Sydney Musculoskeletal, Bone & Joint Health Alliance

Annual Scientific Meeting

Friday, 9 November 2018

New Law Building Annex
The University of Sydney
Welcome

Welcome to the second Annual Scientific Meeting of the Sydney Musculoskeletal, Bone & Joint Health Alliance (SydMSK) which is being facilitated by the Faculty of Health Sciences and Sydney Medical School, Faculty of Medicine and Health. The SydMSK Alliance is an initiative born of the University of Sydney’s investment to expand research strength in musculoskeletal health across the University and affiliated institutions, partnering with Local Health Districts, Primary Health Networks and Sydney Health Partners.

SydMSK Alliance Vision

End the burden of musculoskeletal conditions.

SydMSK Alliance Mission

The Sydney Musculoskeletal, Bone and Joint Health Alliance aims to be the world leader in musculoskeletal science, research, education and treatment. Our mission is to discover new methods to prevent, manage and cure disabling musculoskeletal conditions. Together we will work collaboratively with clinicians, researchers, consumers and policy makers, and facilitate rapid translation of new knowledge into improved care and better health outcomes.

Currently our membership, of >270 staff and students, is drawn from 4 Faculties, 9 research institutes, and 4 Local Health Districts. Since 2017 we have run several successful networking and collaborative opportunities including, two annual scientific meetings; awarded 11 Musculoskeletal Enabling Research seed grant projects; as well as career development workshops.

We are fortunate to have esteemed guest keynote speakers: Professor Susan Thompson from University of New South Wales, Professor Sally Redman from the Sax Institute and Professor Roger Magnusson from University of Sydney.

A special thank you to our Scientific Meeting Sub-committee members: Professor Chris Maher, Dr Marina Pinheiro, Dr Christina Abdel Shaheed, Dr Xia Wang, Dr Premarani Sinnathurai, Dr Jane Grayson, Ms Gu Yu and Dr Alison Evans for their assistance in preparing our Scientific Meeting. Also thank you to staff and students from the Musculoskeletal Health groups at the Faculty of Health Sciences, Faculty of Medicine and Health and the Sydney School of Public Health for their time and effort given ensuring the day runs smoothly.

We hope that you enjoy the 2018 SydMSK Scientific Meeting.

SydMSK Alliance Steering Group:

Professor Joshua Burns, Professor Jim Elliott, Professor Lyn March, Professor David Hunter, Professor Chris Maher, Professor Craig Mums, Professor Andrew McLachlan, Professor Fiona Blyth, Professor Hala Zreigat, Professor Jane Latimer, Associate Professor Manuela Ferreira, Associate Professor Rory Clifton-Bligh, Dr Carmen Huckel Schneider, Dr Paula Beckenkamp, Dr Jocelyn Bowden, Dr Stephanie Mathieson, Dr Tegan Cheng, Emeritus Professor Anne Ashford and Yarie Nikolic.

Contact

Dr Alison Evans (SydMSK Alliance Project Manager)
Email: sydmsk@sydney.edu.au
Twitter: @sydmsk
Facebook: @sydneysmusculoskeletal
Web: www.sydney.edu.au/sydmsk
Invited guests

Professor Duncan Ivison
Deputy Vice-Chancellor (Research)
Professor of Political Philosophy

Professor Ivison is a political philosopher with research and teaching interests in contemporary political theory, the history of political thought and moral philosophy. Prior to this role, he was Dean of the University of Sydney’s Faculty of Arts and Social Sciences from 2010. He has also held appointments at the University of Toronto and the University of York (UK). Professor Ivison completed his BA at McGill University in Montreal, and MSc and PhD at the London School of Economics and Political Science. He was a Laurance S. Rockefeller Visiting Fellow and Visiting Fellow in Ethics and Public Affairs at the Center for Human Values, Princeton University (2002-03), as well as a Postdoctoral Fellow at the Research School of Social Sciences at the ANU (1993-96). He was elected to the Australian Academy of the Humanities in 2009. His books include: *The Self at Liberty: Political Argument and the Arts of Government* (Cornell UP, 1997); *Postcolonial Liberalism* (Cambridge UP, 2002); *Rights* (Acumen and McGill Queens Press, 2008); the *Ashgate Research Companion to Multiculturalism* (2010) and (with Paul Patton and Will Sanders) *Political Theory and the Rights of Indigenous Peoples* (Cambridge UP, 2002).

As DVC Research, Professor Ivison is responsible for helping to develop and deliver the University’s research strategy, and supporting the pursuit of outstanding fundamental and applied research across the institution. Professor Ivison is Chair of the University of Sydney Confucius Institute Board.

Professor Robyn Ward
Executive Dean
Faculty of Medicine and Health

Professor Robyn Ward AM FAHM joined the University of Sydney in July 2018 as the inaugural Executive Dean of the Faculty of Medicine and Health. She was the former Deputy Vice-Chancellor (Research) and Executive Dean (Acting) of the Faculty of Medicine of the University of Queensland.

Professor Ward is an academic leader, cancer researcher and medical oncologist. She is a member of the Pharmaceutical Benefits Advisory Committee (PBAC), chairs the Commonwealth Medical Services Advisory Committee (MSAC), and serves on the Council and Executive of the Australian Academy of Health and Medical Sciences. In 2013 she was made Member of the Order of Australia (AM) for significant service to medical research and patient care in the field of oncology.
Keynote Speakers

Professor Susan Thompson

Susan Thompson is Professor of Planning and Head of the City Wellbeing Program in the City Futures Research Centre, University of New South Wales, Sydney, Australia. With a foundation in public sector planning practice, Susan has had numerous roles at UNSW since she joined some 25 years ago. Susan’s academic career encompasses both research and teaching in social and cultural planning, qualitative research methodologies and healthy built environments. Her publications include the award-winning text book ‘Planning Australia’ and more recently, ‘The Routledge Handbook of Planning for Health and Well-Being’. 2019 will see the publication of her jointly authored book (with Dr Jennifer L Kent) ‘Planning Australia’s Healthy Built Environments’. As well as writing scholarly journal papers, Susan is a regular contributor to practitioner forums, most notably her healthy built environments quarterly column in the Planning Institute of Australia’s ‘New Planner’, now in its ninth year.

Susan’s longstanding contribution to urban planning was recognised in 2012 when she was elected Fellow of the Planning Institute of Australia and in 2015, with the awarding of the prestigious Sidney Luker Memorial Medal. Susan is one of only three women to receive the award since its inception in 1956. In 2017 she was awarded the Australian Urban Research Medal.

Professor Roger Magnusson

Roger Magnusson is Professor of Health Law & Governance at Sydney Law School, where he directs the Master of Health Law (MHL) program. He is also Adjunct Professor of Health Law at Georgetown University Law Center in Washington D.C. Roger’s research interests are in public health law and governance; law and health development; and medical law and bioethics. He was the principal author of the WHO report, Advancing the Right to Health: the Vital Role of Law (2017) and co-author of the Update and Summary Guide to this report (2018).


Roger is a member of the Scientific & Technical Expert Group that advises Public Health Division of the Pacific Community (SPC). In 2014-15 he served as Co-Chair of the Working Group on Implementation, Monitoring and Accountability for the World Health Organisation’s Commission on Ending Childhood Obesity. Roger teaches medical law, public health law, banking and finance law, and torts, at Sydney Law School.

Professor Sally Redman

Professor Sally Redman AO is the Chief Executive Officer of the Sax Institute, which was established in 2002 to forge better links between research and policy. Professor Redman is an international leader in driving the use of research in policy, programs and service delivery at the Sax Institute and in her previous role as the inaugural Director of the National Breast Cancer Centre. She recently led a National Health and Medical Research Council Centre of Research Excellence aimed at testing ways to increase the capacity of policy agencies to use research.

Professor Redman’s background is in public health and health services research and she has over 200 peer reviewed publications. In 2013, she was appointed an Officer in the Order of Australia for her distinguished service to public health and the promotion of relationships between researchers, policy makers and practitioners. She received the President’s Award from the National Heart Foundation in 2017.
### Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Lecture Theatre 101, New Law Annex Building, The University of Sydney</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.30-9.00</td>
<td>Registration</td>
</tr>
<tr>
<td></td>
<td>Foyer</td>
</tr>
<tr>
<td>9.00-9.40</td>
<td>Welcome</td>
</tr>
<tr>
<td></td>
<td>Opening Address</td>
</tr>
<tr>
<td></td>
<td>Invited Guest: Professor Duncan Ivison</td>
</tr>
<tr>
<td></td>
<td>Chair: Prof Chris Maher</td>
</tr>
<tr>
<td>9.40-10.20</td>
<td>Session 1: Plenary</td>
</tr>
<tr>
<td></td>
<td>Healthy built environments: working together to support people's health and wellbeing as part of everyday life.</td>
</tr>
<tr>
<td></td>
<td>Professor Susan Thompson</td>
</tr>
<tr>
<td></td>
<td>Professor of Planning / Head, City Wellbeing Program, Built Environment, University of New South Wales</td>
</tr>
<tr>
<td>10.20-11.00</td>
<td>Morning Tea</td>
</tr>
<tr>
<td></td>
<td>Poster Presentation Session</td>
</tr>
<tr>
<td>11.00-12.00</td>
<td>Session 2: Paper Presentations</td>
</tr>
<tr>
<td></td>
<td>Improving care for musculoskeletal conditions</td>
</tr>
<tr>
<td></td>
<td>Lecture Theatre 101</td>
</tr>
<tr>
<td></td>
<td>Chair: Dr Xia Wang</td>
</tr>
<tr>
<td>11.00-11.10</td>
<td>Effectiveness of a new model of primary care management on knee pain and function in patients with knee osteoarthritis: The PARTNER STUDY Protocol for a cluster randomised controlled trial.</td>
</tr>
<tr>
<td></td>
<td>Dr Jocelyn Bowden</td>
</tr>
<tr>
<td>11.10-11.20</td>
<td>The impact of occupational exposure on pain, function and radiographic severity in persons with base of thumb osteoarthritis.</td>
</tr>
<tr>
<td></td>
<td>Dr Sarah Robbins</td>
</tr>
<tr>
<td>11.20-11.30</td>
<td>Effect of affordable exercise-based technologies on mobility and physical activity in rehabilitation participants: The Activity and MObility UsiNg Technology (AMOUNT) rehabilitation trial.</td>
</tr>
<tr>
<td></td>
<td>Dr Leanne Hassett</td>
</tr>
<tr>
<td></td>
<td>Understanding recovery of musculoskeletal health</td>
</tr>
<tr>
<td></td>
<td>Lecture Theatre 104</td>
</tr>
<tr>
<td></td>
<td>Chair: Prof Jim Elliott</td>
</tr>
<tr>
<td>11.00-11.10</td>
<td>Defining recovery in chronic whiplash: A qualitative study.</td>
</tr>
<tr>
<td></td>
<td>Dr Trudy Rebbeck</td>
</tr>
<tr>
<td>11.10-11.20</td>
<td>Use of guidelines for whiplash: An audit of insurer and health professional practice in Australia.</td>
</tr>
<tr>
<td></td>
<td>Ms Aila Bandong</td>
</tr>
<tr>
<td>11.20-11.30</td>
<td>The effect of glucosamine and chondroitin sulfate on patellofemoral joint health in people with knee osteoarthritis: Analysis of a randomised controlled trial.</td>
</tr>
<tr>
<td></td>
<td>Ms Sarah Kobayashi</td>
</tr>
<tr>
<td></td>
<td>Understanding musculoskeletal pain</td>
</tr>
<tr>
<td></td>
<td>Lecture Theatre 024</td>
</tr>
<tr>
<td></td>
<td>Chair: Dr Christina Abdel Shaheed</td>
</tr>
<tr>
<td>11.00-11.10</td>
<td>Global Musculoskeletal Pain Policy: Coordinating and mobilising a complete body of evidence.</td>
</tr>
<tr>
<td></td>
<td>Prof Fiona Blyth</td>
</tr>
<tr>
<td>11.10-11.20</td>
<td>Development and feasibility of a cross sectional protocol to investigate brain neurochemicals in people with migraine and musculoskeletal pain.</td>
</tr>
<tr>
<td></td>
<td>Mrs Aimie Peek</td>
</tr>
<tr>
<td>11.20-11.30</td>
<td>The association between self-reported pain and functional tests in participants with CAI compared with copers and controls.</td>
</tr>
<tr>
<td></td>
<td>Mr Saeed Al Adal</td>
</tr>
</tbody>
</table>
Session 2: Paper Presentations - cont.

| 11.30-11.40 | Extensor tendon excursion in the phalanges: Clinical application to rehabilitation programmes. Mr Ray Jong | Positive recovery for low risk musculoskeletal injuries screened by the Short form - Örebro Musculoskeletal Pain Screening Questionnaire following road traffic injury: Evidence from an inception cohort study. Dr Ha Nguyen | Sleep interventions for osteoarthritis and spinal pain: A systematic review of randomized control trials. Mr Kevin Ho |
| 11.50-12.00 | | Q & A | Q & A |

12.00-1.00 Lunch

1.00-2.20 Session 3a: Plenary

| 1.00-1.40 | Knowledge mobilisation: impacting policy, practice and service delivery. Professor Sally Redman AO Chief Executive Officer, Sax Institute |
| 1.40-2.20 | Law for muscles, bones, joints and skeletons. Professor Roger Magnusson Professor of Health Law and Governance, Sydney Law School, The University of Sydney |

Intermission

2.30-3.30 Session 3b: Paper Presentations

| 2.30-2.40 | Implementation of a novel clinical PAssway of Care for common musculoskeletal disorders in primary care (PACE Musc trial): A trial protocol. Dr Kerrie Evans / Dr Trudy Rebbeck | Osteoarthritis progression following joint injury: Understanding the mechanisms and developing a cure. Dr Jiao Jiao Li | Exercise for preventing falls in community-dwelling older people: Cochrane Collaboration systematic review. Prof Cathie Sherrington |
| 2.40-2.50 | Efficacy and safety of low dose combination codeine medicines for pain: Systematic review and meta-analysis. Dr Christina Abdel Shaheed | Disruptive technology for rehabilitation following elective surgery for low back pain, knee and hip osteoarthritis: A systematic review and meta-analysis. Dr Xia Wang | Participant impressions of the CHAnGE trial: Promoting physical activity and fall prevention using health coaching and activity trackers. Ms Catherine Kirkham |
| 2.50-3.00 | Effect of two behavioural ‘nudging’ interventions on choice of management options for low back pain: A randomised vignette-based study in general practitioners. Dr Adrian Traeger | Personalised 3D printing ankle-foot orthoses. Ms Elizabeth Wojciechowski | The influence of family history on prognosis of spinal pain and the role of leisure time physical activity and body mass index: Family-linkage data from the Norwegian HUNT Study. Ms Anita Barros Carlos de Amorim |
**Session 3b: Paper Presentations - cont.**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00-3.10</td>
<td>Combination drug therapy for the management of low back pain and sciatica; systematic review and meta-analysis.  Dr Stephanie Mathieson</td>
<td>Sensitive and simultaneous quantitative analysis of metabolites of boswellia serrata extract, curcumin, pine bark extract for osteoarthritis in human plasma by UHPLC-MS/MS.  Ms Xiaoqian Liu</td>
<td>Active women over 50 RCT: Preliminary results.  Ms Geraldine Wallbank</td>
<td></td>
</tr>
<tr>
<td>3.10-3.20</td>
<td>The use and outcome of local anaesthetic painkilling injections in athletes: A systematic review.  Dr Mohammad Jomaa</td>
<td>A comparative study of knee acoustic emission analysis and patient-reported outcome measures (PROMS).  Mr James Spinks</td>
<td>Effect of a combined physical activity and fall prevention intervention on older adults' physical activity levels and mobility-related goals: Randomised controlled trial.  Ms Juliana Souza de Oliveira</td>
<td></td>
</tr>
<tr>
<td>3.20-3.30</td>
<td>Q &amp; A</td>
<td></td>
<td>Q &amp; A</td>
<td></td>
</tr>
<tr>
<td>3.30-4.00</td>
<td><strong>Afternoon tea</strong></td>
<td><strong>Poster Presentation Session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00-5.00</td>
<td><strong>Session 4: Musculoskeletal Enabling Research Grants (MSK ERG) 2017 Update</strong></td>
<td><strong>Chair: Prof Lyn March</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00-4.10</td>
<td>Healthy ageing promotion in middle age with physical activity: intervention development with multidisciplinary input and rapid evidence review.  Prof Cathie Sherrington</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.10-4.20</td>
<td>The KOMPACT-P study: Knee Osteoarthritis Management with Physiotherapy informed by Acceptance and Commitment Therapy- Pilot trial.  Mrs Marie March</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.20-4.30</td>
<td>A feasibility study evaluating the use of heat wrap therapy for acute low back pain (LBP).  Dr Christina Abdel Shaheed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.30-4.40</td>
<td>E-health to empower patients with musculoskeletal pain in rural Australia: a pilot study.  EMPoweR study  Mr Carlos Ivan Mesa Castrillon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.40-4.50</td>
<td>Novel synthetic tendon for the repair and regeneration of rotator cuff tendon  Dr Young Jung No</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.50-5.00</td>
<td>Preventing Osteoporosis in Patients with Acute Spinal Cord Injury  Dr Christian Girgis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.00-5.15</td>
<td><strong>Intermission</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.15-5.30</td>
<td>Announcement of prizes and closing address  Invited guest: Professor Robyn Ward  Chair: Prof Joshua Burns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.30–6.30</td>
<td>Cocktail reception  Foyer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Useful information

Visitors using a wireless-enabled device like a laptop, tablet or phone, can use the University’s guest wireless network to connect to the internet.

See Registration desk for login details to connect to the UniSydney-Guest network.
ABSTRACTS

PAPER PRESENTATION
SESSIONS

(in alphabetical order by first author)
Efficacy and safety of low dose combination codeine medicines for pain: Systematic review and meta-analysis.

Christina Abdel Shaheed¹, Chris Maher¹, Andrew McLachlan²

¹ Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney
² School of Pharmacy, Faculty of Medicine and Health, Pharmacy and Bank Building A15, University of Sydney

Background
Low dose combination codeine medicine are commonly used for pain, however there is a paucity of evidence regarding their effectiveness and safety.

Aims
To investigate the efficacy and safety of low-dose codeine combination analgesics for pain.

Methods
We searched electronic databases for eligible RCTs. Two authors extracted data and assessed risk of bias. Data were pooled using a random effects model with strength of evidence assessed using GRADE.

Primary outcome was immediate pain relief (3-hours post-administration) on the 0-100 visual analogue scale.

Results
Nine RCTs were eligible. There is low quality evidence that a single-dose of low-dose combination codeine medicines provides small pain relief for acute dental pain; mean difference (MD) [95% CI] -12.7 [-18.5, -6.9] and moderate quality evidence of small pain relief for post-episiotomy pain and orthopaedic surgery pain; MD [95% CI] -10.0 [-19.0, -1.0] and -11.0 [-20.7, -1.3] respectively. There is moderate quality evidence that a multiple-dose regimen provides moderate pain relief for hip OA; -19.0 [-31.2, -6.8] and temporomandibular joint pain; -26.0 [-44.5, -7.5]. One study reported a higher incidence of drowsiness in the treatment group compared with the placebo group RR [95%CI] 19.3 [1.2, 306.5].

Conclusion
There is low to moderate level evidence that combination codeine medicines provide small to moderate pain relief for acute and chronic pain conditions (e.g. dental pain, hip OA and temporomandibular joint pain). There are limited data on use beyond 24-hours, and on safety. Further research examining typical use of these medicines is needed as well as better capture of safety data.

Keywords
codeine; pain; safety; efficacy; meta-analysis.

Funding and Conflict of Interest
This work received funding from the Therapeutic Goods Administration. AJM received support from GlaxoSmithKline for a PhD scholarship, and AJM and CGM received support from GlaxoSmithKline for the PACE trial.

Address for correspondence
Dr Christina Abdel Shaheed, Faculty of Medicine and Health, School of Public Health, Institute for Musculoskeletal Health, University of Sydney, Missenden Road, Sydney, NSW, 2050; Email: christina.abdelshaheed@sydney.edu.au
The association between self-reported pain and functional tests in participants with CAI compared with copers and controls.

Saeed Al Adal, Martin Mackey, Fereshteh Pourkazemi, Claire Hiller
Faculty of Health Sciences, University of Sydney

Background
More than 50% of people with ankle sprain have reported residual impairments of chronic ankle instability (CAI) with 66% of these self-reporting pain up to 7 years post injury. No study has used quantitative pain measures or investigated the impact of pain in people with CAI.

Aims
To investigate if the presence of pain affected measures associated with impairments of CAI and pain sensitization compared to people with CAI and no pain, copers and controls.

Methods
115 participants were allocated to one of four groups; CAI with pain, CAI without pain, coper, and control. Participants reported level of instability, pain and function. The blinded examiner tested recognition, balance, function, and pain tests on one leg. One-way ANOVA compared the difference between groups with post hoc tests if significant.

Results
Mean pain level was 3/10, occurred more during sports, once a month, and extended between a couple of hours to one day. Participants with CAI showed a decreased lunge test, decreased Star excursion balance test in the anterior direction, and a higher number of foot lifts during single leg stance. Participants with CAI with pain had the lowest score on the FAAM questionnaire. If pain ≥5/10, they had negative results on recognition, balance, and pain threshold tests.

Conclusion
Participants with CAI and pain did not differ from those without pain. Participants with higher pain levels did have worse results on more tests. Future studies should investigate other pain quantitative sensory tests in participants with CAI and high pain levels.

Keywords
pain; ankle injury; functional test; sensitization; balance.

Funding and Conflict of Interest
None.

Address for correspondence
Saeed Al Adal, Musculoskeletal Health, Faculty of Health Sciences, University of Sydney, 75 East St Lidcombe NSW 2141;
Email: sala7451@uni.sydney.edu.au
The influence of family history on prognosis of spinal pain and the role of leisure time physical activity and body mass index: Family-linkage data from the Norwegian HUNT Study.

Anita B. Amorim¹, Paulo H. Ferreira¹, Manuela L. Ferreira², Ragnhild Lier², Milena Simic³, Evangelos Pappas¹, Joshua R. Zadro³, Paul Jarle Mork⁴, Tom Ivar Lund Nilsen⁴

¹ Discipline of Physiotherapy, The University of Sydney
² Sydney Medical School, The University of Sydney
³ School of Public Health, The University of Sydney
⁴ Department of Public Health and Nursing, Norwegian University of Science and Technology

Background
Spinal pain is a major cause of disability, and parental pain could negatively influence the prognosis of spinal pain in offspring.

Aims
To investigate the influence of parental chronic spinal pain on prognosis of chronic spinal pain in adult offspring, and whether offspring physical activity level and body mass index (BMI) modified this association.

Methods
We used family linked longitudinal data from the Norwegian HUNT study collected in HUNT2 (1995-97) and HUNT3 (2006-08). A total of 1,529 offspring who reported spinal pain in HUNT2 were linked with parental data and followed-up in HUNT3. We estimated relative risk (RR) with 95% confidence intervals (CIs) for recovery from chronic spinal pain, and also from activity limiting spinal pain, in offspring related to chronic spinal pain in parents. We also investigated whether offspring leisure time physical activity and BMI modified these intergenerational associations in spinal pain.

Results
Offspring with both parents reporting chronic spinal pain were less likely to recover from chronic spinal pain (RR: 0.83, 95% CI: 0.69, 0.99) and activity limiting spinal pain (RR: 0.71, 95% CI: 0.54, 0.94), compared to offspring of parents without chronic spinal pain. Analyses stratified by BMI and physical activity showed no strong evidence of effect modification on these associations. However, offspring who were overweight/obese and with both parents reporting spinal pain had particularly low probability of recovery from activity limiting spinal pain, compared those who were normal weight and had parents without spinal pain (RR: 0.57, 95% CI: 0.39-0.84).

Conclusion
Offspring with chronic spinal pain are less likely to recover if they have parents with chronic spinal pain, particularly if offspring are overweight/obese.

Keywords
low back pain; neck pain; obesity; family study; physical activity.

Funding and Conflict of Interest
This research was supported by a grant from the Department of Public Health and Nursing, Norwegian University of Science and Technology, Trondheim, Norway. However, this funding source had no role in the study’s design, data collection, analysis, interpretation of the data, or the decision to submit the paper for publication. No conflict of interest declared.

Address for correspondence
Anita B Amorim, Faculty of Health Sciences, The University of Sydney, 75 East Street, Lidcombe, Sydney NSW 1825;
Email: abar3926@uni.sydney.edu.au
Use of guidelines for whiplash: An audit of insurer and health professional practice in Australia.

Aila Nica Bandong1,2, Andrew Leaver1, Martin Mackey1, Rodney Ingram1, Samantha Shearman1, Christen Chan1, Ian D Cameron2, Niamh Moloney4, Rebecca Mitchell5, Eoin Doyle4, Emma Leyten4, Trudy Rebbeck1,3

1 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
2 Department of Physical Therapy, College of Allied Medical Professions, University of the Philippines
3 John Walsh Centre for Rehabilitation Research, Royal North Shore Hospital
4 Faculty of Medicine and Health Sciences, Macquarie University
5 Australian Institute of Health Innovation, Macquarie University

Background
Clinical practice guidelines have been consistently developed and implemented along with legislative changes to improve access to treatment and outcomes after whiplash injury.

Aims
To investigate insurer and health professional adherence with key guideline recommendations and to explore factors related to adherence.

Methods
Observational study involving an audit of 288 claimant files from 4 insurance providers in NSW. Data were extracted from all available sources (e.g. claim forms, reports) and analysed using descriptive statistics and correlation analysis.

Results
General practitioner consultation occurred ~4 days, and physical treatment ~25 days after injury. Rates of x-ray were low (21.5%) and most claimants received active treatments (e.g. exercise, 90%; advice, 80.5%). However, there were high rates of specialised imaging (e.g. MRI, 45.8%) and passive treatments (e.g. manual therapy, 94.0%) observed. Practices were not compliant with using prognostic tools to assess risk of non-recovery (e.g. Neck Disability Index, 12.8%). More than half of the claimants (59.0%) were referred to other professionals, with only 14% of these referrals to whiplash specialists, and mostly occurring after recommended timeframes. Having legal representation and full accepted claim were associated with higher levels of medical visits and imaging (p 0.21 to 0.3; p<0.01).

Conclusion
There is evidence of adherence to some guideline recommendations but there are practices (i.e. unnecessary imaging, overuse of passive treatments, and underutilisation of whiplash specialists) that might lead to poor outcomes and greater costs. Alternate implementation strategies need to be considered to change practice and improve outcomes for people with whiplash.

Keywords
guideline adherence; professional practice; primary care; insurance audits; whiplash injury.

Funding and Conflict of Interest
This study was supported by funding from the State Insurance Regulatory Authority of NSW, Australia. Aila Bandong is supported by scholarships from the University of the Philippines Expanded Modernization Program - Doctoral Studies Fund and the University of Sydney Non-established Postgraduate Award. Trudy Rebbeck is funded by a University of Sydney SOAR Fellowship.

Address for correspondence
Aila Nica Bandong, Musculoskeletal Lab, Faculty of Health Sciences, The University of Sydney, 75 East Street, Lidcombe, NSW, 2141;
Email: aban9213@uni.sydney.edu.au
Global musculoskeletal pain policy: Coordinating and mobilising a complete body of evidence.

Fiona M Blyth\(^1\), Carmen Huckel Schneider\(^2\), Lyn M March\(^3\)

\(^1\) Centre for Education and Research on Ageing, University of Sydney
\(^2\) Menzies Centre for Health Policy, University of Sydney
\(^3\) Institute of Bone and Joint Research, University of Sydney

Background
Within the last decade or so, important signals have emerged about the burden of chronic musculoskeletal pain at the global population level. However, there has been a limited policy response to this signal.

Aims
To (i) present a summary current understanding of the global burden of musculoskeletal pain, (ii) identify gaps in this evidence base, and (iii) assess the implications of (i) and (ii) for effective policy development to address the global burden of musculoskeletal pain.

Methods
Narrative review.

Results
Disability burden from musculoskeletal pain conditions, notably low back pain and neck pain, has been identified as a leading global cause of Years Lived with Disability within the Global Burden of Disease Study for several years. However, this represents an underestimation of the likely true size of the burden due to several factors, including poor case definitions and suboptimal coding capture of relevant conditions. Risk factors for the burden of musculoskeletal pain are also poorly defined and measured.

Conclusion
While the evidence base related to the global burden of musculoskeletal pain provides a basis for a policy response, the evidence bases around causes and risk factors for this burden, and corresponding policy responses, are fragmented, and require an organised global effort to build collate and synthesise for policy relevance.

Keywords
musculoskeletal pain; global health; burden of disease; low back pain; health policy.

Funding and Conflict of Interest
No conflicts of interest.

Address for correspondence
Fiona Blyth, CERA, University of Sydney, Concord Hospital, Sydney, NSW, 2139; Email: Fiona.blyth@sydney.edu.au
Presence of type 2 diabetes predicts chronic neck/shoulder pain.

Ana Paula M. C. Carvalho-e-Silva¹, Paulo H. Ferreira¹, Manuela Ferreira², Alison R. Harmer¹

¹ Musculoskeletal Health Research Group, Faculty of Health Sciences, The University of Sydney
² Institute of Bone and Joint Research, The Kolling Institute, Sydney Medical School, The University of Sydney

Background
People with type 2 diabetes commonly present hyperglycaemia, which may increase the concentration of circulating cytokines and the accumulation of advanced glycation end products in tissue. This may lead to chronic musculoskeletal pain and joint mobility limitations. Few studies investigated the longitudinal relationship between type 2 diabetes and chronic musculoskeletal pain.

Aims
To investigate whether type 2 diabetes is a risk factor for chronic musculoskeletal pain using baseline (2006-2010) and follow-up (2014-2016) from UK Biobank data.

Methods
Type 2 diabetes was self-report. We excluded those who reported type 1 or gestational diabetes and/or using insulin within their first year of diabetes diagnosis. Chronic musculoskeletal pain was determined if participants had experienced musculoskeletal pain that had interfered with usual activities in the last month and had been present for at least 3 months. Participants pain-free at baseline were included. Regression models were adjusted for age, gender, body mass index, physical activity, smoking status, cardiovascular, rheumatologic and mental health diseases.

Results
Were included 19,933 participants [61.60(7.02) age; 52.06% female], prevalence of type 2 diabetes was 4.61% (n=777). Unadjusted model analyses revealed that type 2 diabetes was associated with chronic hip (OR=1.56, 95%CI 1.08 to 2.26) and neck/shoulder pain (OR=1.81, 95%CI 1.32 to 2.47), but not with back pain (OR=1.37, 95%CI 0.97 to 1.95) or knee pain (OR=1.27, 95%CI 0.87 to 1.83). In the adjusted models, only neck/shoulder pain remained significant (OR=1.37, 95%CI 1.01 to 1.89).

Conclusion
Results suggested that type 2 diabetes is a risk factor for chronic neck/shoulder pain but not for chronic back, knee and hip pain.

Keywords
musculoskeletal pain; type 2 diabetes; back pain; neck/shoulder pain; knee pain.

Funding and Conflicts of Interest
None.

Address for Correspondence
Ana Paula M. C Carvalho-e-Silva, Faculty of Health Sciences, The University of Sydney, 75 East Street, Lidcombe, Sydney NSW 2141; Email: amou6759@uni.sydney.edu.au

Kerrie Evans1, Trudy Rebbeck1,2, Paulo Ferreira3, Milena Simic4, Ana Moura Campos Carvalho-e-Silva5, Ian Cameron9, Michele Sterling10, Michael Nicholas1, Lyndal Trevena2, Darren Beales4, Luke Connelly9, Kathryn Refshauge1, Carrie Ritchie4, Gwendolen Jull10, Kim Bennell11, Manuela Ferreira12, Nadine Foster13, Paul Hodges14, Timothy Shaw15

1 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
2 John Walsh Centre for Rehabilitation Research, Kolling Institute, The University of Sydney
3 Rehabilitation Medicine, Faculty of Medicine, The University of Sydney
4 Recovery Injury Research Centre, NHMRC Centre of Research Excellence in Recovery Following Road Traffic Injuries
5 Faculty of Health and Behavioural Sciences, The University of Queensland.
6 Pain Education Unit, Pain Management Research Institute, Northern Clinical School, The University of Sydney
7 Discipline of General Practice, Sydney School of Public Health, The University of Sydney
8 School of Physiotherapy and Exercise Science, Curtin University
9 Centre for the Business and Economics of Health, Queensland Brain Institute, The University of Queensland
10 Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland
11 Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, School of Health Sciences, The University of Melbourne
12 Institute of Bone and Joint Research, Kolling Institute, The University of Sydney
13 Arthritis Research UK Primary Care Centre, Research Institute for Primary Care and Health Sciences, Keele University, UK
14 School of Health and Rehabilitation Sciences, The University of Queensland
15 Research in Implementation Science and eHealth, Faculty of Health Sciences, The University of Sydney

Background
Musculoskeletal disorders such as low back pain, neck pain and knee OA are the highest disease burden in Australia. These disorders are largely managed by primary health care professionals. Costs escalate when people with these disorders don’t recover and are sent for unnecessary investigations and referrals. To address this burden, guideline-based health messages need to be conveyed effectively, using a more efficient model of service delivery.

Aims
To describe the trial protocol which aims to implement a novel stratified clinical pathway of care for musculoskeletal disorders and evaluate the effect on health outcomes and cost.

Methods
Patients (n=1132) with low back pain, knee OA, or neck pain undergo baseline assessment of risk of persistent disabling pain. Participants will be randomised to usual care or the stratified clinical pathway of care. Those randomized to the pathway will receive care matched to risk. Low risk participants will be directed to a musculoskeletal e-hub which will bring together existing guideline-based resources and websites. Their nominated health care professional will be informed of the risk status, provided with education regarding the e-resources and advised not to over treat. At risk patients will be referred to an expert musculoskeletal clinician, who will provide a more complex assessment and decide on the care pathway. The primary outcome will be health related quality of life (SF12) at 12 months.

Results/Conclusion
Implementation of this clinical pathway of care will reduce disability associated with musculoskeletal disorders, be cost-effective and improve the efficiency of the current health care system, by reducing unnecessary imaging and referrals, and providing timely access to appropriate care when needed.

Keywords
primary health care; musculoskeletal pain; decision support systems; clinical pathways.

Funding and Conflict of Interest
This study is supported by an NHMRC Project Grant APP1141377 $1.5m 2018-2022. Trudy Rebbeck and Paulo Ferreira are funded by a University of Sydney SOAR Fellowship. Paulo Ferreira is funded by an NHMRC Career Development Fellowship.

Address for correspondence
Kerrie Evans, Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney, 75 East Street, Lidcombe, NSW, 2141;
Email: Kerrie.evans@sydney.edu.au
Defining Recovery in Chronic Whiplash: A Qualitative study.

Griffin, AR.,1,2 Moloney, N.,2 Leaver, A.,1 Jagnoor, J.2,4, Michaleff, Z.4,5,6 Lin, C.,5 Rebbeck, T.1,2

1 Faculty of Health Sciences, The University of Sydney
2 John Walsh Centre for Rehabilitation Research, Royal North Shore Hospital
3 Faculty of Medicine and Health Sciences, Macquarie University
4 The George Institute for Global Health, The University of Sydney
5 Sydney Medical School, The University of Sydney
6 Arthritis Research UK Primary Care Centre, Keele University

Background
Recovery following whiplash is poor, and current measures of recovery do not appear to reflect actual patient experience. The most commonly utilised outcome measures assess pain intensity and disability, but the relevance of these measures to people with whiplash, and the meaning of recovery as perceived by these people, has yet to be explored.

Aims
The aim of this study was to develop an in-depth understanding of the meaning of recovery to people with whiplash by exploring the perceptions of people with chronic whiplash, and their treating physiotherapists.

Methods
This was a qualitative study consisting of in-depth semi-structured interviews. Interviews were conducted with 13 participants with whiplash and 7 physiotherapists. Participants were asked what recovery meant to them, and perceptions around barriers and facilitators to recovery were explored.

Results
Both patients and physiotherapists perceived recovery to be defined within the themes of pain, function and emotional wellbeing. In addition, patients identified self-perception to be important in defining recovery, whilst physiotherapists identified ownership on the part of the patient, and the multidimensional nature of recovery, as important. Several themes relating to barriers and facilitators to recovery were identified, including personal and social characteristics, and the therapeutic relationship.

Conclusion
Recovery is a multidimensional and complex construct. In addition to pain intensity and disability, our measurement and conceptualization of recovery should focus on emotional wellbeing, self-perception, and the cultural values and beliefs of the individual. A positive and empowering therapeutic relationship, with attention to psychological and social influences, appears important in facilitating perceived recovery.

Keywords
whiplash injuries; recovery of function; qualitative research; musculoskeletal pain; interview.

Funding and Conflict of Interest
Nil.

Address for correspondence
Ms Alexandra Griffin, Faculty of Health Sciences, The University of Sydney, 75 East St, Lidcombe, NSW, 2141;
Email: agr3036@uni.sydney.edu.au
The Use and Outcome of Local Anaesthetic Painkilling Injections in Athletes: A Systematic Review.

Sinem Gultekin¹, Dr Mohammad Jomaa², Dr Rebekah Jenkin³ and Dr John Orchard²

¹ Sydney Medical School, The University of Sydney
² School of Public Health University of Sydney
³ School of Medical Sciences, The University of Sydney

Background

The use of local anesthetic painkilling injections to improve player availability is common practice in elite-level sport.

Aims

To document the published use of local anesthetic injections in sport, according to number of injections, sites of injections and complications reported.

Methods

A systematic search of Medline, Embase, CINAHL, AMED, Cochrane Database of Systematic reviews, SportDiscus, EBSCO Host and Google Scholar.

Results

1970 local anesthetic injections reported on 540 athletes in 10 studies (from Rugby League, American Football, Australian Football and Soccer) were reviewed. The most common areas of injection were: the acromioclavicular (A/C) joint; hand (including fingers); sternoclavicular joint (including sternum); rib injuries; and iliac crest contusions.

Discussion

This review found some evidence of long-term safety for a limited number of injection sites (e.g. A/C joint) and some evidence of immediate complications and harmful long-term consequences for other sites. The quality of evidence is not high with little long-term data and a lack of independent verification of the effects of the injections. Ideally, long term follow-up should be conducted to determine whether these injections are safe; with follow-up undertaken independently of the treating doctor and team.

Conclusion

Based on the paucity of publications, there is some evidence of long-term safety; however, there is a lack of clear proof of either absolute safety or long-term harm for many of these procedures. Doctors and players in professional sport should proceed with caution in using local anesthetic injections.

Keywords

local anaesthetic; injection; athlete; sport; painkilling.

Funding and Conflict of Interest

Nil for all authors.

Address for correspondence

Dr Mohammad Jomaa. University of Sydney School of Public Health. Sports Medicine at Sydney University, Cnr Western Ave & Physics Road, University of Sydney, 2006; Email: jomaa@doctors.org.uk
Effect of affordable exercise-based technologies on mobility and physical activity in rehabilitation participants: The Activity and MObility UsiNg Technology (AMOUNT) rehabilitation trial.

Hassett L\textsuperscript{1,2}, van den Berg M\textsuperscript{3}, Lindley R\textsuperscript{4}, Crotty M\textsuperscript{3}, McCluskey A\textsuperscript{2}, van der Ploeg H\textsuperscript{1,5}, Smith S\textsuperscript{6}, Schurr K\textsuperscript{7}, Sherrington C\textsuperscript{1} on behalf of the AMOUNT rehabilitation trial team.

\textsuperscript{1} School of Public Health, The University of Sydney
\textsuperscript{2} Faculty of Health Sciences, The University of Sydney
\textsuperscript{3} Department of Rehabilitation, Aged and Extended Care, Flinders University
\textsuperscript{4} Westmead Clinical School, The University of Sydney
\textsuperscript{5} Department of Public & Occupational Health and Amsterdam Public Health Research Institute, VU University Medical Center Amsterdam
\textsuperscript{6} Coffs Harbour campus, Southern Cross University
\textsuperscript{7} South Western Sydney Local Health District

Background
Exercise-based technologies may enable a higher dose of task-specific practice and improve rehabilitation outcomes; however, effectiveness is currently uncertain.

Aims
To evaluate the effect of the addition of exercise-based technologies to usual care on mobility and physical activity (operationalised as time spent upright) in people with mobility limitations admitted to inpatient rehabilitation compared to usual care alone.

Methods
A pragmatic, assessor-blinded, parallel-group randomised trial of 300 rehabilitation inpatients. The intervention group received exercise-based technologies prescribed by a physiotherapist to target mobility and physical activity for 6 months. Technologies included video and computer games/exercises, tablet applications and activity monitors. The control group received no additional intervention and both groups received usual rehabilitation care. Co-primary outcomes were mobility (Short Physical Performance Battery, 0-3 continuous score, CSPS) and time spent upright (proportion of the day spent upright using activPAL) at 6 months.

Results
Participants (mean age 74, SD 14; 50% female) received on average 12 (SD 11) inpatient sessions using 4 (SD 1) different technologies and 15 physiotherapy contacts to support technology use in the post-hospital phase. At 6 months mobility was significantly improved in the intervention group compared to the control group (mean CSPS between-group change score 0.2 points; 95% CI 0.1 to 0.3; p=0.006), however time spent upright was similar between groups (mean between-group difference proportion of the day spent upright: -0.2, 95%CI -2.7 to 2.3; p=0.87).

Conclusion
Exercise-based technologies, targeting specific mobility limitations and promoting physical activity, in addition to usual rehabilitation improved mobility but not time spent upright.

Keywords
technology; rehabilitation; mobility; physical activity; exercise.

Funding and Conflict of Interest
An Australian National Health and Medical Research Council Project Grant (APP1063751) supported this work. Nil conflict of interest to declare.

Address for correspondence
Dr Leanne Hassett, School of Public Health/Faculty of Health Sciences, The University of Sydney, Level 10, King George V Building, Missenden Rd, Camperdown, Sydney, NSW, 2050; Email: leanne.hassett@sydney.edu.au
Sleep interventions for osteoarthritis and spinal pain: A systematic review of randomized control trials.

Ho KK\(^1\), Ferreira PH\(^1\), Pinheiro MB\(^1\), Aquino Silva D\(^2\), Miller C\(^3\), Grunstein R\(^3\), Simic M\(^1\)

\(^1\) The University of Sydney, Faculty of Health Sciences
\(^2\) Universidade Federal de Minas Gerais, Departamento de Fisioterapia, Belo Horizonte
\(^3\) CIRUS, Centre for Sleep and Chronobiology, Woolcock Institute of Medical Research, University of Sydney and Sydney Health Partners

Background
Insomnia symptoms are highly prevalent in people with osteoarthritis and/or spinal pain. Management of comorbid insomnia may improve health outcomes of these patients.

Aims
To determine if sleep interventions improve pain and sleep in people with osteoarthritis and/or spinal pain.

Methods
Medline, Embase, AMED, PsycINFO, CENTRAL, CINAHL and PEDro were searched from their inception date to July 2017. Keywords relating to “sleep”, “osteoarthritis”, “spinal pain”, and “randomized controlled trial” were combined. Included RCTs investigated the use of sleep interventions for people with osteoarthritis and/or spinal pain, and measured at least one sleep and health related outcome. Meta-analyses were performed to pool mean differences for pain and sleep quality. PROSPERO: CRD42016036315.

Results
Of 1445 unique records, 24 studies were included. Studies included participants with spinal pain (n=16), osteoarthritis (n=7), and both (n=1). Sleep interventions included established sleep interventions (cognitive behavioral therapy and pharmacological interventions), pillows, exercise, massage, singing bowls, acupuncture, and mattresses. Thirteen studies were of moderate to high quality (PEDro≥6/10). Due to high heterogeneity between studies we also performed sub-group and sensitivity analyses. Established sleep interventions decreased insomnia severity index for people with low back pain (pooled mean difference: -6.78/28, 95% CI: [-9.47, -4.09], \(I^2=40\)%) and osteoarthritis (-2.41, [-4.19, -0.63], 0%). However established sleep interventions decreased pain for people with low back pain (pooled mean difference: visual analogue scale -12.77/100, 95% CI: [-17.57, -7.97], \(I^2=0\%)\), but not osteoarthritis (-2.32, [-7.18, 2.54], 27%).

Conclusion
Established sleep interventions improve sleep and pain for people with low back pain, but improve only sleep for people with osteoarthritis.

Keywords
osteoarthritis; spinal; sleep; pain; systematic review.

Funding and Conflict of Interest
None.

Address for correspondence
Mr. Kevin Ho, The University of Sydney, Faculty of Health Sciences, 75 East Street, Lidcombe, NSW, 2141; Email: kevin.ho@sydney.edu.au
Effectiveness of a new model of primary care management on knee pain and function in patients with knee osteoarthritis: THE PARTNER STUDY
Protocol for a cluster randomised controlled trial.

David J Hunter1,2, Rana S Hinman3, Jocelyn L Bowden1, Thorlene Egerton2, Andrew M Briggs4, Stephen J Bunker5, Andrew B Forbes6, Simon D French7, Jessica Kasza6, Marie Pirotta8, Deborah J Schofield9, Nick A Zwar10, Kim L Bennell3 and the PARTNER Study Team.

1 Institute of Bone and Joint Research, Kolling Institute, University of Sydney, Sydney; 2 Rheumatology Department, Royal North Shore Hospital, Sydney; 3 Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, The University of Melbourne, Melbourne; 4 School of Physiotherapy and Exercise Science, Curtin University, Perth; 5 Medibank, Docklands, Melbourne; 6 Biostatistics Unit, School of Public Health and Preventive Medicine, Monash University, Melbourne; 7 School of Rehabilitation Therapy, Queen’s University, Kingston, Ontario, Canada; Department of Chiropractic, Faculty of Science and Engineering, Macquarie University, Sydney; 8 Department of General Practice, The University of Melbourne, Melbourne; 9 Department of Economics, Macquarie University, Sydney; 10 School of Medicine, University of Wollongong, Wollongong.

Background
Everyday care of Australians with osteoarthritis (OA) is inconsistent with recommended guidelines. A new primary care model of service delivery (PARTNER model) has been developed to increase uptake of key non-surgical clinical recommendations for OA management.

Aims
To implement and evaluate the new model compared to usual care in NSW and Victoria.

Methods
A two-arm, cluster randomised controlled trial, with quantitative, qualitative and economic evaluations will be undertaken. We will randomise 44 general practices and recruit 572 patients with knee OA. Patients will be aged ≥45 years, and have knee pain ≥4/10 for more than three months. Primary outcomes are change in pain and function at 12 months. The intervention will provide training to GPs to promote more effective OA management. Their patients will have an initial GP visit and 12-month ongoing support by a centralised multidisciplinary PARTNER Care Support Team (CST). The CST are trained in behaviour change and evidence-based OA management. Patients will receive tailored educational materials, a leg strengthening program, and access to a weight-loss program if appropriate.

Results
Our service delivery model is underpinned by models of chronic care and behaviour change, and informed by broad stakeholder input. A mixed methods process evaluation will be undertaken to assess intervention fidelity, understand the process of implementation, identify contextual influences on scalability and sustainability, and to identify cost considerations for scaling up the intervention. ACTRN12617001595303.

Conclusion
This project will fill a major evidence-to-practice gap in primary care management of OA, a major Australian public health burden.

Keywords
primary care; knee osteoarthritis; model of service delivery; RCT; clinical trial.

Funding and Conflict of Interest
Funded by a 3-year NHMRC partnership grant (APP1115720) and co-funded by our partner organisations; Medibank Health Research Fund, nib Health Funds, and Bupa Australia who declare an interest in the outcome. We are receiving further in-kind support, resources and services from Arthritis Australia, Medibank Private, Good2Give, Monash University, Precedence Health Care and HealthChange Australia. The NHMRC Centre of Research Excellence for Translational Research in Musculoskeletal Pain (APP1079078) provide additional funding and in-kind support for the pilot and components of the study outside the scope of the NHMRC partnership grant.

Address for correspondence
Jocelyn Bowden, Institute of Bone and Joint Research, Lv10 Kolling Institute, University of Sydney, Royal North Shore Hospital, St Leonards, NSW, 2065; Email: jocelyn.bowden@sydney.edu.au
Extensor Tendon Excursion in the Phalanges: Clinical Application to Rehabilitation Programmes.

Raymond Jongsl, Sarah K. Tolertonl, Belinda J. Smithl and Mark S. Hilell

l Department of Physiotherapy, Royal North Shore Hospital
ll Department of Hand Surgery & Peripheral Nerve Surgery, Royal North Shore Hospital

Background
Although flexor tendon glide relative to the adjacent tissues is well researched, little is known about the best exercises for extensor tendons.

Aims
To measure the relative motion of the extensor tendon over the proximal and middle phalanges when the finger is moved from one posture to another to determine the combination of movements that generate the greatest extensor tendon excursion.

Methods
Ten fresh-frozen cadavers were dissected. Markers were placed in the proximal and middle phalanges, and extensor tendons of all fingers. Relative motions of the extensor tendon to the phalanges through five commonly prescribed hand postures (extension, table top, straight fist, hook fist and full fist) were measured. Differences in the measurements were compared to determine the motion between postures.

Results
The five hand postures translated to ten combinations of hand therapy exercises. The extensor tendon motion achieved through the ten exercises ranged from 0.04–5.60mm. For all fingers, the exercises with the largest excursion (1.42–5.60mm) were those moving between tabletop and hook fist, and tabletop and full fist.

Conclusion
Using a cadaver model, we determined the optimal combination of finger postures for extensor tendon excursion relative to the underlying phalanges, those being a combination of tabletop and full or hook fist postures. Tailoring therapy to the most effective exercises for gliding of the extensor apparatus simplifies rehabilitation programmes, ultimately improving compliance and outcomes following trauma and surgery.

Keywords
tendon; rehabilitation; exercise; extensor; hand.

Funding and Conflict of Interest
Funding to support this project was received from The Lincoln Centre for Research into Bone and Joint Diseases and Hand Surgery. The authors declare no conflicts of interest.

Address for correspondence
Dr Mark Hile, Department of Hand Surgery & Peripheral Nerve Surgery, Royal North Shore Hospital, St Leonards, NSW, 2066;
Email: NSLHD-Handsurgery@health.nsw.gov.au
Participant impressions of the CHAnGE trial: Promoting physical activity and fall prevention using health coaching and activity trackers.

C Kirkham¹, C Sherrington¹, B Ramsay¹, S Manning², J Wickham² and A Tiedemann¹

¹School of Public Health, The University of Sydney
²School of Biomedical Sciences, Charles Sturt University

Background
Health coaching and pedometers can promote physical activity. We are currently trialling an innovative intervention, combining these two approaches with fall risk assessment and tailored fall prevention exercise advice, to evaluate the effect on physical activity and falls among people aged 60+.

Aims
This study evaluated participant impressions of the intervention.

Methods
Design: Process evaluation of intervention group data from an ongoing cluster RCT.

Participants: Intervention group participants who had completed 6 months of the intervention.

Measures: Participants completed a survey measuring: a) overall program benefit (score/10, higher score = more benefit); b) usefulness of health coaching (score/10); c) usefulness of activity tracker/pedometer (score/10); and d) proportion of participants who would recommend the program to others.

Analyses: Descriptive statistics summarised participant responses.

Results
Data from 134 participants (mean age 74 (SD 10), 81 female) were analysed. Program benefit was rated 7.5/10 (SD 1.8), the main benefits being health coach support to meet goals/stay motivated, and activity tracker to monitor activity/provide motivation. 111 (83%) participants took part in the health coaching and the mean rating of usefulness was 8.1/10 (SD 1.2), with participants appreciating the support, encouragement, motivation and exercise tailoring. The activity tracker/pedometer was rated 8/10 (SD 1.1); participants valued it as a motivator/reminder. Overall, 111 (83%) participants would recommend the program to others.

Conclusion
The intervention was well received and perceived to be helpful. Most participants valued the health coach support and feedback provided by the activity tracker/pedometer.

Keywords
physical activity; falls; health coaching; pedometers; older adults.

Funding and Conflict of Interest
NHMRC project grant; nil conflict of interest.

Address for correspondence
C Kirkham, Musculoskeletal Health Sydney, School of Public Health, The University of Sydney, Level 10 North, King George V Building, Royal Prince Alfred Hospital (C39) Missenden Rd, Camperdown, NSW 2050; Email: ckirkham@sydney.edu.au
The effect of glucosamine and chondroitin sulfate on patellofemoral joint health in people with knee osteoarthritis: Analysis of a randomised controlled trial.

Sarah Kobayashi, Milena Simic, Marlene Fransen, Kathryn Refshauge, Evangelos Pappas
Department of Physiotherapy, Faculty of Health Sciences, University of Sydney

Background
Osteoarthritis (OA) in the patellofemoral joint of the knee affects approximately 25% of the population. Glucosamine and chondroitin sulfate supplement, in combination and in isolation has been shown to reduce the progression of OA in the tibiofemoral joint. However, studies have not investigated whether glucosamine and chondroitin sulfate supplements reduce structural progression of OA in the patellofemoral joint.

Aims
To determine if glucosamine, chondroitin sulfate, or combined supplements taken over two years reduce the progression of MRI-based OA features in the patellofemoral joint, compared to placebo, in people with knee pain.

Methods
This study is an evaluation of the effect of glucosamine and chondroitin supplements. 305 participant magnetic resonance imaging (MRI) scans from the Longitudinal Evaluation of Glucosamine Sulfate (LEGS) trial, conducted in 2007-2009 in NSW, Australia were evaluated. Participants were randomised into treatment groups (a) chondroitin only, b) glucosamine only, c) combined glucosamine and chondroitin, and d) placebo), and were blinded to treatment. Participants had follow-up MRI scans at 1 and 2 years. For participants who did not have a 2-year follow up MRI scans, 1-year MRI scans were evaluated. All MRI scans were evaluated using the MRI Osteoarthritis Knee Score (MOAKS) assessment tool. Bone marrow lesions, full thickness cartilage loss and osteophytes were assessed. Difference between follow up and baseline were determined. Variables were dichotomized into those who structurally improved/remained the same and worsened. A 2x4 chi-squared test was used to assess difference between treatment groups. A p-value of 0.05 indicated differences between treatment groups.

Results
212 (71%) were included for follow-up evaluation, with no differences between treatment groups. Participants who completed follow-up evaluation had 97% adherence, with no difference between groups. Progression of MOAKS features was identified in 17% of participants by BML scores, 28% of participants by full-thickness cartilage loss, and 16% by osteophytes. For all MRI-based patellofemoral joint features, no differences were detected in 2-year structural improvement or delay in progression between treatment groups.

Conclusion
Glucosamine and chondroitin sulfate supplements, used separately and in combination had no significant effect on BMLs, full thickness cartilage loss and osteophytes in the patellofemoral joint over two years compared to placebo.

Keywords
patellofemoral; osteoarthritis; glucosamine; chondroitin; MRI.

Funding and Conflict of Interest
The MRI scans that were used for this study came from the Longitudinal Evaluation of Glucosamine Sulfate (LEGS) trial, which was funded by the National Health and Medical Research Council of Australia (ID: 402511), the Department of Health and Ageing (Australia, ID: 4027810 and by some supplementary funding (<15% total) from Sanofi-Aventis Consumer Healthcare Pty Ltd Australia. The funders had no role in the design of the study, analysis or interpretation of the data. No conflicts of interests to disclose.

Address for correspondence
Sarah Kobayashi, Department of Physiotherapy, University of Sydney, 75 East Street, Lidcombe, NSW 2141;
Email: skob9241@uni.sydney.edu.au
Osteoarthritis progression following joint injury: Understanding the mechanisms and developing a cure.

Jiao Jiao Li and Christopher Little
Raymond Purves Bone and Joint Research Laboratories, Institute of Bone and Joint Research, Kolling Institute, Northern Sydney Local Health District, Faculty of Medicine and Health, University of Sydney, St Leonards, NSW

Background
Osteoarthritis is a leading cause of disability in aging individuals. A major predisposing factor is sports or trauma related joint injury sustained during young adulthood. Current treatments can promote short-term symptomatic healing, but typically result in long-term joint degeneration. Despite this being a significant clinical problem, the mechanism of impaired healing following joint injury remains poorly understood.

Aims
To test the hypotheses that (1) impaired healing following joint injury is due to the inflammatory environment created by diseased cells, and (2) this can be reversed by ‘priming’ the diseased cells using human mesenchymal stem cells (hMSCs; documented anti-inflammatory properties).

Methods
An in vitro model mimicking joint injury was developed by co-culturing hMSCs with synovial fibroblasts and articular chondrocytes isolated from human osteoarthritic joint tissues. The co-cultures were maintained for 28 days in growth, osteogenic or chondrogenic medium (simulating the post-injury joint environment). Cell interactions were assessed using RT-PCR and histology.

Results
The hMSCs showed significant upregulation of several inflammatory markers when co-cultured with diseased joint cells, as well as significant impairment of osteogenic and chondrogenic differentiation to form new tissues. Co-culture with hMSCs caused the diseased joint cells to undergo early and rapid downregulation of inflammatory markers.

Conclusion
Joint injury can create a highly inhibitory environment that increases inflammation in stem cells, and significantly impair their regenerative ability. This inhibitory environment can be reversed by ‘priming’ the injured joint prior to treatment, such as through an intra-articular injection of hMSCs, which can help neutralise the effects of inflammation and improve subsequent treatment outcomes.

Keywords
osteoarthritis; mesenchymal stem cells; joint injury; regeneration; tissue engineering.

Funding and Conflict of Interest
National Health and Medical Research Council, Arthritis Australia, University of Sydney.

Address for correspondence
Jiao Jiao Li, Kolling Institute, University of Sydney, Royal North Shore Hospital, St Leonards, NSW, 2065; Email: jiaojiao.li@sydney.edu.au
Sensitive and simultaneous quantitative analysis of metabolites of boswellia serrata extract, curcumin, pine bark extract for osteoarthritis in human plasma by UHPLC-MS/MS.

Xiaoqian Liu¹, David J. Hunter¹², Jillian Eyles¹², Andrew J McLachlan³, Shane K Eagles¹⁴, Xiaosuo Wang⁴

¹ Sydney Medical School, Institute of Bone and Joint Research, The Kolling Institute, The University of Sydney
² Department of Rheumatology, Royal North Shore Hospital, St Leonards
³ Sydney Pharmacy School, The University of Sydney
⁴ Bosch Mass Spectrometry Facility, School of Medical Sciences, Faculty of Medicine and Health, The University of Sydney

Background
A systematic review found that orally administered boswellia serrata extract, curcumin and pine bark extract demonstrate large treatment effects in people with osteoarthritis. The major active ingredients from these supplements include 11-keto-ß-boswellic acid; acetyl-11-keto-ß-boswellic acid and ß-boswellic acid; curcumin, ferulic acid; caffeic acid; taxifolin and catechin, respectively. Little is known about their pharmacokinetics.

Aims
The aim of this study was to develop and validate an analytical method to investigate the pharmacokinetics of active ingredients in complementary medicines used to treat osteoarthritis.

Methods
The assay was established for nine analytes including deuturated curcumin (as internal standard) in human plasma using protein precipitation and solid phase extraction for sample preparation followed by LC-MS/MS analysis. Analytes were monitored in negative mode (except AKBA detected in positive mode) using electrospray ionization in Agilent triple quadrupole mass spectrometer (6460A). Formic acid in acetonitrile/isopropyl alcohol (3:1, v:v) was used as mobile phase to separate the analytes on a Poroshell C18 HPH column on an Agilent 1290 infinity system.

Results
The assay was found to be linear (with regression coefficients of 96-99%) for all analytes ranging over the concentration from 0 – 1000 ng/mL. The inter- and intra-assay precision was 0.85-15.94% and 1.89-15.06% CV%, respectively. The relative recoveries of the analytes were between 70% to 100% except for taxifolin (39%) and catechin (52%).

Conclusion
The assay was sensitive and robust for application to studies of the pharmacokinetics of active ingredients used in osteoarthritis treatment.

Keywords
boswellia serrata extract; curcumin; pine bark extract; pharmacokinetics; osteoarthritis.

Funding and Conflict of Interest
The funding is from NHMRC Program Grant 1091302. No conflict of interest.

Address for correspondence
Xiaoqian Liu, Sydney Medical School, Institute of Bone and Joint Research, The Kolling Institute, The University of Sydney, Sydney, NSW, 2065; Email: xliu2328@uni.sydney.edu.au
The Australian Arthritis & Autoimmune Biobank Collaborative (A3BC) &

The Australian Rheumatology Association Database (ARAD).


1 Institute of Bone & Joint Research: Sydney University & Kolling Institute, Royal North Shore Hospital; 2 Genes, Environment & Complex Disease Group: Murdoch Children’s Research Institute (MCRI), The Royal Children’s Hospital, Monash Children’s Hospital, Monash Medical Centre, Victorian Children’s Clinic; 3 Genes, Environment & Complex Disease Group: Murdoch Children’s Research Institute (MCRI); 4 Institute of Bone & Joint Research: Sydney University & Kolling Institute; 5 Rheumatology Research Group: Basil Hetzel Institute and The Queen Elizabeth Hospital; 6 Rheumatology Unit, Flinders Medical Centre, Flinders University; 7 Princess Alexandra Hospital, Diamantina Institute, University of Queensland; 8 Institute for Health & Biomedical Innovation, Queensland University of Technology; 9 Harry Perkins Institute of Medical Research, Fiona Stanley Hospital; 10 Rheumatology Unit, Canberra Hospital and Health Services, Australian National University; 11 Department of Clinical Epidemiology, Cabrini Medical Centre; 12 Department of Rheumatology, St George Hospital, University of New South Wales; 13 Department of Rheumatology, Redcliffe Public Hospital; 14 University of Notre Dame Australia and University of Western Australia; 15 Paediatrics and Paediatric Rheumatology, Sydney Children’s Hospitals Network; 16 Rheumatology Department, Liverpool Hospital, Ingham Institute of Applied Medical Research; 17 Australian Institute of Health Innovation, Macquarie University; 18 BJC Health; 19 Department of Rheumatology, John Hunter Hospital; 20 Rheumatology Department, Royal Prince Alfred Hospital, University of Sydney; 21 Walter & Eliza Hay Institute of Medical Research; 22 Royal Melbourne Hospital; 23 Monash Children’s Hospital & The Royal Children’s Hospital; 24 Systems Genomics, Baker Heart and Diabetes Institute; 25 Department of Paediatrics, Women’s & Children’s Hospital, Robinson Research Institute, University of Adelaide; 26 Rheumatology Unit, Royal Adelaide Hospital, University of Adelaide; 27 Paediatric Medicine and Rheumatology, Wesley Hospital & Queensland Rheumatology Services; 28 Department of Rheumatology, Royal Brisbane and Women’s Hospital; 29 Paradise Arthritis & Rheumatology, Gold Coast University Hospital; 30 Diamantina Institute, University of Queensland; 31 Royal Perth Hospital, University of Western Australia; 32 Department of Paediatric Rheumatology, Perth Children’s Hospital & Sir Charles Gardiner Hospital; 33 Perth Children’s Hospital.

Background

The Australian Arthritis and Autoimmune Biobank Collaborative (A3BC) is a national network of biobanks linked by a common registry - the Australian Rheumatology Association Database (ARAD). It creates and integrates a broad range of data from people with arthritis and autoimmune diseases.

Aims

- Progress precision medicine by growing capacity in open-access, data-linked biobanking.
- Innovate preventive medicine via unique partnerships with population health research.
- Demonstrate a new era of data integration and analysis to inform policy and practice.
- Increase research output into safer, more effective and evidence-based prevention, diagnostic, treatment and prognostic strategies.

Methods

The A3BC protocol was developed in consultation with leading stakeholders and best practices. The initial focus is RA, JIA, PsA and AS patients, recruited at over 40 sites, with blood and tissue/fluid collected at multiple timepoints and stored at 8 nodes as plasma, serum, PBMCs, DNA and RNA. At a patient-centric level, biospecimens are integrated with omic data, ARAD questionnaire patient-reported outcome measures (including diet and environmental), electronic medical records, Commonwealth health (e.g. PBS), registries (e.g. cancer), longitudinal/lifecourse data (e.g. ANZ CLARITY), and consumer entry (My Health Record). Cutting-edge analytics mines all data for associations to ground-breaking discovery.

Results

The A3BC protocol will result in new dataset integration systems, new multidisciplinary collaborations, and identification of new risk factors, biomarkers and cross-dataset associations. It
will improve research by enabling innovative research questions, faster translation and facilitating decision-making in precision and preventive medicine.

Conclusion
The A3BC protocol provides best-practice, quality-assured methods to realise its aims. Current experience recruiting and processing participants demonstrates the protocol is fit-for-purpose.

Keywords
biobank; registry; arthritis; autoimmune; rheumatology.

Funding and Conflict of Interest
The A3BC is proudly funded philanthropically by the CLEARBridge Foundation and research foundation grants from The Hospital Research Foundation, the Goatcher Clinical Research Unit (RPH) and the Murdoch Children’s Research Institute. Additional funding being sort from multiple government grants (MRFF, NHMRC, NCRIS), further philanthropic donations and pharmaceutical company support.

Address for correspondence
Professor Lyn March, Department of Rheumatology, Royal North Shore Hospital, The University of Sydney, Level 7C, Royal North Shore Hospital, Post Office Box 139, St Leonards NSW 2065; Email: lyn.march@sydney.edu.au
Combination drug therapy for the management of low back pain and sciatica; systematic review and meta-analysis.

Stephanie Mathieson 1, Richard Kasch 2, Christopher G Maher 1, Rafael Zambelli Pinto 2, Andrew J McLachlan 4, Bart W Koes 5, Chung-Wei Christine Lin 1

1 Musculoskeletal Health Sydney, The University of Sydney
2 Clinic and Outpatient Clinic for Orthopedics and Orthopedic Surgery, University Medicine Greifswald, Germany
3 Department of Physical Therapy, Universidade Federal de Minas Gerais, Brazil
4 Sydney Pharmacy School, The University of Sydney
5 Department of General Practice, Erasmus University Medical Center, The Netherlands

Background
Pharmacological recommendations for the management of low back pain and sciatica are often based on single-ingredient medicines with few recommendations for combination drug therapy. However, combining two or more drugs may be advantageous, but previous reviews had restrictive searches, considered only chronic low back pain, and had industry funding.

Aims
We investigated if combination drug therapy in patients with low back pain with or without sciatica provided greater pain and disability reduction and was tolerable by conducting a systematic review.

Methods
Databases and trial registers were searched from inception to 27th July 2017 for randomised trials of (sub)acute or chronic back pain and/or sciatica participants that were administered combination drug therapy compared to monotherapy, placebo or no/minimal treatment. Risk of bias was assessed using the Cochrane Collaboration risk of bias tool. A Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach was used to provide an overall summary of evidence.

Results
Of the 27 studies included, most combinations (21 of 23) consisted of single trials. Most combinations had no or small effect on pain and disability. A clinically important difference was found in one combination, buprenorphine plus pregabalin versus buprenorphine for chronic back pain at immediate (Mean Difference (MD) -23.30; 95%CI -27.68 to -18.92) and short-term term (MD -27.60; 95% CI -31.70 to -23.50), however, the quality of evidence was low. There was no statistically significant increased risk of serious adverse events. When the risk of adverse events was statistically significant, they favoured monotherapy or placebo.

Conclusion
The small number of studies and limited overall quality of evidence highlights the limited evidence to support any combination drug therapy for the management of low back pain and sciatica.

Keywords
back pain; analgesic; sciatica; systematic review; medicine.

Funding and Conflict of Interest
The authors did not receive funding to conduct this review. The authors do not have any conflicts of interest but declare that RK received a travel research fellowship from MSD Sharp & Dohme GmbH that did not fund the review nor have any influence on the review’s study design, conduct, interpretation or reporting. Authors SM, CGM, AJM, CL, BK have previously conducted investigator-initiated non-combination drug therapy clinical trials in back pain and sciatica (ACTRN 12613000530729, ACTRN12609000966291) that received industry funding or in-kind research support, however, neither funder played any role in the study design, data collection, analysis, interpretation and reporting of either study. RP has no interests to declare.

Address for correspondence
Dr Stephanie Mathieson, Sydney School of Public Health, The University of Sydney & Institute for Musculoskeletal Health, Sydney Local Health District, PO Box 179, Missenden Road NSW 2050 Australia; Email: stephanie.mathieson@sydney.edu.au
Positive recovery for low risk musculoskeletal injuries screened by the Short form - Örebro Musculoskeletal Pain Screening Questionnaire following road traffic injury: Evidence from an inception cohort study.

Ha Nguyen1, Trudy Rebbeck1, Annette Kifley1, Jagnoor Jagnoor2, Michael Nicholas3, Ian Cameron1

1 John Walsh Centre for Rehabilitation Research, the University of Sydney
2 Injury Division, the George Institute for Global Health
3 Pain Management Research Institute, the University of Sydney

Background
Prognosis of musculoskeletal disorders following injury is essential in determining appropriate treatment and care. However, a generic validated prognostic tool to stratify risk of poor recovery for people with musculoskeletal injuries after road traffic injuries (RTIs) is not available.

Aims
To examine differences in recovery, return to work and health related quality of life in people with common musculoskeletal injuries (neck, low back and knee pain) stratified for risk using the Short form - Örebro Musculoskeletal Pain Screening Questionnaire (OMPSQ).

Methods
In an inception cohort study, people with a musculoskeletal injury following RTI were stratified at baseline into low (OMPSQ ≤ 50) and high risk (OMPSQ > 50) of non-recovery. At 6 months, recovery (measured by Global Perceived Effect), return to work, and SF-12 scores at 6 months were assessed.

Results
Four hundred and ninety-eight people (166 with neck, 78 with lower back and 254 with lower limb injuries) participated. Likelihood of recovery was significantly higher in the low than the high risk groups (ARR of being recovered (GPE≥4): 2.96 [95% CI: 1.81 to 4.82]). Significantly more people in the low risk group returned to work (91%) than the high risk group (54.6%). People at low risk had higher SF-12 scores at baseline and 6-month follow-up than those at high risk. There were no differences between injury types.

Conclusion
The short form OMPSQ could be recommended as a generic prognostic tool to identify individuals with musculoskeletal injuries early after RTI who would have a higher or lower likelihood of recovering or returning fully to pre-injury work.

Keywords
road traffic injury, prognosis, risk stratification, recovery, return to work.

Funding and Conflict of Interest

Address for correspondence
Ha Nguyen, John Walsh Centre for Rehabilitation Research, the University of Sydney, Kolling Institute of Medical Research, Level 12, Royal North Shore Hospital, St Leonards NSW 2065; Email: ha.t.nguyen@sydney.edu.au
Background
Muscle strains are common injuries in Australian football and other sports.

Aims
To examine risk factors in the Australian Football League (AFL) from 1992 to 2014 for the four major muscle strain injury types (hamstring, quadriceps, calf and groin).

Methods
Data was extracted de-identified from the AFL injury database. Statistical analysis was primarily binary logistic regression. Covariates for analysis, with all continuous converted to binary status, included recent history (within 8 weeks) and past history (>8 weeks prior) of muscle strains, past history of other injuries, age, match grade, and number of game interchanges.

Results
3727 (1963 hamstring, 431 quadriceps, 474 calf and 859 groin) muscle strains occurred in 272,758 player matches. For all injuries, the strongest risk factor was a recent history of the same injury (18-31 times increased risk) and the next strongest risk factor was past history of the same injury (6-11 times increased risk). Age was an independent risk factor for calf strains. The absolute risk of sustaining a hamstring strain in a single game was approximately 0.2% for a player with no history, 1.4% for a player with a past history and 4.0% for a player with a recent history. Recent hamstring injury increased the risk of subsequent quadriceps and calf strains. Past history of knee cartilage injury was associated with higher risk of quadriceps strain but lower risk of calf strain.

Conclusion
Past history (of injury to same muscles) is the major risk factor for muscle strain injury

Keywords
hamstring; football; muscle strain; groin; risk factors.

Funding and Conflict of Interest
John Orchard was AFL Injury Surveillance coordinator from 1992-2014.

Address for correspondence
Jessica Orchard, Level 2 Charles Perkins Centre (D17), University of Sydney 2006 NSW Australia; Email: jessica.orchard@sydney.edu.au
Development and feasibility of a cross sectional protocol to investigate brain neurochemicals in people with migraine and musculoskeletal pain.

Aimie Peek1, Andrew Leaver1, Michele Sterling2, Graham Galloway2, Sheryl Foster2, Karl Ng4, Maria Eliza Aguila5, Sushil Bandodkar6 Manuela Ferreira7 and Trudy Rebbeck1

1 Faculty of Health Science, University of Sydney
2 RECOVER Injury Research Centre, University of Queensland
3 Translational Research Institute, University of Queensland
4 Sydney Medical School, University of Sydney Medical School
5 College of Medical Professions, University of Philippines
6 Westmead Hospital, Sydney
7 Institute of Bone and Joint Research, University of Sydney Medical School

Background
A potential modifiable mechanism implicated in chronic pain and migraine is dysregulation between Gamma-Aminobutyric Acid (GABA) and glutamate, the main inhibitory and excitatory neurochemicals of the central nervous system. Case control studies have demonstrated differing concentrations of neurochemicals in different pain conditions compared with controls. However, results are inconclusive due to the variability in methods used and that no single study has concurrently examined different pain conditions.

Aims
To develop a robust protocol using expert stakeholder consultation and piloting with the aim to determine whether GABA and glutamate differ in people with migraine compared with common musculoskeletal pain conditions.

Methods
Two stages of research translation were followed, stakeholder consultation and piloting for feasibility. Experts from 4 disciplines, radiology, physiotherapy, neurology and biochemistry were assembled. Meeting were held to reach consensus on spectroscopy, clinical characteristics and saliva analysis protocols. Reliability, stability and validity of spectroscopy measures within and across sites were established using a phantom, and a human participant. Clinical tests were piloted on 6 individuals.

Results
The stakeholder collaboration determined that groups should consist of migraine, low back pain, whiplash and controls. Piloting spectroscopy methods established voxel size (3x3x3cm3), brain regions (ACC, thalamus, PCC) and sequence (MEGAPRESS) using identical scanners (Siemens PRISMA 3T). Reliability of this method was acceptable. Feasibility testing of clinical characteristics saw prioritization of pain sensitivity tests and the concurrent assessment of headache and pain related disability.

Conclusion
This method is deemed reliable ensuring we can answer the question, are brain neurochemicals different across pain conditions.

Keywords
GABA; metabolites; magnetic resonance spectroscopy; pain; migraine.

Funding and Conflict of Interest
Study funded by: Centre of Research Excellence in Recovery following Road Traffic Injuries (CRERTI) and University of Sydney Faculty Fellowship. Dr Trudy Rebbeck funded by: University of Sydney SOAR Fellowship. Professor Michele Sterling funded by: NHMRC Principal Research Fellowship. Mrs Aimie Peek funded by University of Sydney APA Scholarship and CRERTI top-up Scholarship.

Address for correspondence
Aimie Peek, Faculty of Health Sciences, University of Sydney, 75, East Street, Lidcombe, Sydney, NSW, 2141;
Email: apee6909@uni.sydney.edu.au
The impact of occupational exposure on pain, function and radiographic severity in persons with base of thumb osteoarthritis.

Sarah R Robbins, Jillian P Eyles, Leticia A Deveza, Vicky Duong, David J Hunter

Kolling Institute of Medical Research, Institute of Bone and Joint Research, The University of Sydney, Australia; Department of Rheumatology, Royal North Shore Hospital and Northern Clinical School, The University of Sydney, Australia

Background
Little is known about the influence of occupation type on base of thumb osteoarthritis (BTOA).

Aims
Explore the association of occupational exposure with increased biomechanical stress on pain, function and radiographic severity of persons with BTOA.

Methods
Baseline data from 92 participants with BTOA were retrieved from an ongoing trial. We captured detail regarding occupational activities involving biomechanical stress such as lifting/carrying heavy objects, uncomfortable thumb positioning and/or repetitive movements.

Logistic regression analyses examined the association between age, gender, occupation, years worked, retirement status, grip strength and Kellgren-Lawrence grade (KLG) and low/high levels of pain, and function.

Results
Most participants were female (n=71, 77.2%) and the average age was 64.8±10.1 years. Over half of the participants had a KLG of 3 or 4 (n=62, 67.4%) and had an occupation involving biomechanical stress (n=56, 60.9%).

Participants with higher grip strength had higher odds of reporting better function (adjusted OR 0.9, 95% CI 0.88, 0.98). Participants with worse radiographic severity (KLG 3 or 4) had twice the odds of reporting worse function (adjusted OR 2.8, 95% CI 1.00, 7.61). Type of occupation was significantly associated with worse radiographic severity ($\chi^2$= 8.14, p =0.004), but not pain and function. There were no significant findings in our analyses for pain intensity.

Conclusion
Working in occupations involving higher biomechanical stress was associated with worse radiographic severity but not with worse symptoms. Future longitudinal studies should assess whether these types of occupations lead to a quicker disease progression compared to those with less demanding jobs.

Keywords
osteoarthritis; thumb; pain; function; occupation.

Funding and Conflict of Interest
This work was supported by National Health and Medical Research Council (NHMRC) Program Grant (grant number APP1091302) and by the Lincoln Centre for Bone and Joint Diseases.

Address for correspondence
Sarah Robbins, Rheumatology Department – 7C, Royal North Shore Hospital, The University of Sydney, Reserve Road, Sydney, NSW 2065; Email: sarah.robbins@sydney.edu.au
Exercise for preventing falls in community-dwelling older people: Cochrane Collaboration systematic review.

C Sherrington¹, N Fairhall¹, A Tiedemann¹, G Wallbank¹, Z Michaleff¹, K Howard¹, L Clemson¹, S Hopewell², SE Lamb SE³.

¹ The University of Sydney, Sydney, Australia
² Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences (NDORMS), University of Oxford, Oxford, UK

Background
Previous reviews have found exercise to prevent falls in community-dwelling older people but require updating.

Aims
We aimed to determine the effect of different types of exercise on falls in older people.

Methods
For this Cochrane review update we searched seven databases to May 2018 and included randomised controlled trials that evaluated the effect of exercise as a single intervention on falls in people aged 60+ living in the community. We classified exercise programs using ProFaNE taxonomy and undertook meta-analyses.

Results
This review includes 98 trials with 19,774 participants in 24 countries. Risk of bias was low to moderate. Rate of falls was reduced compared to control by: 26% from balance and functional exercises (Rate Ratio 0.74, 95% CI 0.68 to 0.80; participants = 6918; I² = 28%); 19% from Tai Chi (Rate Ratio 0.81, 95% CI 0.66 to 0.99; participants = 2887; I² = 70%); and by 38% from programs that involved multiple exercise categories (commonly balance/functional plus resistance exercises, Rate Ratio 0.62, 95% CI 0.44 to 0.89; participants = 1079; studies = 9, I² = 67%). There was no evidence of fall prevention effects from programs that only involved resistance exercises, dance or walking. Balance and functional exercises led to a significant 53% reduction in the number of people experiencing fractures.

Conclusion
This review provides moderate to high certainty evidence that falls and fractures can be prevented by well-designed exercise programs. Effective programs primarily involve balance and functional exercises, Tai Chi or include multiple exercise categories.

Keywords
falls; ageing; physical activity; evidence-based practice; systematic review.

Funding and Conflict of Interest
Authors Sherrington and Tiedemann received salary funding from the National Health and Medical Research Council. Authors have no conflicts of interest to declare.

Address for correspondence
Prof Cathie Sherrington, School of Public Health, University of Sydney, Level 10 North, King George V Building, Royal Prince Alfred Hospital (C39), University of Sydney, NSW 2006; Email: cathie.sherrington@sydney.edu.au
Effect of a combined physical activity and fall prevention intervention on older adults’ physical activity levels and mobility-related goals: Randomised controlled trial.

Oliveira JS1, Sherrington C1, Paul SS2, Ramsay E1, Kirkham C1, Chamberlain K3, O’Rourke S1, Hassett L1,2, Tiedemann A1.

1 School of Public Health, University of Sydney
2 Faculty of Health Sciences, University of Sydney, Sydney

Background
Physical inactivity and falling are major public health issues for older people.

Aims
We investigated the impact of a combined physical activity and fall prevention intervention on physical activity and mobility-related goal attainment among people 60+.

Methods
Community-dwellers aged 60+ were randomly assigned to intervention (n = 64; one physiotherapist visit, fortnightly telephone-based health coaching, pedometer, tailored fall prevention advice, fall prevention brochure) or control groups (n=67; fall prevention brochure). Primary outcomes were mobility goal attainment (Goal Attainment Scale) and objectively-measured physical activity (accelerometer counts per minute, CPM) at six and 12 months. Secondary outcomes were falls, other physical activity measures, quality of life, fear of falling, mood, and mobility.

Results
Participants (n=131) had a mean age of 71 years (SD 6.5) and 31 (24%) had fallen in the past year. The intervention group reported better mobility goal attainment at 6 months compared to controls (OR 1.97, 95% CI 1.06 to 3.68, p=0.03) but this was not maintained at 12 months (OR 1.195% CI 0.6 to 2.1, p=0.78). Physical activity counts were not significantly different between groups at six months (mean difference=12.8 CPM, 95%CI -98.3 to 123.9, p=0.82) or 12 months (55.6 CPM, 95%CI -13.8 to 125.0, p=0.12). There were no significant between-group differences in the secondary outcomes.

Conclusion
A combined physical activity and fall prevention intervention was associated with significantly higher mobility goal attainment at six months. There was some indication of a non-significant impact on physical activity, warranting future investigation in a larger trial.

Keywords
physical activity; accidental falls; mobility; goals; aged.

Funding and Conflict of Interest
This research was supported by a research bequest in addition to a Marrickville Council Community Grant and funding from the NSW Office of Communities, Sport and Recreation Participation and Facility Program. We declare that we have no conflict of interest.

Address for correspondence
Juliana S Oliveira, School of Public Health, The University of Sydney, M179 Missenden Road NSW 2050;
Email: juliana.oliveira@sydney.edu.au

James Spinks¹, Edgar Wakelin², Joshua Twiggs¹², and Graham Brooker¹

¹ Engineering and IT, The University of Sydney, Sydney
² 360 Knee Systems, Suite 3, Building 1, 20 Bridge Street, Pymble

Background
Osteoarthritis (OA) is the most common form of knee arthritis with approximately 9% of Australians affected. Despite the prevalence of this disease, there is currently no clinically scalable non-invasive method to quantitatively measure functional knee degradation. Knee Acoustic Emission (AE) Analysis is the examination of sounds produced by the knee during movement, providing a non-invasive quantitative assessment of joint degradation.

Aims
Investigate the AE of knees in a healthy and OA group of participants and the relationship between AE and patient reported outcome measures.

Methods
Healthy and OA subjects will complete a series of movements whilst wearing a wireless knee brace that measures knee AE. The brace uses a combination of Piezoelectric Contact Microphones (MEAS Vibration Sensor) and Electret Microphones (SparkFun BOB-12758) positioned around the knee joint to capture AE’s during movement. Two inertial sensors (IMU - Adafruit BNO055’s) calculate the flexion/extension angle at which the emissions occur. Knee Injury and Osteoarthritic Outcome Score (KOOS) are then collected for each patient and compared with the AE data.

Results
The device has been manufactured to fit within a low-profile knee brace. The total cost of the device is $150. IMU testing shows that the flexion angle can be measured to within 0.77°. Testing of the microphones on healthy individuals will be investigated to understand the characteristic AE of normal knees before investigation of OA knees. It is expected that the AE from OA knees will have characteristically different emissions.

Conclusion
Knee Acoustic Emission Analysis has the potential to be utilized as a scalable, non-invasive, quantitative measure of knee degradation.

Keywords
acoustic emissions; knee; medical device; patient outcomes; osteoarthritis.

Funding and Conflict of Interest
This study is funded by the Sydney Industry Placement Scholarships (SIPPS) Program in conjunction with 360 Knee Systems.

Address for correspondence
James Spinks, Engineering and IT, The University of Sydney, Suite 3, Building 1, 20 Bridge Street, Pymble, NSW, 2073;
Email: james@kneesystems.com
Effect of two behavioural ‘nudging’ interventions on choice of management options for low back pain:
A randomised vignette-based study in general practitioners.

Adrian Traeger¹, Jason Soon², Adam Elshaug³, Erin Cvejic¹, Chris Maher¹, Jenny Doust², Stephanie Mathieson¹, Kirsten McCaffery¹, and Carissa Bonner³

¹ School of Public Health, University of Sydney
² Menzies Centre for Health Policy, University of Sydney
³ Centre for Research in Evidence-Based Practice, Bond University

Background
‘Nudges’ take advantage of cognitive biases to make some choices more difficult than others while preserving the freedom to choose.

Aims
We aimed to determine whether embedding nudges in a general practitioner clinical decision support display can reduce low-value management choices.

Methods
We enrolled 120 Australian general practitioners to complete four clinical vignettes of patients with low back pain. Participants chose from a list of three guideline-concordant and three guideline-discordant (low-value) management options for each vignette, on a computer screen. We used a 2x2 factorial design to randomise participants to two possible nudge interventions: ‘partition view’ nudge (low-value options presented horizontally, high value options listed vertically), or ‘default option’ nudge (high-value options presented as the default, low-value options presented only after clicking for more). The primary outcome measure was the proportion of scenarios where practitioner chose at least one of the low-value care options.

Results
Participants using a conventional decision support display (all options listed vertically) chose at least one low-value care option in 42% of scenarios. The default option nudge reduced the odds of choosing at least one low-value care option by 44% (odds ratio [OR] 0.56, 95% CI 0.37 to 0.85; p=0.006) compared to those not exposed. The partition view nudge had no effect on the odds of choosing low-value care (odds ratio [OR] 1.08, 95% CI 0.72 to 1.64; p=0.7).

Conclusion
Embedding a default option nudge in a simulated clinical decision support display reduced the odds of choosing low-value care options for low back pain.

Keywords
low back pain; behaviour change; primary care; quality of healthcare; evidence-based practice.

Funding and Conflict of Interest
None to declare.

Address for correspondence
Adrian C Traeger, School of Public Health, The University of Sydney, Level 10 King George V Building, Missenden Road, Camperdown, NSW, 2050; Email: adrian.traeger@sydney.edu.au
Active Women over 50 RCT: Preliminary results.

Ms Geraldine Wallbank, Prof Catherine Sherrington, Prof Colleen Canning, Dr Leanne Hassett, Prof Roberta Shepherd, Ms Eloise Howse, Dr Bethan Richards, Ms Catherine Mackay, A/Prof Anne Tiedemann

1 Sydney School of Public Health, Faculty of Medicine and Health, The University of Sydney
2 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
3 Healthy Sydney University, The University of Sydney
4 Department of Rheumatology, Royal Prince Alfred Hospital, Sydney Local Health District
5 Workplace Health and Safety, Royal Prince Alfred Hospital, Sydney Local Health District

Background
Physical inactivity can substantially impact health across the lifespan and is of public health significance. Some age-related disabilities can be prevented with adequate physical activity in earlier life; yet physical activity uptake in middle age is generally sub-optimal.

Aim
To test the impact of an education session with follow-up email support on objectively-measured physical activity in women aged 50+ years.

Methods
A randomised wait-list controlled trial is underway. Participants are female staff from The University of Sydney and Sydney Local Health District, who are randomised to receive an intervention immediately, or after 4 months (wait-list control group). The intervention is a one-hour workshop-based education session with follow-up email support for 3 months. The control group receive the workshop after completion of follow-up measures. Primary outcome is proportion of people achieving ≥10,000 daily steps, measured with Actigraph accelerometer. Secondary outcomes include physical activity, exercise perceptions, physical functioning and mood.

Results
Data collection is ongoing, with 70/100 participants completed participation to date. Preliminary results show that at follow up, 33 intervention participants (100%) had investigated or implemented one or more of the resources/strategies suggested at the workshop, and planned to increase their physical activity over the next 6 months. Twenty-four participants (73%) set physical activity goals, of which 23 people (96%) partially/fully achieved them by follow-up.

Conclusion
Preliminary results show the education session was well received by participants, who were motivated to improve their future physical activity. The intervention impact on primary and secondary outcomes is yet to be determined.

Keywords
physical activity; education; disability prevention; middle age; randomised controlled trial.

Funding and Conflict of Interest
Healthy Sydney University seed grant, The University of Sydney (2017), Musculoskeletal Health Sydney Collaborative Research Scheme, The University of Sydney (2017), Musculoskeletal Health Sydney Academic Research Group Postgraduate Research Scholarship (2018-). No conflict of interests are declared.

Address for correspondence
Geraldine Wallbank, Faculty of Medicine and Health, The University of Sydney, PO Box 179, Sydney, NSW 2050;
Email: geraldine.wallbank@sydney.edu.au
Disruptive technology for rehabilitation following elective surgery for low back pain, knee and hip osteoarthritis: A systematic review and meta-analysis.

Xia Wang1, David J. Hunter1, Giovana Vesentini2, Daniel Pozzobon1 and Manuela L. Ferreira1

1 Institute of Bone and Joint Research, Kolling Institute, Royal North Shore Hospital, University of Sydney
2 Department of Obstetrics and Gynaecology, Sao Paulo State University

Background
Disruptive technology has brought affordability and convenience to people with chronic diseases, but its effectiveness in musculoskeletal rehabilitation has not been well investigated.

Aims
To evaluate the effectiveness and safety of disruptive technology-based rehabilitation interventions used in post spinal surgery or total hip/knee replacement (THR/TKR).

Methods
Six databases were searched from the earliest records to June, 2018. Eligible studies were randomised controlled trials that investigated the effectiveness of disruptive technology-based intervention compared with a control group, for people undergoing elective THR/TKR or lumbar spinal surgeries. Trials deemed clinically homogeneous were grouped in meta-analyses using random-effects model.

Results
We identified 19 eligible studies including 15 studies in post-TKR population (N=1706), 3 in post-THR (N=383) and one study in post lumbar disectomy (N=60). Three disruptive technologies were identified: telerehabilitation using telephone (N=1130) or videoconferencing (N=384), game-based therapy (N = 308) and educational software (N=327). Comparing to usual care, disruptive rehabilitation was more effective in reducing pain (mean difference (MD): -0.19; 95% confidence interval (CI): -0.35, -0.02) and improving function measured with the timed up-and-go test (MD: -7.03; 95% CI: -11.18, -2.88) in people undergoing TKR. No difference was observed in rates of hospital readmissions or treatment-related adverse events.

Conclusion
There is low quality evidence that current disruptive technology-enabled rehabilitation has small but significant effects over usual rehabilitation in reducing pain and improving function post-TKR. No evidence was observed for post-THR or lumbar spinal surgery rehabilitation. Disruptive rehabilitation is feasible, well-accepted and can be used safely in people undergoing these musculoskeletal surgeries.

Keywords
joint arthroplasty; spinal surgery; disruptive innovation; telerehabilitation; game therapy.

Funding and Conflict of Interest
This work has been supported by the Ramsay Research Foundation. DJH is supported by an NHMRC Practitioner Fellowship. MLF is funded by a National Health and Medical Research Council (NHMRC) Career Development Fellowship (APP1143593) and a Sydney Medical Foundation Fellowship.

The author(s) declared no potential conflict of interest with respect to the research, authorship, and/or publication of this manuscript.

Address for correspondence
Xia Wang, Institute of Bone and Joint Research, University of Sydney, Reserve Road, St Leonards, NSW, 2065;
Email: xia.wang@sydney.edu.au
Personalised 3D printing Ankle-Foot Orthoses.
Elizabeth Wojciechowski¹,², David Little¹,², Manoj P Menezes¹,², Sean Hogan², Tegan L Cheng¹,² and Joshua Burns¹,².

¹ University of Sydney
² Sydney Children’s Hospital Network (Randwick and Westmead)

Background
Children and adolescents with Charcot-Marie-Tooth disease (CMT) are often prescribed ankle-foot orthoses (AFO) to manage lower limb impairments such as foot drop. They are usually handmade by a plaster cast of the patient’s lower limb followed by thermoplastic vacuum forming. This traditional approach provides limited design options, is labour-intensive and can be associated with long wait times. 3D printing has the potential to transform the way AFOs are designed, manufactured and delivered.

Aims
The aim of this study is to evaluate personalised 3D printed AFOs vs. traditional handmade AFOs on walking ability for children with CMT.

Methods
A 3D printing design and validation pipeline for personalised AFOs in CMT was proposed and evaluated. This includes, acquiring 3D images of the lower limb using a 3D surface scanner, generating computer aided design (CAD) models of AFOs, 3D printing prototypes and optimising the design.

Results
CAD models replicating the design of traditional manufactured AFOs (leaf spring, hinged and solid) were generated from images of the lower limb captured with a 3D surface scanner. AFO designs were then optimised to reduce weight and improve function of the device by introducing design features such as holes. Prototypes of the traditional and optimised AFOs were manufactured using an industrial 3D printer in Nylon 12.

Conclusion
The proposed 3D printing pipeline is a feasible workflow for the design, manufacture and delivery of AFOs and may offer many potential benefits over traditional manufacturing methods including improved biomechanical function, patient satisfaction and delivery time.

Keywords
3D printing; additive manufacturing; ankle foot orthoses; charcot-marie-tooth disease; CMT.

Address for correspondence
Elizabeth Wojciechowski, The Children’s Hospital at Westmead, Cnr Hawkesbury Road and Hainsworth Street, Westmead, NSW,2145;
Email: Elizabeth.wojciechowski@sydney.edu.au
ABSTRACTS

POSTER PRESENTATION
SESSIONS

(in alphabetical order by first author)
The effectiveness of lifestyle physical activity interventions compared to other interventions in the management of people with low back pain: A systematic review and meta-analysis.

Hosam Alzahrani1, Martin Mackey1, Emmanuel Stamatakis2, Marina B Pinheiro1, Manuela Wicks1, Debra Shirley1

1 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
2 Lifestyle, and Population Health, Charles Perkins Centre, Epidemiology Unit; and Prevention Research Collaboration, The University of Sydney

Aims
To investigate the effectiveness of lifestyle physical activity (LPA) interventions compared to other commonly prescribed interventions for the management of people with low back pain (LBP).

Methods
We performed a systematic review with meta-analyses of randomized controlled trials, searching Medline, Scopus, CINAHL, EMBASE, and CENTRAL. This review considered trials investigating the effect of LPA intervention compared to other interventions in people aged ≥18 years diagnosed with non-specific LBP. Analyses were conducted separately for short-term (≤3 months), intermediate-term (>3 and <12 months), and long-term (≥12 months), for each outcome. The analyses were conducted using weighted mean difference (WMD). The overall quality of evidence was assessed using the GRADE system.

Results
Three trials involving 422 participants were included in this review. Due to insufficient data, we were able to conduct meta-analyses for pain and disability outcomes only. For pain, the pooled results did not show any significant effects between LPA intervention and other interventions at all-time points. For disability, LPA was not statistically more effective than other interventions at short-term; however, the pooled results favored LPA at intermediate-term (WMD= -6.05, 95% CI: -10.39 to -1.71, p=0.006) and long-term (WMD= -6.40 95% CI: -11.68 to -1.12, p=0.02) follow-ups among participants with chronic LBP. The overall quality of evidence was rated “moderate-quality” based on the GRADE system.

Conclusion
For people with chronic LBP, the LPA intervention provide intermediate and long disability relief, although this improvement was not clinically important. These findings may have implications for including LPA in management LBP in clinical practice.

Keywords
physical activity; lifestyle; low back pain; systematic review; meta-analysis.

Funding and Conflict of Interest
HA is supported by a PhD scholarship from Taif University, Taif, Saudi Arabia. No sources of support were used to assist in the preparation of this article. The authors have no conflict of interest to declare.

Address for correspondence
Hosam Alzahrani, Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney, 75 East Street, Room S223, Building S, Cumberland Campus, NSW 2141; Email: halz2656@uni.sydney.edu.au
Influence of genetics on motion in healthy people.

Munkh-Erdene Bayartai, Justin Sullivan, Marina B Pinheiro, Sarah Kobayashi, Evangelos Pappas, Paulo H Ferreira

Faculty of Health Sciences, The University of Sydney

Background
Alterations in motion during usual daily activities are associated with some musculoskeletal conditions, including low back pain and knee osteoarthritis. Since these conditions have an important genetic component, determining the genetic influences on motion could assist in explaining the genetics and environmental influences on musculoskeletal pain.

Aims
The aim of the systematic review was to investigate the extent to which genetics and the environment influence movement characteristics of the musculoskeletal system.

Methods
MEDLINE, CINAHL, EMBASE, and Scopus electronic databases were used to search for articles investigating genetic influences on movement. No limitation was applied regarding age, gender, publication date, study design or language. Only studies that recruited predominantly healthy participants, not specific groups with pathologies, were included.

Results
A total of five studies were identified after screening against the eligibility criteria, all of which used a cross-sectional design. Twin samples were used in four studies and genotyping in one study. Genetic influences on gait ranged from 14% to 61% across the temporal spatial parameters. The total lumbar range of motion was 47%. The coordination of elbow joint positioning and the control of static head position were 87% and 42% respectively.

Conclusion
There is wide variability in genetic influences on temporal spatial parameters of gait, lumbar range of motion, as well as movement coordination. Therefore, a large variance of human motion parameters appears to also be influenced by the environmental factors. Future research should investigate genetic influences on motion patterns particular to common musculoskeletal conditions.

Keywords
genetics; heritability; movements; kinematics; posture.

Funding and Conflict of Interest
None.

Address for correspondence
Munkh-Erdene Bayartai, Faculty of Health Sciences, The University of Sydney, 75 East St, Lidcombe, NSW, 2141;
Email: mbay0086@uni.sydney.edu.au
Graded exercise in a multidisciplinary pain management program, the role of motor control: A randomized control trial.

Jessica Castle, Maria De Sousa, Michael Nicholas, Lois Tonkin, Damien Finniss, Ali Asghari, Dan Costa
Michael J Cousins Pain Management and Research Centre, Royal North Shore Hospital

Background
Motor control exercises have gained much popularity and have been widely used in the treatment of chronic low back pain (CLBP). While a number of studies have evaluated their efficacy in patients with CLBP in primary care, their contribution has not been studied in the context of patients with CLBP attending a tertiary referral multidisciplinary pain management program.

Aims
This randomised controlled trial was designed to see if the inclusion of motor control exercises provide any additional benefit to the routine exercise program used in the 3 week multidisciplinary ADAPT cognitive behavioural therapy (CBT) pain management program.

Methods
Participants were aged between 18 to 65 years and had CLBP for longer than 12 weeks. Sixty chronic pain patients were randomly assigned to CBT + General Exercise or CBT + Motor Control exercise. Outcome measures included pain, disability, depression and functional measures, including lifting from floor to waist. Outcome measures were collected pre-treatment, post-treatment and 1 month follow-up.

Results
Significant improvements were achieved by both treatment groups on all outcome measures from pre-treatment to post-treatment and maintained at the one-month follow-up. There was no statistical difference between treatment groups. For example, mean difference for pain NRS between groups at 1 month was 0.46 (95% confidence interval = -0.63, 1.56).

Conclusion
The inclusion of Motor Control exercises within an intensive pain management program was not more beneficial than using General Exercises. Additionally, as both groups demonstrated significant improvements in pain, disability, depression and functional, then it may suggest that the type of exercise was less important.

Keywords
low back pain; chronic pain; motor control exercise.

Funding and Conflict of Interest
Nil.

Address for correspondence
Jessica Castle, Michael J Cousins Pain Management and Research Centre, Royal North Shore Hospital, Sydney, NSW, 2065;
Email: Jessica.castle@health.nsw.gov.au
Using short message service and an online survey to collect patient reported outcomes in the SHaPED trial.

Coombs D1,2,3, Machado GC1,2, Richards B1,2,4, Needs C4, Buchbinder R5, Harris I6, Howard K1, McCaffery K1, Billot L7, Edwards J8, Rogan E9, Facer R10, Maher CG1,2,3

1 The University of Sydney, Faculty of Medicine and Health, Sydney School of Public Health; 2 Institute for Musculoskeletal Health; 3 Physiotherapy Department, Royal Prince Alfred Hospital, Sydney Local Health District; 4 Rheumatology Department, Royal Prince Alfred Hospital, Sydney Local Health District; 5 Department of Epidemiology & Preventive Medicine, School of Public Health and Preventive Medicine, Monash University; 6 South Western Sydney Clinical School, University of New South Wales; 7 The George Institute for Global Health, University of New South Wales; 8 Emergency Department, Royal Prince Alfred Hospital; 9 Emergency Department, Canterbury Hospital; 10 Emergency Department, Concord Repatriation General Hospital

Background
Key problems in managing low back pain (LBP) in the emergency department (ED) are overuse of imaging, opioids and admissions. The SHaPED trial will implement an evidence-based model of care and extract primary outcomes from electronic medical records. However, recruiting and collecting patient outcomes in busy ED settings is difficult. Short message service (SMS) has been tested for use in data collection in LBP research, but little is known about integrating this technology with an online survey system (REDCap) in EDs.

Aims
In this paper, we describe the system we are using to collect patient-centered outcomes in the SHaPED trial and the preliminary response rates.

Methods
A stepped-wedge cluster trial will evaluate the implementation of the ACI model of care at four EDs in NSW. Clinician participants will receive training on the new model, educational materials, and feedback. Patients receive an SMS invitation (via Twilio) to participate in an online survey one week after emergency presentation to measure pain, function, perceived health, and satisfaction. Two follow-up surveys are sent at two and four weeks after ED presentation. Three reminders are sent to non-responders supplemented by telephone interviews. Ethics approval (RPAH HREC X17-0043).

Results
Preliminary results show that of the 53 participants, 19 (36%) responded to the SMS invitation and completed the survey online. 28 (53%) required telephone follow-up. Seven (13%) of these answered the survey over the phone. Twelve (23%) patients declined to participate and 15 were unable to be contacted or could not answer the survey over the phone. Total response rate at this point is 49%.

Conclusion
Automated SMS system, on its own, is not a feasible option to collect patient outcomes and needs to be supplemented by other means such as phone calls.

Keywords
low back pain; emergency department; patient reported outcome measures; short message service; redcap.

Funding and Conflict of Interest
Funding: The SHaPED trial received seed funding from Sydney Health Partners ($90,000) and the Agency for Clinical Innovation ($20,000). GCM is funded by a National Health and Medical Research Council (NHMRC) Early Career Fellowship. RB is funded by an NHMRC Senior Principal Research Fellowship. CGM is funded by an NHMRC Principal Research Fellowship. Study sponsor: The University of Sydney, NSW 2006 Australia. Conflict of Interest: None declared.

Address for correspondence
Danielle Coombs, School of Public Health, Faculty of Medicine and Health, The University of Sydney, 83-117 Missenden Rd, Camperdown, NSW, 2050; Email: Danielle.Coombs@health.nsw.gov.au
Predicting Semi-functional Knee Laxity in Preoperative TKA Patients using Morphological Measurements.

Cerys Edwards1,2, Edgar Wakelin1, Ella Moore1, Joshua Twiggs1,2, David Liu4, Brad Miles1
1 360 Knee Systems, Sydney
2 Biomedical Engineering, University of NSW; 3 Biomedical Engineering, The University of Sydney
4 Bone and Joint Surgery Gold Coast

Background
If the ligaments of the knee are not well balanced after total knee arthroplasty (TKA), stiffness or instability may occur. Detailed knowledge of a patient’s soft tissue profile prior to surgery may allow surgeons to reduce poor post-operative outcomes, however, a method for routine non-invasive soft tissue analysis does not currently exist.

Aims
To investigate the relationship between a patient’s pre-operative ligament laxity profile and patient specific morphological factors, and to determine correlations between post-operative laxity and patient reported outcomes measures (PROMS) for optimal ligament balance.

Methods
Patient bone morphology and component placement was determined through analysis of CT scans, obtained pre- and post-operatively, using scan IP (Simpleware, UK). Stressed x-rays were obtained using a TELOS stress x-ray device (Metax, Germany), followed by 2D-to-3D registration using Mimics (Materialise, Belgium) to determine ligament laxity. PROMS were collected prior to and >6 months following TKA.

Results
Telos-generated laxity ranges acquired from 54 patients indicated that those who pre-operatively have greater laxity in extension than flexion (laxity range difference >2°) have significantly improved pain at 6-months than those who pre-operatively show greater laxity in flexion (laxity range difference <2°)(p=0.018). Future prospects for this project include characterizing bone morphology and correlating morphology to laxity.

Conclusion
Telos-generated laxity ranges provide unique insight into the relationship between laxity and postoperative outcomes, however this method is time consuming and costly. The development of a predictive model based on the laxity and PROMS of patients with known morphology may allow for routine non-invasive soft tissue modelling.

Keywords
osteoarthritis; ligament; laxity; total knee arthroplasty; predictive modelling.

Funding and Conflict of Interest
Conflicts of interest – EW, JT, BM, EM, CE are employees or consultants to 360 Knee Systems.

Address for correspondence
Cerys Edwards, Biomedical Engineering, UNSW, Suite 3, Building 1, 20 Bridge Street, Pymble, NSW, 2073;
Email: cerys@kneesystems.com
Is the Patient Activation a Valid Measure of Osteoarthritis Self-Management?

Eyles, JP1,2,3, Ferreira, M1,2, Mills, K4, Lucas, BR1,3, Robbins, SR1,2, Williams, M3, Lee, H4, Appleton, S6, Hunter, DJ1,2

1 Kolling Institute of Medical Research, Institute of Bone and Joint Research, University of Sydney, Australia
2 Department of Rheumatology, Royal North Shore Hospital and Northern Clinical School, University of Sydney, Australia
3 Physiotherapy Department, Royal North Shore Hospital, Sydney, Australia
4 Faculty of Medicine and Health Sciences, Macquarie University, Sydney, Australia
5 Rehabilitation Department, Hunters Hill Private Hospital, Sydney, Australia
6 Physiotherapy Department, Mount Wilga Private Hospital, Sydney, Australia.

Background
The Patient Activation Measure (PAM-13) was developed using the Rasch model. It assesses knowledge, skill, and confidence in the management of one’s health. Previous studies report positive relationships between higher PAM-13 scores, self-management behaviours and longitudinal health outcomes in adults with chronic disease. There is little extant measurement property evidence for the use of PAM-13 in populations with osteoarthritis (OA).

Aims
To examine the measurement properties of PAM-13 in people living with OA.

Methods
Rasch analysis of data from 217 completed surveys tested for internal consistency and unidimensionality of PAM-13. Differential Item Functioning (DIF) examined bias in respondent subgroups and correlations tested relationships between PAM-13 and patient-reported outcomes.

Results
Results: The internal consistency of the PAM-13 was acceptable (Cronbach’s alpha 0.92; item and person reliability 0.98 and 0.87). Unidimensionality was confirmed; 49.4% of the variance was explained. The Rasch fit statistics were acceptable (except for item-2). Issues with targeting of the PAM-13 items to people with higher ability were identified. Moreover, the item difficulty order was different from that proposed. Significant DIF was identified for sex and educational level. PAM-13 scores were moderately correlated with depressive symptoms ($r=-0.34$) and quality of life ($r=0.32$) as expected.

Conclusion
The PAM-13 demonstrated adequate internal consistency, unidimensionality structural and construct validity. There was altered item difficulty order found for people living with OA compared with the original PAM-13 and some bias arising from sex and educational status subgroups. While noting these possible limitations, the PAM-13 demonstrated adequate fit to the Rasch model.

Keywords
measurement properties; rasch; osteoarthritis; psychometrics; patient activation.

Funding and Conflict of Interest
No funding conflicts of interest to declare for this research.

Address for correspondence
Jillian Eyles, Rheumatology, School of Medicine, Northern, University of Sydney, Royal North Shore Hospital, Pacific Highway, St Leonards, Sydney, NSW, 2065; Email: jillian.eyles@sydney.edu.au
Exploring prescription of opioids for non-serious low back pain in emergency departments.

Giovanni E. Ferreira¹², Gustavo C. Machado¹², Christina Abdel Shaheed¹², Christine C. Lin¹², Bethan C. Richards²³, Chris G. Maher¹²

¹ Faculty of Medicine and Health, School of Public Health, The University of Sydney, NSW, Australia
² Institute for Musculoskeletal Health, Sydney, Australia
³ Rheumatology Department, Royal Prince Alfred Hospital, Sydney, NSW, Australia

Background
Although most cases of low back pain (LBP) presenting to emergency departments (EDs) are non-serious, they represent a significant burden to Australian EDs. Currently, data on how patients with non-serious LBP are managed in Australian EDs are lacking, especially in regards to practices that are divergent from guideline recommendations, such as opioid prescription.

Aims
To describe rates and factors associated with prescription of opioids in patients with non-serious LBP presenting to EDs.

Methods
We collected retrospective data from patients aged 18+ years with non-serious LBP presenting to the EDs of two hospitals in the Sydney Local Health District from Jan 2016 to April 2018. Prescription of any opioids in the ED was the primary outcome. We explored factors associated with prescription of opioids using multivariate logistic regression.

Results
We identified 2132 presentations that had data available on medication prescription. Among these, 1854 (87%) had non-serious LBP. At least one type of opioid has been prescribed to 1180 (63.3%) patients. There was increased odds of being prescribed an opioid among people who arrived by ambulance (OR 1.32, 1.03-1.69), were admitted to hospital (OR 27, 12-58), received any lumbar imaging (OR 2.04, 1.54-2.71) or spent more time in the ED (1.32, 1.03-1.69).

Conclusion
While guidelines discourage use of opioids for LBP we found that around 2/3 of patients with LBP in ED are prescribed an opioid. Our study shows the need for implementation strategies to reduce the prescription of opioids for this population in EDs.

Keywords
low back pain; emergency medicine; diagnostic imaging; analgesics, opioid; overtreatment.

Funding and Conflict of Interest
None.

Address for correspondence
Giovanni E. Ferreira, Faculty of Medicine and Health, School of Public Health, The University of Sydney, Level 10 KGV Building, Missenden Road, Camperdown, Sydney, NSW, 2050; Email: giovanni.ferreira@sydney.edu.au
Sleep Quality and Fatigue are Associated with Hip Osteoarthritis Pain Exacerbations: An Internet-Based Case-Crossover Study.

Kai Fu¹, Joanna Makovey², Ben Metcalf², Kim L. Bennell², Yuqing Zhang³, Rebecca Asher⁴, Sarah R. Robbins¹, Leticia A. Deveza³, Peter A. Cistulli⁵, David J. Hunter¹

¹ Kolling Institute of Medical Research, Institute of Bone and Joint Research, University of Sydney, NSW, Australia; Department of Rheumatology, Royal North Shore Hospital and Northern Clinical School, University of Sydney, NSW, Australia
² Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne, VIC, Australia
³ Division of Rheumatology, Allergy, and Immunology, Massachusetts General Hospital, Harvard School of Medicine, Boston, MA, United States
⁴ NHMRC Clinical Trials Centre, University of Sydney, Sydney, NSW, Australia
⁵ Charles Perkins Centre, Sydney Medical School, University of Sydney, NSW, Australia; Department of Respiratory and Sleep Medicine, Royal North Shore Hospital and Northern Clinical School, University of Sydney, NSW, Australia

Background
There is limited understanding of the role of sleep and fatigue in hip OA pain exacerbations.

Aims
To evaluate the association of sleep quality and fatigue with hip pain exacerbations in persons with symptomatic hip osteoarthritis (OA).

Methods
Eligible participants with symptomatic hip OA were followed for 90 days and asked to complete online questionnaires at 10-day intervals (control periods). They also logged on to the study website to complete questionnaires during an episode of a hip pain exacerbation (case periods) defined as an increase of two points in pain intensity compared with baseline on the numeric rating scale (0-10). Subjective sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), and fatigue was measured by Multi-Dimensional Assessment of Fatigue (MAF). The association of sleep quality and fatigue to the risk of pain exacerbation was analysed using conditional logistic regression.

Results
Of 252 participants recruited, 130 (52%) had both case and control periods and were included in the final analysis. Poor sleep quality was significantly associated with increased odds of pain exacerbation (global PSQI score > 5 vs ≤ 5: adjusted odds ratio [OR] 1.89, 95% CI 1.12 to 3.21). Greater fatigue (GFI > 21) was also associated with an increased risk of hip pain exacerbation (adjusted OR 1.93, 95% CI 1.20 to 3.11). There was no significant interaction between sleep quality and fatigue (p=0.18). Short sleep duration was not associated with pain exacerbations (adjusted OR 1.13, 95% CI 0.61 to 2.09).

Conclusions
Poor sleep quality and greater fatigue were significantly related to pain exacerbation in persons with symptomatic hip OA. These findings should promote further investigation into interventions targeting sleep and fatigue for pain in persons with hip OA.

Keywords
Osteoarthritis; hip; pain; sleep; fatigue; case cross-over studies.

Funding and Conflict of Interest
This work was supported by NHMRC program grant (#APP631717).

Address for Correspondence
Kai Fu, Institute of Bone and Joint Research, Kolling Institute, University of Sydney, Sydney, NSW, Australia Level 10, Kolling Building, Royal North Shore Hospital, St Leonards 2065; Email: kafu7690@uni.sydney.edu.au
The effects of Mechanical Diagnosis and Therapy are moderated by the delivery approach in a low back pain population: A systematic review with a meta-regression.

Mark H Halliday¹, Alessandra Narcisro Garscia², Anita Amorim¹, Gustavo Machado¹, Jill A Hayden³, Evangelos Pappas¹, Paulo H Ferreira¹, Mark J Hancock⁴

¹ The University of Sydney
² Duke University
³ Dalhousie University
⁴ Macquarie University

Background
Mechanical Diagnosis and Therapy (MDT) is a treatment-based classification system founded on three core principles; classification into diagnostic syndromes, directional preference exercises, and force progression. Many randomised controlled trials have investigated the efficacy of MDT for low back pain (LBP). However, results have varied between trials. One potential factor may be the inconsistent delivery of MDT.

Aims
The aim of this study was to compare the effect sizes in trials that delivered MDT consistent with the core principles of the approach to trials that met some or none of the core principles

Methods
Electronic databases were searched until June 2018 using a sensitive search strategy for citations that delivered MDT compared to non-pharmacological conservative controls for outcomes of pain and disability in a LBP population. Studies were classified into ‘original,’ meeting the core principles, or ‘generic’ delivery of MDT using some or none of the principles. Data was extracted by 2 independent reviewers. Meta-regression procedures were used to analyse the effect of delivery mode on clinical outcomes.

Results
Studies that included the original MDT approach showed greater reductions in pain and disability of 15.0 (95% CI 7.3-22.7) and 10.5 (95% CI 3.9-17.1) points respectively on a 100-point scale compared to generic trials. Adjusting for confounders of symptom duration and control intervention did not affect the results.

Conclusion
Delivery of MDT using the core principles of the approach results in greater reduction in pain and disability compared to a generic delivery of the approach in a LBP population.

Keywords
McKenzie method; back pain; exercises; disability; meta-analysis.

Funding and Conflict of Interest
We received no funding and report no conflict of interest

Address for correspondence
Mark Halliday, Faculty of Health Sciences, The University of Sydney, 75 East St, Lidcombe, NSW, 1825;
Email: mark.halliday@health.nsw.gov.au
Relationship between proprioception and pain and disability in people with non-specific low back pain: A systematic review with meta-analysis

Jianhua Lin¹,², Mark Halaki¹, Pavithra Rajan¹ and Andrew Leaver¹
¹ Faculty of Health Science, University of Sydney, Australia
² Department of Rehabilitation Therapy, Yangzhi Affiliated Rehabilitation Hospital of Tongji University, China

Background
Non-specific low back pain (NSLBP) is a common musculoskeletal problem. Proprioception deficit has been associated with low back pain and correlated with pain and disability; however, strength of association is variable.

Aims
To examine the association between proprioception and pain and disability in people with NSLBP and the impact of potential moderators on the strength of the association.

Methods
A systematic literature search was performed in eight databases and Google scholar. The methodological quality of studies was assessed. Two independent reviewers assessed the literature and extracted data. Meta-analysis of data from homogeneous studies was performed according to proprioception test methods. Subgroup of movement directions was analysed.

Results
The literature search identified 3067 records of which 14 studies were included for meta-analysis. Proprioception was measured by active joint repositioning sense (AJRS), passive joint repositioning sense (PJRS) and threshold to detect passive motion (TTDPM). Meta-analyses revealed no significant correlation between any proprioception measures and pain or disability (p>0.05). The subgroup analysis of movement direction showed little correlation between absolute error (AE) of passive lumbar flexion and pain ($r=0.225$, $95\% CI$ 0.040 to 0.395), and between AE of passive lumbar extension and disability ($r=0.196$, $95\% CI$ 0.010 to 0.369).

Conclusion
AJRS and TTDPM are not correlated with pain and disability in people with NSLBP. The AE of passive lumbar movement is correlated to a small degree with pain and disability. Therefore, the differences in proprioception observed between people with pain and people without pain seem to be independent of the symptoms.

Keywords
Non-specific low back pain; proprioception; correlation coefficient; pain; disability

Funding and Conflict of Interest
Jianhua Lin is supported by China Scholarship Council.

Address for correspondence
Andrew Leaver, Faculty of Health Science, University of Sydney, 75 East Street, Lidcombe NSW 2141; Email: andrew.leaver@sydney.edu.au
A Patient-Specific Predictive Cartilage Model: Preventing End-Stage Osteoarthritis.

Estelle Liu¹,², Edgar Wakelin², Ella Moore², Brett Fritsch³ and Qing Li¹

¹ Engineering and IT, The University of Sydney, Sydney, NSW, Australia
² 360 Knee Systems, Suite 3, Building 1, 20 Bridge Street, Pymble, NSW, Australia
³ Sydney Orthopaedic Research Institute, Sydney, NSW, Australia

Background
Osteoarthritis is a degenerative disease for which there is currently no cure. End-stage OA can only be treated with total knee arthroplasty (TKA), with over 50,000 TKAs performed in Australia annually. OA is characterised by cartilage wear which may be exacerbated by certain activities. Knee morphology and medical history are known to affect knee cartilage, but volumetric and surface-profile cartilage degradation is not well understood.

Aims
Develop a model to predict regional cartilage wear patterns in knees based on morphological and medical history factors.

Methods
Bone resections will be acquired from 100 patients. A 3D laser-scanner will be used to generate a mesh of the cartilage surface, and following cartilage dissolution, the bony surface. The meshes will be subtracted to obtain the cartilage profile. Thickness maps will then be isolated into regions of interest for specific knee kinematics, such as areas affected by injury. Patient medical history will be collected concurrently. The correlations between morphological measurements, patient history and cartilage thickness will be used to develop a predictive algorithm for cartilage degradation in OA patients.

Results
A model generated from morphological factors has demonstrated the ability to accurately predict cartilage profiles superior to MRI assessment and intraoperative observation. Patient history can supplement this to better predict wear and develop patient-specific conservative management protocols.

Conclusion
Early intervention in OA with data-driven, patient-specific disease management may delay or prevent end-stage OA, increase the active years of the patient, improve quality of life, and reduce costs to the healthcare system.

Keywords
knee osteoarthritis; total knee replacement; cartilage; predictive model; intervention.

Funding and Conflict of Interest
This study is under Sydney Industry Project Placement Scholarships (SIPPS) program with 360 Knee Systems.

Address for correspondence
Estelle Liu, Engineering and IT, University of Sydney, Suite 3, Building 1, 20 Bridge Street, Pymble, NSW, 2073;
Email: estelle@kneesystems.com.au
MRI features, bony morphology and symptoms: How are they related in femoroacetabular impingement?

Nicholas J Murphy1,2, James M Linklater3, Jillian Eyles1,2, Young Jo Kim4, Libby Spiers5, Kim L Bennell9, Alexander Burns6, Camdon Fary7,8, Robert Molnar9, John O’Donnell10,11, Michael O’Sullivan12, Sunny Randhawa13, Parminder Singh10,14, Phong Tran7,8, David J Hunter1,2

1Institute of Bone and Joint Research, Kolling Institute of Medical Research, University of Sydney, Australia. 2Department of Rheumatology, Royal North Shore Hospital, Australia. 3Department of Musculoskeletal Imaging, Castlereagh Sports Imaging Centre, St Leonards, Australia. 4Department of Orthopedic Surgery, Boston Children’s Hospital, Boston, USA. 5Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne, Australia. 6Orthopaedics ACT, Canberra, Australia. 7Department of Orthopaedic Surgery, Western Health, Melbourne, Australia. 8Australian Institute for Musculoskeletal Science (AIMSS), The University of Melbourne and Western Health, Melbourne, Australia. 9Sydney Orthopaedic Trauma & Reconstructive Surgery, Sydney, Australia. 10Hip Arthroscopy Australia, Richmond, Australia. 11St Vincent’s Private Hospital, East Melbourne, Australia. 12North Sydney Orthopaedic and Sports Medicine Centre, North Sydney, Australia. 13Macquarie University Hospital, Sydney, Australia. 14Maroondah Hospital, Eastern Health, Melbourne, Australia.

Background
Femoroacetabular impingement (FAI) is a common cause of hip pain in young adults and a leading cause of future hip osteoarthritis. FAI is commonly diagnosed using MRI, however the relationship between MRI features, osseous morphology and symptom severity has not previously been studied.

Aims
We sought to study the relationship between MRI features, osseous morphology and symptom severity in FAI.

Methods
Seventy-two participants were diagnosed with FAI syndrome by orthopaedic surgeons. Participants underwent standardized plain radiographs, MRI scans and completed the international Hip Outcome Tool-33 (iHOT-33) a measure of hip health-related quality of life (0= worst, 100= best). The Hip Osteoarthritis MRI Scoring System (HOAMS) was used to score: cartilage lesions, bone marrow lesions (BMLs), subchondral cysts, labral damage, osteophytes, synovitis, herniation pits, and paralabral cysts. For each HOAMS feature scored, the maximum grade of severity and count of subregions involved were independently analysed. Osseous parameters measured included maximum alpha angle (AA) in radial planes at 30-degree intervals from superior to anterior positions, lateral centre edge angle, femoral version, and femoral neck-shaft angle. Independent sample t-tests, one-way analysis of variance (ANOVA) and Spearman’s correlations were used to test associations between variables.

Results
Seventy-two participants (age 33.2±10.5 years, 39% female) had mean iHOT-33 score 44.2±18.7. The maximum AA was associated with the HOAMS severity score for cartilage lesions (r=0.319, p=0.007), BMLs (r=0.235, p=0.049), subchondral cysts (r=0.266, p=0.025) and osteophytes (r=0.373, p=0.001). The maximum AA was associated with the count of HOAMS subregions affected for cartilage lesions (r=0.302, p=0.010), subchondral cysts (r=0.295, p=0.012) and osteophytes (r=0.368, p=0.002). No other significant associations were found. The iHOT-33 score was not associated with HOAMS score for any MRI feature, nor was it associated with any measure of osseous morphology.

Conclusion
The maximum AA was associated with cartilage lesions, BMLs, subchondral cysts and osteophytes scored on MRI. Symptom severity was related to neither MRI features nor osseous morphology. Limitations of this study include its cross-sectional design and potentially biased sampling frame; as such these results should be interpreted cautiously.

Keywords
femoroacetabular; impingement; hip; osteoarthritis; FAI.
Funding and Conflict of Interest
This study was funded by grants from the National Health and Medical Research Council (NHMRC) grant (APP1069278) and the Australian Hip Arthroscopy Education and Research Fund (AHAERF).

Address for correspondence
Nicholas Murphy, University of Sydney, Rheumatology Dept, 7C Clinical Administration, St Leonards, NSW, 2065;
Email: nmur6094@uni.sydney.edu.au
Imaging of Structural and Molecular Transport Compartmentalisation in an In Vivo Osteoarthritis Model.

Lucy Ngo¹, Melissa L. Knothe Tate¹
¹ Graduate School of Biomedical Engineering, University of New South Wales, Sydney, Australia

Background
Osteoarthritis is the most common cause of disability among older adults and is recognized as a disease involving the tissues of the entire joint, underpinned by multifactorial degenerative processes. Understanding progressive age-related disruptions to molecular transport may have important implications for deciphering osteoarthritis aetiology and pathogenesis. Multimodal imaging facilitates dissection of interactions across length-scales.

Aims
This study aims to explore transport through joint tissue dependent on molecular size-selectivity and boundary membrane functional barrier properties.

Methods
In this study, we delivered a single mixed bolus of two tagged dextrans (10kDa and 70kDa) via heart injection, into two anaesthetized cohorts, comprising of 8-10-month and 17-19-month Dunkin Hartley guinea pigs (DHGP). DHGP are an animal model for spontaneous, age-related osteoarthritis, with young and old animals corresponding to middle-aged and aged humans, respectively. Tracer transport was quantified in fluorescent serial-sectioned cryo-fixed specimens.

Results
Observed was a distinct separation of molecules through the whole joint. The larger tracer manifested in greater quantities in the marrow cavity but was less prevalent in the bone, cartilage and meniscus. However, the meniscus, ligament and tendon exhibited an abundance small tracer, with significantly lower quantities in younger animals. Muscle fibres showed little fluorescence with tracer congregating in bounding fasciae. Subchondral bone lesions exhibited marked changes in fluorescence compared to surrounding healthy tissue.

Conclusion
Molecular communication is implicated as a potential factor in osteoarthritis pathophysiology. A greater understanding may aid to slow joint tissue degradation progression and modulate joint health by harnessing spatiotemporal transport mechanisms.

Keywords
molecular transport; molecular size selectivity; functional barrier properties; osteoarthritis; knee joint.

Funding and Conflict of Interest
The authors have no conflicts of interest or other financial disclosures to report.

Address for correspondence
Melissa Knothe Tate, Graduate School of Biomedical Engineering, University of New South Wales, Sydney, NSW, 2052;
Email: m.knothetate@unsw.edu.au
Construct validity of musculoskeletal ultrasound in thumb-base osteoarthritis: Comparison with clinical, functional and radiological findings.

Oo WM1, Deveza LA1, Duong V1, Fu K1, Linklater JM2, Meneses SRF1, Riordan EA1, Hunter DJ1

1 Rheumatology Department, Royal North Shore Hospital and Institute of Bone and Joint Research, Kolling Institute, University of Sydney
2 Department of Musculoskeletal Imaging, Castlereagh Sports Imaging Center, St. Leonards

Background
Although musculoskeletal ultrasound has increasingly been utilized in clinical research of osteoarthritis (OA), ultrasound studies in thumb-base (trapeziometacarpal) OA are still lacking.

Aims
The aim of this study was to investigate the construct validity of ultrasound compared with pain, functional outcomes and plain radiography.

Methods
This is a prospective cross-sectional study of ongoing clinical trial with eligibility criteria including thumb-base pain on Visual Analogue Scale (VAS) ≥40 (0 to 100mm), Functional Index for Hand OA (FIHOA) ≥ 6 (0 to 30) and Kellgren Lawrence (KL) grade ≥ 2. The most symptomatic side was scanned to measure synovitis, power Doppler, osteophyte severity using a 0-3 semi-quantitative score, joint space narrowing (JSN) in millimeters (mm), and erosion.

To correlate ultrasound findings with VAS pain, FIHOA, KL grade, OARSI osteophyte and JSN scores, Eaton grades and muscle strength, Pearson or Spearman coefficients were calculated, and a significant correlation defined as a p-value less than 0.05.

Results
The study included 93 participants (mean age of 67.04 years, 78.5% females). Power Doppler was significantly correlated with VAS pain \( r_s=0.21 \) (P=0.04), with no significant correlation with other clinical outcomes.

In comparison to radiograph, ultrasonographic osteophyte score was significantly correlated with KL grade \( r_s=0.44(P<0.001) \), OARSI osteophyte grade \( r_s=0.35(P=0.001) \), OARSI JSN grade \( r_s=0.43(P<0.001) \) and Eaton grade \( r_s=0.30(P<0.005) \). JSN on ultrasound revealed a significant association with KL grade \( (r_s=-0.43(P<0.001)) \), OARSI osteophyte grade \( r_s=-0.29(P=0.013) \) and OARSI JSN grade \( r_s=-0.35(P=0.002) \).

Conclusion
Musculoskeletal ultrasound may have a role in clinical research and practice for assessment of thumb base OA.

Keywords
Ultrasonography; Hand Osteoarthritis; Arthritis; Inflammation; Ultrasound

Funding and Conflict of Interest
No conflict of interest

Address for correspondence
Win Min Oo, Rheumatology Department, Royal North Shore Hospital and Institute of Bone and Joint Research, Kolling Institute, University of Sydney, Australia; Email: wioo3335@uni.sydney.edu.au
Community-based interventions for chronic musculoskeletal conditions in rural and remote populations: Systematic review.

Pavithra Rajan, Jian Hua Lin, Andrew Leaver, Kathryn Refshauge, Michelle Lincoln and Claire Hiller
Faculty of Health Sciences, The University of Sydney

Background
Close to one half of the population lives in rural and remote areas. Access to health care services and health outcomes are poorer as compared to urban areas. Chronic musculoskeletal conditions are disabling and have a profound negative impact on life. While there is ample evidence in support of exercise interventions for chronic musculoskeletal health conditions, trials on the rural and remote populations are scarce with inconclusive results. Inadequate evaluation of these interventions in rural and remote areas has resulted in failure to establish evidence-based service models to facilitate development of successful programs.

Aims
The aims of this project were to:
1. Describe what community-based interventions have been used in the management of chronic musculoskeletal health conditions in rural and remote populations globally
2. Explore outcomes of these interventions.

Methods
A systematic review was undertaken with major databases like Medline, Scopus, Web of Science, Rural and Remote Health, Embase and Pedro until May 2018 with no restrictions on language or publication date. Screening was independently done by two researchers.

Results
A total of 3219 articles were identified initially. Data from 7 studies were included. Interventions included ergonomic modifications or self-management, exercise and physical activity.

Conclusion
Overall, the evidence is promising for self-management and exercise/physical activity programs for chronic musculoskeletal conditions in rural and remote areas. While such interventions may seem effective, diversity within communities, heterogeneity in chronic musculoskeletal conditions, and the nature and delivery of interventions make it difficult to identify the best intervention to address this issue.

Keywords
self-management; musculoskeletal; exercise; physical activity.

Funding and Conflict of Interest
Pavithra Rajan is a recipient of the University of Sydney International Scholarship-Strategic.

Address for correspondence
Pavithra Rajan, PhD student, The University of Sydney, 75 East street, Lidcombe, NSW, 2141; Email: praj6490@uni.sydney.edu.au
Implementation and Evaluation of ‘My Whiplash Navigator’: An online tool to assist recovery after whiplash.

Trudy Rebbeck1, Aila Nica Bandong1,2, Michele Sterling2, Andrew Leaver1, Carrie Ritchie2, Joan Kelly2, Angelo Basteris2, Martin Mackey1

1 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
2 Recover Injury Research Centre, University of Queensland
3 Department of Physical Therapy, College of Allied Medical Professions, University of the Philippines

Background
Whiplash, a world-wide health burden requires a novel solution to improve management. Poor guideline adherence, lack of identifying and addressing modifiable risk factors contribute to the burden. Online tools that facilitate clinical pathways of care are a novel direction forward.

Aims
To implementation and evaluate ‘My Whiplash Navigator’ with primary health care professionals (HCPs).

Methods
We followed a research translation framework (using processes of feasibility and efficacy) to implement and evaluate ‘My Whiplash Navigator’ with student, primary and specialist HCP’s. Implementation strategies included classroom education, educational meetings, educational outreach and reminders. Outcomes evaluated were website metrics, questionnaire assessment of opinions and knowledge gained, and website logs of treatment decisions.

Results
260 HCP’s registered on my Whiplash Navigator (175 students, 65 primary and 20 specialist HCP’s) from June 2016-March 2018. Most effective implementation strategies were classroom teaching for students (81% uptake) educational meetings for primary HCPs (47% uptake). Popular pages visited were those containing information about advice and exercises followed by those explaining how to assess risk. All HCPs agreed that their knowledge improved regarding risk management (83%) and in providing appropriate exercises (86%). Specialists most common decision was to ‘share care’ improving their management decisions from a previous cohort. Areas to improve were navigation and access to outcome measures.

Conclusion
Implementation of ‘My Whiplash Navigator’ improved knowledge and practise to be more consistent with a risk-based clinical care pathway for whiplash. Classroom education and educational meetings should be used in future strategies used to scale translation of the website.

Keywords
primary health care; whiplash injuries; decision support systems; clinical pathway; online tool.

Funding and Conflict of Interest
This study was supported by funding from the State Insurance Regulatory Authority of NSW and Motor Accident Insurance Commission of QLD. Trudy Rebbeck is funded by a University of Sydney SOAR Fellowship. Michele Sterling is funded by a NHMRC Principal Research Fellowship.

Address for correspondence
Trudy Rebbeck, Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney, 75 East Street, Lidcombe, NSW, 2141; Email: trudy.rebbeck@sydney.edu.au
Clinician, patient and general public beliefs about diagnostic imaging for low back pain:
A qualitative evidence synthesis.

Sweekriti Sharma¹, Adrian C Traeger¹, Benjamin J Reed²,³, Denise A O’Connor²,³, Tammy C Hoffmann⁴, Carissa Bonner¹, Chris G Maher¹,³, Rachelle Buchbinder²,³
¹ Sydney School of Public Health, University of Sydney
² Monash Department of Clinical Epidemiology, Cabrini Institute, Malvern, Victoria
³ Department of Epidemiology and Preventive Medicine, School of Public Health and Preventive Medicine, Monash University
⁴ Faculty of Health Sciences and Medicine, Centre for Research in Evidence-Based Practice, Bond University, Gold Coast, Queensland
⁵ Institute for Musculoskeletal Health, Sydney Local Health District

Background
Low back pain (LBP) accounts for an estimated 83 million years lived with disability every year, making it the number one cause of disability worldwide.

Aims
The aim of this study was to systematically review the qualitative research that has explored clinician, patient and general public beliefs about diagnostic imaging for LBP.

Methods
We conducted a systematic review of qualitative studies. We searched 5 databases (MEDLINE, EMBASE, CINAHL, AMED, and PsycINFO). Two reviewers independently screened articles and extracted data. Initial synthesis was done by open coding results into key themes and subthemes. The protocol was registered on PROSPERO (CRD42017076047).

Results
Of 6157 studies from the search, we screened 429 full-texts, and 63 studies met our inclusion criteria. We identified five key themes from our preliminary synthesis: (1) clinical presentation justifies scanning e.g. severe, worsening, long lasting and relapsing pain warrants scanning; (2) scans have benefits to clinicians e.g. help make correct diagnosis, locate the source of the pain; (3) scans have benefits to patients e.g. provide reassurance that there is no serious problem; (4) scans have risks e.g. causes unnecessary disease labelling and risk of radiation exposure; (5) health system tests drivers e.g. ordering because occupational system require it.

Conclusion
Both patients and clinicians believe that imaging is an important diagnostic tool for LBP. These beliefs are at odds with evidence that diagnostic imaging causes more harm than good for most people with LBP and could be important targets of public health campaigns.

Keywords
low back pain; diagnostic imaging; beliefs; overdiagnosis; clinicians.

Funding and Conflict of Interest
None to declare.

Address for correspondence
Sweekriti Sharma, Sydney School of Public Health, University of Sydney, Level 10 North, King George V Building, Missenden Road, Camperdown, NSW, 2050; Email: sweekriti.sharma@sydney.edu.au
Patient and Parent Reported Outcomes Following Pollicisation.

Sarah K. Tolerton, Belinda J. Smith, Ariella J. Smith and David A. Stewart
Department of Hand Surgery & Peripheral Nerve Surgery, Royal North Shore Hospital

Background
Pollicisation of the index finger is an established procedure for treatment of congenital anomalies of the hand including Type IIIB to V congenital thumb hypoplasia, five fingered hands and ulnar dimelia.

Aims
To provide insight into the patient and parent satisfaction of functional and aesthetic outcomes of pollicisation surgery.

Methods
One surgeon performed 102 pollicisations in 88 patients between 1991 and 2016. At January 2018, 78 of these patients (with 94 pollicisations) were ≥8 years old. Age-related Patient-Reported Outcome Measures (PROMs) were distributed to patients ≥8 years old and their families by mail, including the Patient/Observer Scar Assessment Scale, Abil Hands Kids, PedsQL (8-12), Peds QL (13-18), QuickDash and SF36. Questionnaire scores were calculated and compared to normal values.

Results
Questionnaires were returned by 32 patients (42 pollicisations). The median age at completion of questionnaires was 14.1y (range 8.3–31.9y), with a median age at surgery of 1.9y (range 0.9–14.5y). The scores of each questionnaire set and their comparison with age-related normal values will be presented.

Conclusion
Few studies in the congenital hand surgery literature use PROMs to assess patient or parent satisfaction following surgery.

Despite recognised functional limitations following pollicisation surgery, the majority of patients and their parents to return their questionnaires are satisfied with the aesthetic and functional outcomes.

The development and application of consensus outcome measures including patient and parent satisfaction is necessary for ongoing research in congenital hand surgery.

Keywords
pollicisation; congenital hand surgery; patient reported outcome measures.

Funding and Conflict of Interest
No funding was received. The authors declare no conflicts of interest.

Address for correspondence
Dr David Stewart, Department of Hand Surgery & Peripheral Nerve Surgery, Royal North Shore Hospital, St Leonards, NSW, 2066;
Email: NSLHD-Handsurgery@health.nsw.gov.au
Are physiotherapists choosing wisely? A systematic review of physiotherapy treatment choices.

Joshua Zadro\textsuperscript{1,2}, Mary O’Keeffe\textsuperscript{1,2}, Christopher Maher\textsuperscript{1,2}

\textsuperscript{1} School of Public Health, Sydney Medical School, The University of Sydney
\textsuperscript{2} Institute for Musculoskeletal Health, Sydney Local Health District

Background
Low-value care provides little-to-no benefit or causes harm, and diverts resources from high-value care that is cost-effective. Physiotherapists commonly treat people with musculoskeletal conditions, including low back pain (LBP), but the prevalence of high and low-value physiotherapy remains unknown.

Aims
To determine the proportion of physiotherapy for LBP and other conditions that is high-value, low-value, or of unknown-value.

Methods
We performed a keyword search in numerous electronic databases combining terms synonymous with "practice patterns" and "physiotherapy". Articles that quantified treatment practices through vignettes or audits were included. Practice guidelines and high-quality systematic reviews were used to classify treatments as being high-value, low-value, or of unknown-value. Two reviewers independently performed the selection of studies; resolving disagreements by discussion. Data were presented using medians and interquartile ranges (IQR); hence, the proportions do not sum to 100%.

Results
After screening 8,507 articles, 145 were included and 57 investigated treatment practices for LBP. The proportion of physiotherapy that was high-value, low-value, and of unknown value for LBP was 39\% (IQR: 12\%-65\%), 16\% (IQR: 5\%-37\%), and 18\% (IQR: 7\%-37\%), respectively. For other conditions, the high-value physiotherapy ranged from 15\% (shoulder pain) to 91\% (neurological conditions), while low-value physiotherapy ranged from 12\% (neck pain) to 94\% (cardiorespiratory conditions).

Conclusion
Less than half of physiotherapy for LBP is high-value; with a reasonable proportion providing little-to-no benefit or causing harm. This suggests the best available evidence does not inform a large proportion of physiotherapy for LBP and strategies to improve the quality of physiotherapy are needed.

Keywords
physiotherapy; physical therapy; low-value care; high-value care; practice patterns.

Funding and Conflict of Interest
No funding was received to conduct this study. The authors declare no conflicts of interest.

Address for correspondence
Joshua Zadro, School of Public Health, The University of Sydney, Level 10 North, King George V Building, Royal Prince Alfred Hospital, Missenden Road, NSW, 2050. Email: joshua.zadro@sydney.edu.au
ABSTRACTS

MUSCULOSKELETAL ENABLING RESEARCH GRANTS
(MSK ERG) 2017 UPDATE
SESSION

(in alphabetical order by first author)
A feasibility study evaluating the use of heat wrap therapy for acute low back pain (LBP).

Christina Abdel Shaheed1,2, Christine Lin1,2, Stephanie Mathieson1,2, Gustavo Machado1,2, Fiona Stanaway1, Andrew McLachlan3, Adrian Traeger1,2, Jane Latimer1,2, Ric Day4, Chris Maher1,2

1 Faculty of Medicine and Health, School of Public Health University of Sydney
2 Institute for Musculoskeletal Health, University of Sydney
3 Faculty of Medicine and Health, School of Pharmacy, University of Sydney
4 St Vincent’s Clinical School, University of New South Wales

Background
Heat wrap therapy is now recommended by clinical practice guidelines as first line non-pharmacological management of acute low back pain (LBP).

Aims
Our primary objective was to evaluate the acceptability of heat wrap therapy among i) people with acute LBP presenting to primary care and ii) the clinicians managing these patients.

Methods
We recruited 12 primary care clinicians (general practitioners and pharmacists). Each clinician was asked to recruit 4 participants with moderate to severe acute non-specific LBP. Patients were provided with 1 week treatment of heat wrap therapy and followed up at 1 week and 1 month. We used semi-structured interviews to determine patient and clinician acceptability of the intervention. We also collected clinical outcomes such as pain, function and medication use.

Results
The study has been well received by general practitioners and pharmacists and all feel that the intervention can help reduce the use of analgesia, including opioids, for the management of LBP. General practitioners have been particularly receptive to the study, some commenting they are under increasing pressure to reduce prescribing of opioid analgesia but are not being offered solutions to help them manage their patients with moderate to severe pain. So far, patients report the intervention is not invasive, easy to use and helps them manage their pain using less medicine. The qualitative findings are consistent with the recorded clinical outcomes.

Conclusion
The heat wrap therapy has uniformly been positively received by the primary care clinicians and patients recruited onto this feasibility study. Patients have reported pain relief and less use of medicines whilst using the heat wrap.

Keywords
heat wrap; acute low back pain; primary care; general practitioners; acceptability.

Funding and Conflict of Interest
Sydney Musculoskeletal, Bone & Joint Health Alliance seed grant.

Address for correspondence
Dr Christina Abdel Shaheed, Faculty of Medicine and Health, School of Public Health, Institute for Musculoskeletal Health, University of Sydney, Missenden Road, Sydney, NSW, 2050; Email: christina.abdelsheeed@sydney.edu.au
Preventing Osteoporosis in Patients with Acute Spinal Cord Injury.

Christian M Girgis¹,4, Lianne Nier²,4, Liza Nery¹, Jean Doyle¹, Lyn March³,4, Rory Clifton-Bligh¹,4

¹ Department of Endocrinology, Royal North Shore Hospital, Sydney
² Department of Spinal Cord Injury Rehabilitation Medicine, Royal North Shore Hospital, Sydney
³ Department of Rheumatology, Royal North Shore Hospital, Sydney
4 Northern Clinical School, University of Sydney

Background
Bone loss is rapid and profound in patients with acute spinal cord injury (SCI). Sudden immobilisation, denervation of bone and a range of nutritional and endocrine factors conspire against the skeleton, resulting in ~40% bone loss at 12 months post SCI. Fractures typically start to occur 5 years after SCI, by which time response to osteoporosis therapies is typically disappointing. The early phase after SCI provides a window period in which anti-resorptive therapies may offset acute skeletal deterioration and chronic morbidity.

Aims
To assess whether prophylactic treatment of acute SCI sufferers with a potent anti-resorptive agent early after their injury limits early rapid bone loss, preserves bone density over time and has an impact on fracture incidence.

Methods
As a tertiary centre for SCI in NSW, our institution manages ~70 new cases per year. Patients older than 18 years suffering acute traumatic SCI (with neurological deficit) will be included in a prospective study examining the effect of zoledronic acid 4 mg within 6 weeks of their injury. Markers of bone turnover, bone mineral density, and novel biomarkers of musculoskeletal function will be assessed prospectively at 6-12 monthly intervals. A historical control group of chronic SCI subjects 1-5 years post injury will also be examined.

Results
We established a multi-disciplinary team of physicians, rehabilitation specialists and allied health staff over 3 sites within Sydney to construct a research protocol to assess the musculoskeletal health of SCI patients (ACTRN12618000915257). This world-first LHD-wide initiative will be known as the “Healthy Bones in SCI Campaign”. This project has just received ethics approval and the first patient is currently being recruited. We hope to soon present data on this project (and predict ~10-15 recruited subjects by the year’s end).

Conclusion
This collaborative project seeks to prevent bone loss in spinal cord injury and alleviate fracture-related morbidity in this under-serviced population.

Keywords
osteoporosis; spinal cord injury; fracture; bisphosphonate; disability.

Funding and Conflict of Interest
This research is supported by the Musculoskeletal Enabling Research Grant, Sydney Musculoskeletal Alliance. No disclosures to report.

Address for correspondence
Dr Christian Girgis, Department of Endocrinology, Royal North Shore Hospital, Reserve Rd, St Leonards; Email: christian.girgis@sydney.edu.au
The KOMPACT-P study:
Knee Osteoarthritis Management with Physiotherapy informed by Acceptance and Commitment Therapy- Pilot trial.

MK March¹,², S Dennis²,³,⁴, AR Harmer², E Godfrey⁵, S Venkatesh⁶, D Espinosa⁷, B Thomas⁸ and A Maitland⁹

¹ Physiotherapy Department, Blacktown Mt Druitt Hospital
² Musculoskeletal Health Research Group, University of Sydney
³ South Western Sydney Local Health District
⁴ Ingham Institute for Applied Medical Research
⁵ Department of Health Psychology, King’s College London
⁶ Renal Supportive Care, Nepean Blue Mountains LHD
⁷ Clinical Trials Centre, University of Sydney
⁸ Department of Orthopaedics, Blacktown Mt Druitt Hospital
⁹ Post Acute Community Care, Western Sydney LHD

Background

Adults who have osteoarthritis experience more psychological distress compared to their peers without osteoarthritis. Our recent systematic review demonstrated that it is likely that worse pre-operative psychological health increases hospital length of stay after total knee arthroplasty. Previous studies have found equivocal results when examining the effects of a pre-operative physical exercise program on hospital length of stay and patient reported outcomes following knee arthroplasty, however, none of these included a psychological component.

Aims

Our primary aim is to investigate the safety, acceptability and feasibility of a Physiotherapy informed by Acceptance and Commitment Therapy (PACT) intervention in adults awaiting total knee arthroplasty.

Methods

This is a mixed methods pilot randomized controlled trial of 51 participants. Randomisation will occur in a 2:1 ratio in favour of the treatment group. Data collection of secondary outcomes will include patient reported functional outcomes, health service measures, psychological health measures, quality of life measures, and sociodemographic data. This data will inform sample size and variation for a fully powered RCT should this pilot study achieve success according to its predetermined criteria.

Results

This project will be submitted to ethics in the near future and has undergone significant changes in its design and aims. The learning journey will be discussed, and an interactive discussion will be facilitated around the challenges identified. Future planning and grant funding for a fully powered RCT to test the intervention will also be discussed.

Conclusion

Transdisciplinary intervention and collaboration present many challenges to the early career researcher but are valuable learning experiences to be shared.

Keywords

knee arthroplasty; osteoarthritis; physiotherapy; psychological health; pilot trial.

Funding and Conflict of Interest

This project is funded by two grants: Kickstarter grant (WSLHD and USYD FHS) and the SydMSK Enabling Research Grant.

Address for correspondence

Marie K March, Physiotherapy Department, Blacktown Hospital, Marcel Cres, Blacktown, NSW, 2148; Email: Marie.March@health.nsw.gov.au
E-health to empower patients with musculoskeletal pain in rural Australia: A pilot study. EMPoweR study

Carlos Ivan Mesa Castrillon1, Phillip Roland Davis1, Jose Antonio Michell de Gregorio1, Milena Simic1, Evangelos Pappas1, Georgina Luscombe1, Manuela Ferreira2, Jenny Wheeler3, Grahame Knox3, Kristy Hatswell5, Susan Simpson2, Amy Archer3, Stephen Bunker3, Ornella Clavisi2, Kim Bennell6, Katrina Scurr6, Adrian Bauman7, Jennifer Alison1, Timothy Shaw7, Tony Lower8, Mathew Jennings9, Marcos Noronha10, Paulo Henrique Ferreira1.

1 Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney
2 Institute of Bone and Joint Research, The Kolling Institute, Sydney Medical School, Faculty of Medicine and Health, The University of Sydney
3 Western New South Wales Local Health District
4 Medibank private
5 MOVE muscle, bone & joint health
6 University of Melbourne
7 Charles Perkins Centre, The University of Sydney
8 NSW Farmers Association
9 Liverpool hospital, South Western Sydney Local Health District
10 Rural Health School, LaTrobe University

Background
Strategies to improve access to health services and resources in rural populations are necessary to attenuate the burden of musculoskeletal pain.

Aims
(I) To investigate the feasibility of implementing an e-health-supported intervention, for people living in rural NSW-Australia with chronic non-specific low back pain and/or knee osteoarthritis. (II) To estimate the efficacy of the intervention compared to usual care on physical function and other secondary outcomes.

Methods
This is a 2-group multicenter randomized controlled trial with parallel design. In addition, there is an embedded cohort of patients receiving the currently implemented Virtual Outpatient Musculoskeletal Physiotherapy Services in Western NSW Local Health District (LHD). Participants were randomly allocated to usual care (n=16) or intervention group (n=16), which includes a tailored physical activity plan, and progressive resistance exercise program, delivered remotely.

Recruitment rate, attendance, adherence, follow-up rate, participant's opinion, difficulties and barriers are being assessed; similarly, measures of function, pain, physical activity, activity limitations and quality of life are being collected at baseline and 3 months post randomization.

Results
The study involved two PhD students and two research assistants; and enabled new collaborations in Western NSW LHD. The study protocol was presented at the Western Health Research Network conference, and a protocol manuscript is being prepared. Future grant applications for NHMRC partnership and TRGS will ensure the sustainability for the main trial.

Conclusion
The EMPower study has enabled the establishment of new strong partnerships including Musculoskeletal Australia, Medibank Private, Farmers NSW, Orange and Dubbo hospitals and Western NSW LHD.

Keywords
musculoskeletal pain, eHealth; low back pain; knee osteoarthritis; rural health.

Funding and Conflict of Interest
This trial is funded by the Sydney Musculoskeletal, Bone & Joint Health Alliance Musculoskeletal Enabling Research Grant (MSK ERG) and APA Scholarship. This trial is sponsored by The University of Sydney.

Address for correspondence
Paulo Henrique Ferreira, Faculty of Health sciences, The University of Sydney, 75 East street, Sydney, NSW, 2141;
Email: paulo.ferreira@sydney.edu.au
Novel synthetic tendon for the repair and regeneration of rotator cuff tendon.

Young Jung No¹, Stuart Fraser² and Hala Zreiqat¹

¹ Biomaterials and Tissue Engineering Research Unit, School of AMME, Faculty of Engineering and IT, University of Sydney
² Laboratory of Blood Cell Development, Discipline of Physiology, School of Medical Sciences, University of Sydney

Background
Rotator cuff tendon (RCT) ruptures result in persistent pain and restriction of upper limb movement for patients. Previously marketed synthetic RCT grafts have all unacceptable failure and complication rates due to poor biomechanics and poor host tissue-graft integration. In addition, RCTs possess unique geometry and fibre alignment, making it difficult to achieve effective clinical outcomes using typical autografts of the long tendons of the bone-patellar tendon complex and hamstring which have otherwise been used for Achilles' tendon and knee ligament repairs.

Aims
The two aims of the project were to (1) engineer fibre-reinforced hydrogels (FRH) (Australian Patent #20169905392) specific for repair of the RCT; and (2) investigate the behaviour of mouse embryonic stem cells (ESC) on the engineered FRH.

Methods
FRH was synthesized by reinforcing polyvinyl alcohol and gelatin composite hydrogel with ultra-high molecular weight polyethylene fibres. The FRH scaffolds were lyophilized and cut into 1cm x 1cm x 0.1cm prior to seeding with mouse embryonic stem cells for up to 6 weeks.

Results
We were able to successfully fabricate flat, synthetic FRH with transversely arranged fibres that can ‘wrap around’ near the proximal end of the humerus where RCT ruptures typically occur (Figure 1). These scaffolds also possess the ability to accommodate sufficient longitudinal and rotational strain to allow normal shoulder joint movement. Mouse ESC seeded onto the FRH, cultured for up to 6 weeks show distinct long, thin morphology resembling specialized fibroblastic cells and presume tenogenic differentiation, as opposed to the squamous morphology on tissue culture plastic surface cultured under the same conditions (Figure 2).

Conclusion
The engineered FRH scaffold demonstrates potential for use as a synthetic graft for repairing RCT ruptures. The dimensions can be tailored to match the requirements for the patient, and the FRH provides a suitable environment for the differentiation of mESC into tendon-like cells.

Keywords
tendon; rotator cuff; biomaterials; synthetic grafts; embryonic stem cells

Funding and Conflict of Interest
Sydney Musculoskeletal Group Enabling Research Grant; No conflict of interest is declared.

Address for correspondence
Hala Zreiqat, Biomaterials & Tissue Engineering Research Unit, University of Sydney, Sydney, NSW, 2006, Email: hala.zreiqat@sydney.edu.au
Healthy ageing promotion in middle age with physical activity: Intervention development with multidisciplinary input and rapid evidence review.

Sherrington C, Tiedemann A, Purcell K on behalf of the project group.
Institute for Musculoskeletal Health, School of Public Health, University of Sydney

Background
WHO defines healthy ageing as "the process of developing and maintaining functional ability that enables wellbeing in older age" and highlights the importance of health and lifestyle prior to older age. Physical capacity often starts to decline in middle age (45 to 65 years) so this is an ideal time for intervention. Physical activity is an obvious intervention choice due to its proven impact on physical and mental capacity.

Aims
To generate and assess intervention options for the promotion of physical activity among people aged 45-65 years. To develop a ‘best bet’ physical activity intervention for people aged 45-65 years.

Methods
The project group included 16 people with a broad range of multidisciplinary research and clinical expertise. The project group met to generate intervention options, discuss the benefits and barriers of various options and develop a ‘best bet’ intervention. Those unable to attend were interviewed individually. A rapid review of relevant evidence was also undertaken. The results of the discussions were incorporated with findings of the evidence review into an issues paper.

Results
A summary of the intervention options, rapid evidence review results, intervention program developed and the next steps will be presented.

Conclusion
There is an urgent need for scalable intervention strategies to enhance physical capacity in people aged (45 to 65). The combination of multidisciplinary brainstorming, rapid evidence review, and document development was a useful way to commence the develop of an intervention.

Keywords
healthy ageing; physical activity; middle age; exercise promotion; health coaching.

Funding and Conflict of Interest
Sydney Musculoskeletal, Bone & Joint Health Alliance Musculoskeletal Enabling Research Grant (MSK ERG) 2017. No conflicts of interest.

Address for correspondence
Professor Cathie Sherrington, Institute for Musculoskeletal Health, School of Public Health, The University of Sydney Level 10 North, King George V Building, Royal Prince Alfred Hospital (C39) Missenden Rd Camperdown, Sydney NSW 2059;
Email: cathie.sherrington@sydney.edu.au