TLR7 function, and promote strong activation of phagocytes and immune cells. We also provide proof-of-principle data that gene-targeting ASOs can be selected to synergize with TLR8 agonists currently under investigation as immunotherapies, and show that rational ASO selection can be used to prevent unintended immune suppression of TLR7. Accordingly, we propose that rational selection of TLR8-potentiating ASOs could present new opportunities in the therapeutic development of bi-functional ASOs with gene-targeting and immunostimulatory activities. Taken together, our work characterizes the immomodulatory effects of ASOs to advance their therapeutic development. doi: 10.1093/nar/gkaa523

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2.7   Abrar Arbaeen

PhD Student, The University of Sydney

Opioid Exposures In Children Under 5 Years Of Age (2004–2019): A Retrospective Study Of Calls To Australia's Largest Poisons

reasons for exposure and disposition. Methods: A retrospective analysis of paediatric (<5 years of age) opioid exposure calls to the New South Wales Poisons Information Centre (NSWPIC, Australia's largest poison centre), 2004–2019. Join point regression analysis was used to examine temporal trends. Results: There were 4807 cases of paediatric opioid exposure during the 16 year study period, with an average of 300 exposures per year. Exposures increased, 2004–2007, with an annual percentage change (APC) of 14.6% (95% CI = 4.3 to 26.0%), then decreased, 2007–2016, APC 3.4% (95% CI = 5.3 to 1.3%). A steeper decrease was observed after 2016, APC 14.1% (95% CI = 21.8 to 5.6%). The overall APC was 2.3% (95% CI = 4.7 to 0.2%), 2004–2019. Accidental exposures accounted for 86% of calls (4137). The majority of calls were from family members regarding exposures that happened at home, highlighting the need for safety initiatives. The preparations most frequently involved were paracetamol/opioid combination products (primarily codeine), 53% (2566) and ibuprofen/opioid combinations 14% (650). Twenty-two percent of cases were referred to a hospital (1062), and a further 15% (719) of calls originated from hospital staff. Conclusion: Opioid exposures in young Australian children continue to occur; however, the rate has declined since 2007. Safe storage and parent education initiatives could further reduce the burden of paediatric opioid poisoning in Australia.

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2.8   Alanoud Mohammed Aldossary

PhD Student, University of Newcastle

Facilitators and Barriers for Breastfeeding among Working Women in Saudi Arabia

Aims: This research aims to explore the facilitators and barriers of breastfeeding as perceived by Saudi women in paid employment. To contextualise Saudi women's experiences, current workplace policies related to breastfeeding and their ope-rationalisation in the local workplace environment will be examined. Also, the experiences of co-workers, line managers and employers will be sought to position women's understandings concerning their workplace culture. Finally, the views of health care professionals who work with childbearing women will be sought to increase understanding around the role the health care worker and health care services play in supporting women to initiate and continue breastfeeding after returning to paid employment. Methods: A mixed-methods design will be conducted using triangulation, where the researcher uses a single-phase design to apply quantitative and qualitative methods to gain a more detailed understanding of the area of interest. The qualitative strand of this study will explore the facilitators and barriers towards breastfeeding as perceived by women in paid employment, their co-workers, and line managers or employers. The quantitative strand has two arms. The first arm consists of an online survey with health care professionals working with pregnant and postpartum women to explore their knowledge of the health benefits of breastfeeding and current practices related to supporting women to initiate and maintain breastfeeding. The second arm consists of researcher observations, examining resources and spaces available in the workplace that support breastfeeding practices. Significance of research:

The findings from this research have the potential to increase knowledge regarding the factors that facilitate or hinder Saudi women's decision to initiate and continue breastfeeding on return to paid employment. Additionally, understanding of Saudi health care workers' current skills and knowledge base related to breastfeeding may be increased. It is conceivable, therefore, that results from this research can support the development of policies and practices that will facilitate breastfeeding initiation and duration rates amongst Saudi working women.

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2.9   Sultan Ayyadah Alanazi

<div align="center">PhD Student, The University of Queensland</div>

Improving the Management of Ankle Osteoarthritis through the development of Core Domain Set

Osteoarthritis (OA) is well-recognized as a global health burden, and a leading cause of disability worldwide. Ankle OA, a long term consequence of ankle fracture and sprains, affects over 70 million individuals globally. In light of its post-traumatic nature and common onsets earlier in the life, individuals with ankle OA live with the consequences of the condition for a considerable period of time. Individuals with end-stage ankle OA have poor quality of life and experiencing similar physical and mental disabilities to those with end-stage hip OA, radiculopathy, renal failure, and congestive heart failure. There is inconsistency and lack of guidelines in reporting outcome measures in ankle OA research which has impeded the ability to synthesise data in meta-analysis in existing ankle OA reviews. This is problematic as it restricts the ability to advance ankle OA management, may result in investigation of outcomes

that are not relevant to stakeholders (i.e. patients), and increases risk of reporting bias. Studies with similar and relevant outcome measures will allow researchers to conduct meta-analyses of primary study data; therefore, progressing evidence for the management of ankle OA. The Core Outcome Set (COS) which is ""an agreed-upon set of outcomes that should be measured and reported in clinical trials of a particular health condition"" has the potential to overcome the variation of reported outcome measures in ankle OA research. Outcome Measures in Rheumatology (OMERACT), an international leading research initiative, has established an inventory approach to develop ultimate core outcomes. There are a number of pre-requisite steps to developing core outcomes, which include establishing health-related domains (i.e. Core Domain Set) that are agreed-upon by patients and healthcare professionals and determining agreed-upon outcome measures to capture the domains.

Mixed methods approach used to develop the COS of ankle OA as follow: 1) Systematic review of outcome measures used in ankle OA research. This will enable us to record a list of potential core domains from published articles.

2) Systematic review to critique the literature to determine the reliability and validity of outcome instruments used in ankle OA research.

3) Semi-structure interviews with ankle OA patients to include their perspectives on the development process.

4) Qualitative study with healthcare professionals (e.g. clinicians and researchers) to gain their insights and experiences on managing and researching ankle OA.

5) International Delphi Survey to reach consensus on the most important domains that need to be included in the final core domain set of ankle OA.

The overarching aim of this project is to provide a rationale for development of COS and generate an evidence-based international COS for

ankle OA management research.

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2.10   *Lena Yaslam Babaeer*

PhD Student, The University of Queensland

Health Behaviours and Educational Outcomes In University Students: A Mixed-Method Study

The relationship between health behaviours (HB) and educational outcomes(EO) in university populations has received little attention in the research literature. The transition to higher education is a significant challenge for young adults and is accompanied by emotional, psychological, and financial challenges. These challenges have the potential to result in adverse outcomes in terms of HB and EO. This thesis has identified gaps in the literature that when addressed, will help to provide a better understanding of how to support Australian university students and develop tailored intervention and polices. These key gaps are summarised below: Although available evidence has examined the relationship between dietary behaviour and EO in university students, the relationship between physical activity (PA), sedentary behaviour (SB), and EO is still not clearly understood. This gap will be addressed by undertaking a systematic review evaluating the evidence about the relationship between PA, SB, and EO among university students. The relationship between HB and EO among university students is still unclear. This is because of a number of pertinent limitations and methodological issues in the evidence that is currently available. To address these gaps, and guided by the WHO framework, study 2 will use a longitudinal study to comprehensively examine these relationships among students. Given

the potential relationships between HB and EO, there is a need to support students to engage in positive HB to promote learning and academic performance. An electronic resource (the Stacks App) has been designed and developed by a UQ team to support positive students' health and study behaviours, to support learning and enhance well-being during the transition to the university environment. Study 3 will evaluate the implementation of the Stacks App using the RE-AIM framework. The association between HB and EO can be influenced by a range of factors form different level as has highlighted by the WHO framework. However, the literature has explored factors influences signal health behaviour and focused on individual-level factors. To address these gaps, study 4 will be guided by the WHO framework and use a qualitative study to obtain an in-depth understanding of these factors and association with EO among students.

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2.11   *Abdullah Alzhrani*

PhD Student, The University of Queensland

Exploring Use Of Touchscreen Mobile Devices Among Working Adults In Relation To Musculoskeletal Disorder Risk Factors: A University Case Study

The use of Touchscreen Mobile Devices (TSMD), i.e. smartphone an tablet, is common among the general public. Many of the previous studies focused on the relationship between TSMD use and musculoskeletal discomfort and poor posture, especially among young student. However, the exposure to TSMD use with respect to the musculoskeletal disorders risk factors has been rarely documented through objective measurement

in real life previously. This cross-sectional study, targeted adults. the aim was to investigate whether the use of TSMD in different arrangements (posture and location) is related to the musculoskeletal discomfort in the neck, shoulder and upper extremities based on objective data. A mobile app was used to monitor TSMD use, an activity monitor was used to monitor gross body posture and daily log was used to monitor location. Fifty-four (54) individuals participated in the study. The average age of participants was 38±10 years, with 29 female. The average time spent using TSMD was 152±91 minutes per day, with an average of 52 pick-ups per day. The findings shows that most of TSMD use occurred at home and less amount of use occurred at work and other locations. most of TSMD use occurred while sitting followed by lying, standing and walking. Younger participants spent longer time on their TSMD compared to older age groups. There was no difference between the participant by sex. TSMD use while lying down was significant predictor of musculoskeletal discomfort in the neck and shoulders. Those who reported discomfort in the neck and right shoulder spent significantly more time using their TSMD while lying compared to those who did not report discomfort. Giving the shorter duration of use at work and location other than home, TSMD use at work and other locations may not impose significant health risk. However, TSMD use at home was characterised by longer sessions of use and use while lying down. This study recommend the avoidance of TSMD use while lying as it compromise the neck and the shoulders posture due to the lack of appropriate head and hand support, and lack of proper body alignment, compared to TSMD use while sitting.

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2.12   *Rooa Abdullah Yousef Sindi*

PhD Student, Curtin University

Quantitative Measurement of Breast Density Using Personalized 3D-Printed Breast Model for Magnetic Resonance Imaging

Despite the development and implementation of several MRI techniques for breast density assessments, there is no consensus on the optimal protocol in this regard. This study aimed to determine the most appropriate MRI protocols for the quantitative assessment of breast density using a personalized 3D-printed breast model. The breast model was developed using silicone and peanut oils to simulate the MRI related-characteristics of fibroglandular and adipose breast tissues, and then scanned on a 3T MRI system using non-fat-suppressed and fat-suppressed sequences. Breast volume, fibroglandular tissue volume, and percentage of breast density from these imaging sequences were objectively assessed using Analyze 14.0 software. Finally, the repeated-measures analysis of variance (ANOVA) was performed to examine the differences between the quantitative measurements of breast volume, fibroglandular tissue volume, and percentage of breast density with respect to the corresponding sequences. The volume of fibroglandular tissue and the percentage of breast density were significantly higher in the fat-suppressed sequences than in the non-fat-suppressed sequences ($p < 0.05$); however, the difference in breast volume was not statistically significant ($p = 0.529$). Further, a fat-suppressed T2-weighted with turbo inversion recovery magnitude (TIRM) imaging sequence was superior to the non-fat- and fat-suppressed T1- and T2-weighted sequences for the quantitative measurement of breast density due to its ability to represents the exact breast tissue compositions. This study shows that the fat-suppressed sequences tended to be more useful than the non-fat-suppressed sequences for the quantitative measurements of the volume of fibroglandular tissue and the percentage of breast density.

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2.13   *Zakaria Ahmed Mani*

PhD Student, Monash University

An Exploration of Competence Among Hospital Emergency Nurses In Armed Conflict Areas: A Mixed Methods Study

This study is expected to provide evidence of emergency nurses' competence in armed conflict areas for the first time. The findings are expected to provide insights into core competencies of healthcare providers working in teams in hospitals in areas of armed conflict, define core competence of nurses in hospitals in areas of armed conflict, and analyse both stakeholder and emergency nurses perceptions of competence of nurses in hospitals in areas of armed conflict. The outcomes of the study are likely to inform the standard of care, educational, physical and psychological preparation of nurses and related disciplines for their roles and enhance quality and safe care in these regions.

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2.14   *Mohammed Abuwarwar*

PhD Student, Monash University

Novel Strategies For Targeting Cancer-Associated Fibroblasts

The tumour micro-environment (TME) contains a heterogeneous and diverse population of cells. Activated fibroblasts, referred to as cancer-associated fibroblasts (CAFs), are one of the dominant cell types found in solid tumours, and their abundance is often associated with poor prognosis, through regulation of tumour survival, angiogenesis, tissue invasion and metastasis. Moreover, despite the clinical success of immunotherapies in treating circulating hematologic cancers, they have failed to be as effective in solid tumours. A key difference between these tumour types is the presence of CAFs in TME. CAFs have also been shown to play essential roles in promoting immunosuppression and evasion from immune surveillance, by secreting cytokines and chemokines that modulate the function of immune cells in tumours. Here, we hypothesise that targeting CAFs will reverse local immune suppression and improve tumour immunotherapy. In order to test the immunosuppressive role of CAFs, we first created novel immortalised CAFs lines (iCAFs) using the PiggyBac Transposon system to introduce the simian virus 40 large antigen (SV40 LT) and a fluorescent selection marker into CAFs. We have shown that iCAFs share a similar phenotype to the primary CAFs. Using primary and immortalised CAFs from breast carcinoma, colorectal carcinoma and pancreatic ductal adenocarcinoma, we report that CAFs across major tumor types are able to potently suppress T cell proliferation in vitro. Next, we aim to knockout key targets using CRISPR technology from iCAFs to further test their involvement in T cell suppression.

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2.15   *Nader Eqaab D Alotaibi*

PhD Student, University of Adelaide

Nursing Care for Mechanically Ventilated Patients in Intensive Care Units in Saudi Arabia

Patients who are in Intensive Care Units (ICUs) and require mechanical ventilation device are at increased risk of developing Ventilator Associated Pneumonia (VAP), a serious life- threatening condition. Clinical Practice Guidelines (CPGs) have been produced which summarise recommendations to minimize the risk of developing VAP. Within those guidelines, there are a number of strategies that fall within the specific remit of nurses. This research study is investigating the adherence of ICU nurses working in Saudi Arabia to these evidence-based recommendations and what factors, if any, influence adherence.

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