

**Physiotherapists provide considerable services to children with ASD and indicate needs for professional development and clinical guidelines: an observational study.**

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## Abstract Presentations

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**KEYNOTE  
&  
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SPEAKERS  
ABSTRACTS**

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## The bare bones of pulmonary rehabilitation – running rehab programs with minimal resources

Alison, JA<sup>1</sup>

<sup>1</sup>Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney

There is strong evidence of the effectiveness of pulmonary rehabilitation in improving exercise capacity and quality of life, as well as reducing hospital readmission after an exacerbation in people with chronic obstructive pulmonary disease (COPD). However, much of the evidence comes from research trials carried out in large metropolitan centres, often using costly equipment. More recently, a number of randomised controlled trials have shown that alternative modes of exercise training, requiring minimal equipment, may be effective in improving exercise capacity and quality of life for people with COPD. Therefore, minimal physical resources should not be a limitation to providing effective pulmonary rehabilitation. However, physical resources are only one part of rehabilitation. Of equal or greater importance are personnel resources. It is vital that physiotherapists who provide pulmonary rehabilitation are well skilled in patient assessment, individualised exercise prescription, clinical reasoning and outcome evaluation. Pulmonary rehabilitation physiotherapists should also be able to educate the patient to manage their disease as well as motivate the patient to incorporate regular exercise in their lives. Therefore, the ‘bare bones’ of pulmonary rehabilitation not only refers to physical resources but also personnel resources. These will be discussed in this breakfast session.

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## How do I know my treatment worked? What research can tell us about treatment effects?

Alison, JA<sup>1</sup>

<sup>1</sup>Discipline of Physiotherapy, Faculty of Health Sciences, The University of Sydney

As physiotherapists we are clinical scientists. We make daily decisions on which treatments might be most effective for our specific patient at the particular stage of their illness, injury or disease, based on the best available research evidence combined with patient preference and our own clinical expertise. What the research can tell us about treatment effects and how believable this research is depends on the quality of the research, including such factors as the relevance of the research question, the study design, blinding and dropouts. The much more difficult question is ‘How do I know my treatment worked?’ For an individual patient we only have a sample of  $n=1$ . The intervention chosen may have good evidence of effectiveness based on high quality research, but can we be sure that the patient’s response was due to the intervention? In some instances, extremes of immediate improvement or decline may be considered to indicate real treatment effects however, when the changes are less dramatic there may be uncertainty whether they were the result of the intervention. Some of the factors contributing to the uncertainty are that natural recovery/decline, Hawthorne and placebo effects, or the effect of the unique patient/therapist interaction cannot be accounted for in an individual patient. There are a few strategies that can be used to evaluate single patient responses to treatment such as  $n$ -of-1 randomised trials. However, it is often not possible to answer with any certainty the question ‘Did my treatment work?’

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## Control of the core during different rotation torques – A motor control assessment of how planned movement alters trunk muscle activation patterns.

Allison, G, & Morris, S

### Background

There has been a substantial amount of literature defining the role of the deep transversus muscles and the core in general. Most of the literature provides an experimental paradigm that is based on fundamental assumptions that once assumed to be correct lead the researcher, and more importantly the clinician, to develop interventions or experimental protocols that are fundamentally problematic. There are many current research projects (theses) and training programs based on the rationale of the ability of a single muscle acting at a submaximal level of intensity 30ms earlier can impact on the mechanical stability of the lumbo-pelvic region. However, do these altered patterns reflect a deficit in the mechanics of the spine or are they a marker of altered cognitive processes?

### The thesis

The main factor in contributing to the activation patterns of the core relate to the intention of the focal task of movement. The fact that the feed forward activation strategy of various muscles is predominantly subconscious does not form the basis that the feed forward response and the actual focal task should be unlinked or disassociated. We propose that it is equally likely that so called deficits in the feed forward response of any single or cluster of muscles cannot be separated from the choice of movement strategies that people make under different cognitive and physical settings.

### The aim

This presentation will demonstrate that conscious movement choices that perturb the spine are strongly associated with the feed forward behaviours of the core muscles... and visa versa. We will show how simple instructions can change the transversus abdominis activation pattern from that of “pathologically delayed” to normal. It follows that situational factors can impact on the selection of movement patterns that individuals choose to undertake.

### The data

Specifically we will use inverse dynamics and fine wire EMG data to show that unilateral TrAb activation is part of a diagonal sling synergy that controls the trunk in response to rotation perturbations. This is a ground up “throw” sequence. Without rotation forces we show that TrAb does not necessarily pre-activate and acts synchronously with other muscles as in a push motor control strategy. These findings shows that the contralateral TrAb will be delayed if no axial rotation forces are part of the spinal perturbation from the selected movement pattern. The magnitude of changes in the TrAb feed forward activation patterns in some normal controls are the similar to changes reported between people with and without LBP.

### Clinically – So What?

Individuals with LBP may choose to move differently or avoid rotation by bracing (i.e. increased Ext Oblique activity) and therefore it is this choice that may be the largest predictor of any latency in delays in TrAb. Altered TrAb activation may be a marker of the presence of LBP, Anxiety or Fear or other cognitive processing or belief system dysfunction and in our opinion is much less likely to purely reflect a mechanical basis for segmental instability.

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## Moving ICU physiotherapy into the future

Berney, S, Senior Physiotherapist in ICU and Deputy Director of Physiotherapy, Austin Health

Progress in intensive care medicine has resulted in improved survival rates. Approximately 119,000 patients required admission to a general ICU in Australia each year with around an 89% survival rate at hospital discharge. However, the legacy of survival can be significant with prolonged immobility and catabolism contributing to deconditioning, muscle atrophy and weakness that can impact future health related quality of life. Reports of prolonged muscle weakness and impaired physical and cognitive function have resulted in critical care clinicians redefining the research agenda to include patient centred outcomes in addition to mortality. There has been increased interest in the identification of the potential harmful effects of various treatments delivered in the ICU and the provision of interventions to prevent or ameliorate muscle weakness. One such intervention is rehabilitation that includes early mobilisation commenced in the ICU. There is low level evidence to support the role of early mobilisation in reducing the ICU length of stay and improving longer term outcomes such as readmission to hospital. In addition there is high level evidence that rehabilitation commenced in the ICU can improve functional capacity at hospital discharge. These interventions have been reported to be safe and feasible to implement in the critical care setting.

Current research is focused on developing diagnostic and outcome measures, identifying the contributing mechanisms that lead to long term muscle weakness, establishing the efficacy of interventions commenced early in an ICU admission and assessing the effects of rehabilitation commenced in the ICU on longer term patient centred outcomes.

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## Seeking effective clinical education experiences for physiotherapy students: Affordances and engagements

Billett, S, Griffith University

This presentation sets out some bases constituting effective clinical education experiences. A key premise is that clinical settings need to be considered in terms of their own potentials, contributions and limitations as learning environments in terms of the knowledge that physiotherapists need to learn, and not compared with what occurs within educational institutions. Following a discussion about the norms, practices and emphases in educational institutions, clinical settings will be considered as learning environments on the bases of what they afford learners, on the one hand, and how those learners engage with them. These affordances include the range of activities and interactions that are accessible for learners, including those that are inherently pedagogically rich in some way. In addition, rather than seeing circumstances which present themselves as being un-conducive of effective learning (i.e. work intensive situations, absence of senior clinicians etc) the issue is how these kind of authentic experiences can be utilised to become effective opportunities for learning because they represent the practices which need to be learnt. Then, bases by which individuals engage in these experiences and from which they will learn the kinds of knowledge which are required effective for effective physiotherapy practice. These engagements will be premised on the capacities, agency and intentionality of students as proactive learners. They also emphasise the importance of students' personal epistemologies in ways that might be distinct from their role within educational institutions. In all, the presentation will attempt to approximate what might constitute a curriculum and pedagogy of physiotherapy practice.

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## A biopsychosocial clinical reasoning model for acupuncture and dry needling

Bradnam, L, Senior Lecturer in Physiotherapy Flinders Clinical Effectiveness, School of Medicine, Flinders University, Adelaide

**Question:** Can the psychological status of an individual be considered in the context of a clinical reasoning model for dry needling and acupuncture? **Intervention:** The scientific literature regarding the mechanisms whereby sensations and emotions are integrated in the human brain and their effect on the body via output transfer systems of the autonomic, immune and endocrine systems was reviewed. A clinical reasoning question was formulated to add to the original 'layering' clinical reasoning model.

**Results:** Interoceptive sensory stimuli and emotions are integrated in limbic and frontal brain regions to allow emotional responses to feedback from the body and provide the individual with a 'sense of self'. A strong connection with brainstem nuclei modulating output transfer systems allows emotions to regulate homeostatic balance. Acupuncture may be interpreted as an interoceptive stimulus by the brain. Acupuncture can modulate neural activity in similar brain regions to those processing emotional responses to sensory inputs.

**Conclusion:** Acupuncture may influence emotional responses and their impact on the neurobiology of the human body. This suggests acupuncture may be used as an adjuvant to other therapies in disorders with a biopsychosocial component. A biopsychosocial clinical reasoning question based on the modulation of emotional processing in the brain is proposed and added to the layering model to support a holistic approach to dry needling and western acupuncture practice.

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## A neurophysiological clinical reasoning model for dry needling and acupuncture.

Bradnam, L, Senior Lecturer in Physiotherapy, Flinders Clinical Effectiveness, School of Medicine, Flinders University, Adelaide

**Question:** Can a clinical reasoning model based on current neurophysiological research be used to underpin clinical decision making for dry needling and acupuncture? **Intervention:** The scientific literature regarding the neurophysiology of pain and the mechanisms underlying the effects of acupuncture on the nervous system were reviewed and a clinical reasoning model developed.

**Results:** The layering clinical reasoning model was developed to inform clinical decisions such as where to place needles, how many to use and how long to needle for by determining the predominant pain mechanism and stage of healing in each individual patient. Interventions are targeted at the different 'layers' of the central nervous system, i.e. peripheral effects around the site of needle insertion, spinal effects in the cord, and central effects that take place in the brain. These different levels can be modulated using particular acupuncture parameters.

**Conclusion:** The 'Layering Method' is a clinical reasoning model for western acupuncture that takes a research-evidenced, mechanisms-based approach to clinical decision making. An orthodox diagnosis is made and acupuncture points selected to target the source of the physical impairment or pain mechanism. Knowledge of the neurophysiology or 'levels of effect' of acupuncture on the central nervous system allows treatments to be progressed for recalcitrant problems, or when pain mechanisms change over time.

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## Getting ready for school: Physiotherapy intervention for preterm born children with mild movement problems

Burns Y R<sup>1,2</sup>

<sup>1</sup>Division of Physiotherapy, School of Rehabilitation and Health Sciences University of Queensland, Brisbane

<sup>2</sup>Growth and Development Clinic, Mater Mother Hospital, Brisbane

What prepares a child for school and who decides if and when they are ready? What happens when a child does not cope? Concerns have been raised about the readiness of many extremely preterm born (ELBW) children for the cognitive, physical, behavioural and interpersonal challenges of the classroom. Up to 50% of children born < 1000g can present with problems of motor co-ordination, postural stability, attention and fitness from the age of three and four years through primary school and into adolescence<sup>1,2</sup>. Would intervention prior to starting formal education help? To date no intervention program addressing this in non disabled ELBW preschool/primary school children has been reported so a pilot trial of a 6 week intervention program with small groups of 4-5 year old children was conducted. The program was designed to address the problems experienced by these children. Some significant improvements were achieved but were these sustained and better than usual activities?. Currently a randomised control trial is underway to address this. Other groups of children are challenged with start of school. Should Paediatric Physiotherapists be identifying and helping to prepare these children for school?

1. Goyen TA, Lui K. Developmental coordination disorder in "apparently normal" school children born extremely preterm. *Arch Dis Child*. 2009;94:298-302..

2. Burns YR, Danks M, O'Callaghan M, Gray PH, Cooper D, Poulsen L, Watter P. Motor coordination difficulties and physical fitness of extremely-low-birthweight children. *Dev Med Child Neurol* 2009;51: 136-142.

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## The 'CENTREd' Model: Steps, Skills and Tools for Self-Management Support of Health and Chronic Conditions

Cameron-Tucker, H

Menzies Research Institute University of Tasmania; Department of Physiotherapy Royal Hobart Hospital, Hobart, Tasmania

**Background:** There is an increasing focus on patient-centred care and self-management support of health, including chronic conditions. Self-management support aims to enable people to develop the confidence and capability to take an active role in health self-management: engaging in activities to obtain the best possible health with respect to a sense of self and physical, emotional, social, spiritual and medical wellbeing, thereby maximising function and quality of life.

**Objectives:** To describe a participant-centred model for health self-management support.

**Design:** Qualitative enquiry using semi-structured interviews explored the lived experience of a purposeful sample of participants with chronic obstructive pulmonary disease (COPD), attending a Stanford Chronic Disease Self-Management Program (CDSMP) with or without supervised exercise (CDSMP±Ex). Data were subjected to iterative thematic analysis.

**Participants:** Fourteen men and six women with severe COPD were interviewed over two years about their experience of COPD and the CDSMP±Ex.

**Results:** Findings pointing to participant-centred care supported the proposed 'CENTREd' Model – Commit to partnership, Engage and establish a mutually-agreed agenda, Negotiate goals, Take action to address goals, Repeat back decisions/information and Establish proactive follow-up. The Model incorporates communication, motivational interviewing, problem solving, goal setting and action planning skills and tools. Embedded in the Model is the 'SNAPPS' Health-Management Framework (Smoking, Nutrition, Alcohol, Physical activity, Psychosocial well-being and Symptom management), providing a holistic health focus.

**Conclusions:** The 'CENTREd' Model articulates for healthcare practitioners a philosophy, strategies to guide practice, a health-behaviours focus, skills and tools that may be brought immediately to any healthcare interaction across the care continuum to provide health self-management support.

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## Neuroscience to Neurorehabilitation: Building the Evidence for Effective Sensory Rehabilitation after Stroke.

Carey, L, National Stroke Research Institute, Melbourne

Sensory loss after stroke is a 'hidden' and somewhat neglected problem, yet has a major impact on use of the upper limb and return to previous life activities, even years after stroke. Compelling evidence of neural plastic changes in the brain provides a rationale for more active approaches to rehabilitation. In this lecture I will present my journey in translating knowledge of neuroscience and learning into an evidence-based approach to rehabilitation of sensory functions after stroke. I will retrace the steps involved in systematically developing the novel approach to sensory retraining that first achieved task specific training effects and then transfer of training effects to novel stimuli. Evidence from the 'SENSe' randomised controlled trial will be presented as well as evidence of changes in the brain associated with sensory recovery and rehabilitation.

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## The Top & Bottom: Care in needling the lumbar and cervical spine

Cary, D, FACP Specialist Musculoskeletal Physiotherapist

This presentation will present information from a clinical and a research base that will assist dry needlers in making decisions about the safety of needling around the cervical and lumbar spine. Areas of interest will include the vertebral artery, kidneys and abdominal organs.

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## Enhancing outcomes of patellofemoral pain management: targeting the foot

Collins, N

Patellofemoral pain (PFP) remains one of the most common and burdensome lower limb conditions presenting to musculoskeletal physiotherapists. Increasing evidence that PFP is not self-limiting, and may precede patellofemoral joint (PFJ) osteoarthritis in later years, has important implications for long-term physical activity and general health. As primary contact practitioners, physiotherapists must have a thorough understanding of optimal and efficacious strategies to minimise this burden.

In light of increasing evidence of an association between greater foot pronation and PFP, interventions that address this should be considered. While foot orthoses have long been advocated for PFP, high-quality clinical trials investigating their efficacy have been lacking until recently. Our 12-month RCT (n=179) found that prefabricated foot orthoses resulted in significantly greater short-term improvements in PFP than a flat shoe insert, suggesting that the contoured shape of the orthoses has some therapeutic effect. Notably, similar outcomes between groups treated with foot orthoses and with multimodal physiotherapy (PFJ mobilisation, patellar taping, vasti muscle retraining) imply that foot orthoses are an effective alternative to physiotherapy.

Despite evidence of efficacy, the multifactorial nature of PFP necessitates targeted, individualised prescription of foot orthoses. A preliminary clinical prediction rule shows that the probability of success can be increased from 40% to 85% in older, shorter individuals who have greater foot pronation and lower PFP severity. These findings suggest that, by appropriately prescribing foot orthoses for PFP, particularly for patients who present with factors that suggest a greater likelihood of success, physiotherapists can enhance clinical outcomes for those with PFP.

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## Physical activity and fitness: promoting health for all

Dwyer, GM, The University of Sydney

Physical activity is a prerequisite for optimal growth and development in children. Regular physical activity in childhood and adolescence is recognised as an important factor in the prevention of chronic diseases such as osteoporosis, cardiovascular disease, type 2 diabetes mellitus and obesity. While much of the focus on activity in children is associated with prevention of childhood obesity, the need to be active applies to the same degree in children with disability who can walk or self-propel in a wheelchair. Paediatric physiotherapists are well positioned to promote health for all children. The ICF framework provides an ideal structure to base continuum of care and extend management beyond impairments to assessment and promotion of activity and fitness. This presentation will review research findings of activity and fitness levels of typically developing children and children with disability or chronic disease (CF, CP, DMD, Down syndrome, JIA and Spina Bifida). Methods of assessing activity and fitness will also be presented.

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## Exercise training in pulmonary arterial hypertension

Ganderton, L, Curtin University, Perth, Western Australia

Individuals with pulmonary arterial hypertension (PAH) frequently present with exertional symptoms of dyspnoea and fatigue, which limit their ability to perform daily activities and, as a result, negatively impacts on their quality of life. In PAH, the inability of the pulmonary vasculature to vasodilate in response to an exercise demand causes a reduction in cardiac output limiting oxygen delivery to the exercising muscles. This leads to a reduction in aerobic exercise capacity and contributes to the symptoms of dyspnoea and fatigue. Skeletal muscle dysfunction is also believed to contribute to exercise intolerance in this population.

Whilst, exercise training is yet to become an established form of therapy for individuals with PAH, a small number of studies have recently reported benefits following exercise training in this group. Data from our randomised controlled trial, investigating the short term benefits of exercise training in PAH, have supported and extended the current evidence base for exercise training in this population. Training has been shown to improve (i) exercise tolerance (six minute walk distance; endurance time on constant workload exercise tests); (ii) aerobic capacity (increased anaerobic threshold; increased peak oxygen uptake); (iii) skeletal muscle function; and (iv) quality of life (CAMPHOR; SF-36). This presentation will identify the factors that contribute to exercise intolerance in PAH, discuss the physiological and symptom responses to exercise, and demonstrate the benefits of exercise training on exercise capacity and quality of life for this population.

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## The association between negative joint loads, muscle and movement in the prevention & management of hip joint pathology

Grimaldi, A

Health of the musculoskeletal system is inherently linked with load. Load can produce both anabolic and catabolic effects in musculoskeletal tissues. Joint cartilage and subchondral bone exposed to negative joint loads will undergo deformation and subsequent deterioration, and may become a source of pain. This presentation will discuss 4 major types of negative loading:

1. Excessive compression, including impact loading
2. Excessive shear force
3. Bony impingement &
4. Lack of adequate gravitational load

The close association between joint loading, muscle function, and postural and movement habits will be explored in the framework of prevention and management of hip joint pathology.

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## Subgrouping and clinical prediction rules: Help or hindrance to clinical practice?

Hancock, M

Selecting the optimal treatment for individual patients is an important goal of physiotherapists working with patients with musculoskeletal conditions. This is especially the case for "non-specific" conditions where a pathological diagnosis is not obvious but is important even when the diagnosis is clear. Providing evidence of subgroups of patients who respond best to specific treatments is a research priority but has many challenges.

Clinical prediction rules are one approach used to identify subgroups who respond best to specific interventions but other approaches including classification systems exist. This talk will expand on the different approaches and study designs being used by researchers to provide evidence that treatments can be targeted to specific individuals to improve outcomes. Examples of different approaches will be presented including some recent studies providing early encouraging findings. The talk will aim to provide clinicians with the information required to critically evaluate literature in this difficult area so the findings can be appropriately used to guide clinical practice.

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## Groin Injury Screening in the AFL (a 5 year review)

Hogan, A

Despite recent advances in knowledge and understanding, groin pain remains one of the three most common injury states reported in the football codes. Most recently, clinicians have recognised the need for screening protocols that facilitate early detection of groin pain and injury. GroinScreen, developed by this author for professional football teams (i.e., Australian Rules Football, Rugby Union, Soccer), is one such program. One format of GroinScreen, used by four AFL clubs, included Hip ROM tests and groin pain provocation tests (Squeeze test, Pubic Stress tests, and Resisted Adduction test).

Data collected since 2005 has been reviewed and key findings will be presented. The implications for future groin injury screening protocols will also be discussed.

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## Neuroimmunopharmacology of pain: a mouthful to say, but perhaps the new hope for pain management?

Hutchinson, M

Over the past 3 decades our appreciation for the unique qualities and destructive power of the immune-like cells of the central nervous system has grown. It is now apparent from a wealth of preclinical literature that these cells, glia, and their signalling molecules contribute causally to a myriad of central nervous system disorders such as chronic pain states. Some of this evidence has been gleaned from work conducted in the Neuroimmunopharmacology field. Neuroimmunopharmacology is the study of Neuroscience, Immunology and Pharmacology and the intersections of the 3 disciplines. This presentation will cover the basic developments of glial contributions to chronic pain (neuroimmunology), explain the potential opportunities to intervene in this process (neuropharmacology) and uncover some possible mechanisms for co-morbidities between chronic pain states and other disorders (neuroimmunopharmacology). This presentation is aimed to accelerate your knowledge of the three disciplines to an extent that you will be equipped with the basic tools to further your own education of this exciting and dynamic field of research.

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## What are Physiotherapist Doing to a “Brain in Pain”

Lundeberg, T., Foundation for Acupuncture and Alternative Biological Therapies, Sabbatsbergs Hospital, Stockholm, Sweden

It is clear that the processing of nociceptive information is complex, and that the experience of pain can be modulated by a variety of mechanisms that either facilitate or inhibit nociceptive information. One of the areas playing a key role in pain modulation is PAG (peri aqueductal grey) -it contributes to the pain inhibitory effects of acupuncture, stress, expectation, and distraction, and it may play an indirect role in DNIC. It may also facilitate pain during anxiety. Decreased activity in the PAG, likely due to an inhibition of PAG activity, also appears to contribute to the pain enhancing effects of depression and pain catastrophizing.

Somatosensory stimuli, such as noxious stimuli (DNIC), acupuncture and movement, can reduce the experience of pain and cortical activity in areas of the ‘pain neuromatrix’ whereas negative affect, such as depression, anxiety and pain catastrophizing, generally increase the experience of pain and increase activity in areas of the ‘pain neuromatrix’ – especially those related to the attentional and affective dimension of pain – as does chronic stress and insomnia. However, extreme acute stress produces analgesia (SIA).

Cognitive factors also influence the experience of pain. Paying attention to a noxious stimulus enhances pain and increases activity within the ‘pain neuromatrix’ while distraction decreases its perceived intensity and associated cortical activity.

Hypnotic suggestions or suggestions of effect (expectation/“placebo”) or side effects (nocebo) can influence the experience of pain and activity within the ‘pain neuromatrix’ in either direction depending on the suggested effects.

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## Acupuncture Analgesia

Lundeberg, T., Foundation for Acupuncture and Alternative Biological therapies Sabbatsbergs Hospital Stockholm, Sweden

Evidence for the involvement of the nervous system in acupuncture analgesia is strong. Studies performed in the 1960s showed that manual acupuncture at LI4 induced a gradual increase in skin pain threshold that reached a plateau at 30 min, was maintained for at least 50 min, and faded after removal of the needle. This characteristic time-dependent analgesic effect was totally abolished after the infiltration of a local anesthetic deep into the acupoint at the muscle, but not subcutaneously, highlighting the importance of nerve innervations distributed in the deeper structures of the acupoint.

The results indicated the involvement of peripheral sensory nerves in acupuncture analgesia. Recent studies suggest that acupuncture analgesia may be attributed to different mechanisms at various levels of the nervous system.

1. Local effects – needling induces a local release of adenosine, which interacts with the A1 receptor located on the nearby afferent nerves, thus interfering with the transmission of nociceptive signals.

2. Spinal Effects – The gate control theory of stimulating thick A-beta and A-delta fibers to suppress the thin fiber transmission (nociception)

3a. Central effects – Diffuse noxious inhibitory control (DNIC)

b. Deactivation of limbic structures and modulation of the default mode

This would suggest that one should combine local and distant points when treating pain. If the objective is to reduce the affective component distant points may be used, using an intensity which is strong but not painful.

In clinical practise manual and electrical (EA) stimulation is used- Interestingly different frequencies induce the release of different opioid peptides. Neurochemical studies have shown that 2 Hz stimulation increased the CSF content of enkephalins and endorphins, whereas 100 Hz induce the release of dynorphins. As an extension of these experimental approaches, a dense-and-disperse (DD) mode of stimulation was designed, where 2 Hz was automatically alternating with 100 Hz, each lasting for 3 s, which, as expected, evoked the release of both enkephalins and dynorphins, resulting in a synergistic interaction. The central pathways mediating low and high frequency EA analgesia have been explored by Han and collaborators. 2Hz EA sequentially activate the arcuate nucleus of the hypothalamus (β-endorphinergic neurons), PAG, medulla (enkephalinergic neurons), and the dorsal horn to suppress nociceptive transmission, 100 Hz EA activated a short parabrachial nucleus-PAG-medulla-spinal dorsal horn pathway involving

dynorphin. The intensity of EA stimulation necessary to cause an analgesic effect seems to vary according to the physiological status of the subject.

With regard to the optimal duration for an EA session it has been reported that a period of 30 min is required for the “full” analgesic effect in healthy volunteers. However, when treating different pain conditions the variability in the time needed is highly individual ranging from a few to 45 minutes. It should be pointed out that continuous acupuncture stimulation for more than 1–2 h may lead to a diminution of analgesic effect, a phenomenon known as “acupuncture tolerance”. One of the underlying mechanisms is the release of central cholecystokinin (CCK) octapeptide which acts against the analgesic effect of the endogenous opioid peptides.

Also, the analgesic effect of acupuncture is strengthened by performing more treatment sessions – cumulative effect.

It is well known that expectation coexists with the physiological effect of acupuncture, and it is very difficult to distinguish the two factors. Kong and co-workers have found that conditioning positive expectation enhanced acupuncture analgesia. They suggested that expectation may activate some forebrain structures to induce an up–down influence on subcortical brain matrix for modulation of pain perception, whereas acupuncture may induce a peripheral–central effect to suppress pain perception mechanisms i.e. the brain pathways mediating the analgesic effect appears to be very distinct. This would suggest that a successful acupuncture treatment is characterized by needling and expectation.

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## Review of the APA Guidelines for Physiotherapists Working in and/or Managing Hydrotherapy Pools 2002

Mac Mahon, M

The APA Guidelines for Physiotherapists Working in and/or Managing Hydrotherapy Pools (2002) was a document produced by the Aquatic Group of the APA for the purpose of providing basic information to physiotherapists and other aquatic professionals.

As time has progressed the APA recognised that the focus of this document needed to shift and be updated. The new guidelines are being formulated to help maximise safety and professional standards, by utilizing the most recent research and clinical expertise.

The guidelines will include detailed, referenced information on infection control including infectious conditions. Water and environmental safety will include occupational health and safety. The effects of immersion on specific conditions will be discussed and include the physiology of immersion. This will be a contemporary document with website links to all relevant peak bodies and government sites.

The presentation will demonstrate examples of how the guidelines could be used in the clinical setting. It is envisaged that these updated Aquatic Physiotherapy Guidelines will provide a valuable resource to all clinicians working in Aquatic Physiotherapy.

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## Shoulders in Oldies: Considerations associated with musculoskeletal disorders of the shoulder in the older population

Magarey ME, School of Health Science, University of South Australia

Shoulder pain is highly prevalent in the older population with a variety of different musculoskeletal conditions responsible for the pain. The most prevalent appears to be disorders primarily related to the rotator cuff although the research evidence is poor in this area. Contemporary understanding of rotator cuff tendinopathy and subacromial pain should allow a change of thinking in relation to management of these conditions in the older patient. Understanding of the physiology of muscle degeneration with age is also relevant to management of this population and the impact that can be made by resistance training. Clinical experience demonstrates that older people, both those within the workforce and those in the retired population, with shoulder pain frequently present with a variety of co-morbidities and contributing factors to development and continuation of their pain. Attention to the physical contributing factors can significantly decrease the impact of the shoulder pain on function. Finding ways to work on control and strength of the rotator cuff is challenging but essential to reducing shoulder pain but may need a different approach than in the younger population. Attention to lifestyle related co-morbidities should also form a significant, but equally challenging part of patient management.



## Iatrogenic Pneumothorax: Safety Concerns When Using Acupuncture or Dry Needling in the Thoracic Region

McCutcheon, LM, Combined Health Acupuncture and Dry Needling Education  
Research Fellow School of Medicine, Griffith University

Pneumothorax is a very rare but serious complication associated with acupuncture and dry needling around the thoracic region. Physiotherapists and other health practitioners should be aware of the risks associated with needling around the thorax and should take care to minimize the possibility of an iatrogenic pneumothorax. An awareness of the signs and symptoms of a pneumothorax is necessary for practitioners using acupuncture and dry needling in the thoracic region. Understanding the normal anatomy and its variants in the thoracic region can minimize risk associated with needling practices in this region. Various technique modifications are suggested so that the pleura or lungs are avoided whilst using acupuncture or dry needling in the thoracic region. Acupuncture and dry needling in the thoracic region administered by well trained physiotherapists and other health practitioners is very safe, however to maximize safety therapists should consider the relevant anatomy and not practice using advanced acupuncture and dry needling techniques without adequate competency based training.

## The Effect of Acupuncture and Dry Needling to Cervical Transversospinalis Muscles in subjects with Whiplash Associated Disorder II (WAD)

McCutcheon L.<sup>1</sup>, Yelland M.<sup>2</sup>

<sup>1</sup> Combined Health Acupuncture and Dry Needling Education  
Research Fellow School of Medicine, Griffith University

<sup>2</sup>Director Griffith PHCRED Program, School of Medicine, Griffith University, Gold Coast, Australia

**Purpose:** The purpose of this study is to investigate the effect of acupuncture and dry needling in patients with WAD II.

**Participants:** Ten participants, between the age of eighteen and forty-five years, were recruited. Inclusion criteria included persistent pain and disability of greater than 3 months duration.

**Methods:** A pilot study using a prospective same subject design was employed. It involved the sequential introduction and withdrawal of acupuncture and dry needling to the suboccipital and cervical transversospinalis muscles over a six week period to determine the effect on multiple outcome measures including MRI fatty infiltrate analysis and cross sectional area, range of motion, algometry assessment, visual analogue scale (VAS) assessment of pain, the modified Symptom Severity Index (SSI) of pain, a functional measure (Neck Disability Index [NDI]), Body Mass Index (BMI), a kinaesthetic assessment (Joint Positional Error) and a neuropathic pain assessment (S-LANSS).

**Analysis:** Related t test and a one-way ANOVA for related designs were used to statistically assess outcome measures. The MRI analysis assessed morphological muscle changes associated with increased fatty infiltrate and cross sectional area (rCSA) of the cervical multifidus and semispinalis cervicis.

**Results:** Preliminary data analysis has demonstrated statistically and clinically significant reductions in the pain VAS ( $p=0.01$ ), NDI ( $p=0.006$ ), the S-LANSS ( $p=0.008$ ), PPT ( $p<0.001$ ), ROM ( $p<0.001$ ), muscle:fat ratio ( $p<0.001$ ) and rCSA ( $p=0.001$ ).

**Conclusions:** The results provide preliminary evidence that acupuncture and dry needling of the suboccipital and transversospinalis muscle groups may reduce pain, alter fatty deposits in affected musculature and improve function in WAD II patients.

Funding acknowledgements: This research was funded via the Griffith University PHC RED Research Fellowship Program.

## Speaking the same language – classification and terminology of persistent pelvic pain

Helena Frawley, PhD, FACP

Interpretation of the literature in the area of persistent pelvic pain is challenging. For the benefit of patients, this area of health care is multi-disciplinary, however this diversity of brings its own set of challenges. When defining terms: is pelvic pain a bio- psycho- or social condition? Is it visceral or somatic? Is it centrally modulated or is it in the end organ? It may be all of these, or present in predominantly one guise at one time. Adopting a nomenclature which is broad enough to include all of these descriptions, yet specific enough to allow diagnostic precision, is a monumental task. There is debate whether a classification system should be pragmatic and patient-focused, or more specifically describe mechanisms and relationships between the individual organ specific phenotypes. For a health-care provider, a classification system needs to represent a clear clinical tool. It must also be flexible enough to allow change as knowledge progresses. Pelvic pain terminology is in this state of evolution.

At present, the most commonly used descriptors of pelvic pain derive from gynaecology, urology and pain medicine disciplines. Within existing descriptions, attempts have been made to define involvement of the pelvic floor muscles in pelvic pain 'syndromes' however, when terminology specifies therapy, confusion exists over 'physiotherapy' as a discipline and 'physiotherapy' as a treatment. In addition, there is insufficient description of many accepted observations of abnormality within and beyond the pelvic floor in patients who present with persistent pelvic pain. This presentation will aim to describe current pelvic pain classification systems, how the physiotherapy clinician may be guided by these, and future directions in their development.

## Clinical Practice Guidelines – what do they tell us?

Helena Frawley, PhD, FACP

Clinicians value Clinical Practice Guidelines to inform their daily practice. Clinical Practice Guidelines have been defined as systematically developed recommendations that assist the clinician and patient in making decisions about health care. How do they differ from evaluation of evidence from research findings, grades of recommendation to practice, consensus statements, clinical pathways, treatment algorithms, options for treatment? And how do they apply to a physiotherapist who has a patient presenting with persistent pelvic pain? Where does one find this information?

This presentation will review what information is available to assist physiotherapists to provide evidence-based clinical care for patients presenting with persistent pelvic pain, where to find the information and how to interpret it. This journey will traverse several disciplines, a broad range of literature, and arrive at a destination which requires further work. There are no physiotherapy-specific clinical practice guidelines for 'persistent/chronic pelvic pain'. Guidelines for 'general' pelvic pain exist in the gynaecological literature and some specific guidelines exist for 'bladder pain syndrome' and vulvodynia can be found. These guidelines cover medical and conservative therapies, hence contain limited details of specific physiotherapy assessment and treatment techniques. From these limitations, a proposed structure will be drawn.

## Aquatic Physiotherapy in a Country Hospital

McLean, B

Working for Queensland Health as sole Aquatic Physiotherapist in a country hospital is both challenging and rewarding. Challenges come from both the tyranny of distance, when one wishes to be involved with hands on professional development, and coping with the demands of the public system. Rewards include the variety of work experience, working in a very ambient environment and the satisfaction of assisting patients perform activities which would otherwise be out of their reach. These activities are made feasible by having access to an aquatic environment.

The buoyant environment is supportive acting as a medium of stability, yet allows challenges to that stability. Each patient presents with his or her own level of postural control and stability, no matter what their diagnosis. Of primary importance is to ensure that each patient, when performing an exercise program or receiving Aquatic Physiotherapy treatment, works from a level of good postural control to maximise the effectiveness of treatment. From this stability, good pelvic control can be developed. This is essential for balance. Working in the aquatic environment provides the ideal medium to work towards this control. Attending the Level 3 Aquatic Physiotherapy course challenged me to review my previous aquatic techniques and clinical outcomes of patients I had previously treated in the pool. By using the basic theories of physics and physiology, the course taught me how to validate my techniques, use realistic goal setting to achieve effective outcomes of treatment and the ability to vary my repertoire of treatment techniques.

## New Ways out of the Dilemma of a Missing Reference Standard in the Diagnosis of Lumbar Spinal Stenosis

Melloh, M

Lumbar spinal stenosis (LSS) is one of the most commonly diagnosed spinal disorders in patients referred to a specialist, accounting for the majority of surgical interventions in the spine in elderly patients. Using MRI, the smallest cross-sectional area (CSA) of the dural sac has been accepted as a good discriminator for the presence of LSS. However, both under- and over-diagnosis of LSS are common when using the CSA to quantify a stenosis. Recently, the Nerve Root Sedimentation Sign in sagittal and transverse MRI scans has been described as a new sign in the diagnosis of LSS. It could be shown that the Sign discriminates well between LSS and other pathologies by testing cases with known LSS and controls without LSS. Future direction of research could be towards the potential role of the Sedimentation Sign as a triage or an add-on test as well as towards a composite score including the CSA and the Sedimentation Sign as an answer to the unsatisfactory clinical validity of the CSA alone.

Myer, G, Co-Director of Research for the Division of Sports Medicine, Cincinnati Children's Hospital Medical Center

### Abstract:

Though specific subsets of athletes may be more susceptible to at risk knee positions during sports activities, the underlying causes for this increased susceptibility are not clearly defined. This course will synthesize in vivo, in vitro and computer simulated data to delineate the most likely mechanism(s) of ACL injury, and sequence the pathways which anatomical, hormonal and neuromuscular risk factors likely act synergistically to contribute to these "high risk" mechanisms. From these data, detailed neuromuscular "field" screening and training techniques will be presented that can be used to identify and target "high risk" athletes for the prevention of ACL injury.

### Learning Objectives:

- Synthesize in vivo, in vitro and computer simulated data to delineate the most likely mechanism(s) of ACL injury
- Sequence the pathways which anatomical, hormonal and neuromuscular risk factors likely act synergistically to contribute to these "high risk" mechanisms.
- Detail neuromuscular "field" screening techniques that can be used to identify "high risk" athletes
- Demonstrate techniques to target deficits in "high risk" athletes for the prevention of ACL injury.

## Pessaries for Pelvic Organ Prolapse – Advancing Clinical Practice

Neumann, P, Specialist Continence and Women's Health Physiotherapist (as awarded by the Australian College of Physiotherapists in 2010)

Pessaries have been used in the management of pelvic organ prolapse (POP) for millennia. The modern pessary is made of flexible silicone and its prescription and fitting have been traditionally been performed by gynaecologists.

This paper will present a case for the management of POP with support pessaries by Continence and Women's Health Physiotherapists. The newly developed Clinical Practice Guidelines for the prescription and fitting of pessaries will be discussed and outcomes of the first workshop translating evidence into practice presented.

### References

Thakar R, Stanton S. Management of genital prolapse. *British Medical Journal*. 2002; 324(7348): 1258-1262.

## What's what in the vulva: Sorting out pudendal neuralgia, provoked vestibulodynia and vaginismus

Neumann, P, Specialist Continence and Women's Health Physiotherapist (as awarded by the Australian College of Physiotherapy in 2010)

Pain in the vulval area can create a diagnostic dilemma. This presentation will focus on the diagnoses of pain in the vulval area most frequently encountered by the pelvic floor physiotherapist: provoked vestibulodynia (PVD), vaginismus, and pudendal neuropathy (PN). The clinician must remember that other pelvic pain diagnoses must be excluded so that it is imperative to be part of a multidisciplinary team when treating these conditions.

The current definitions for vaginismus and PVD will be reviewed and the newly proposed diagnostic category of "genito-pelvic pain/penetration disorder" presented (Binik 2010).

This new categorization provides an opportunity to deal with these problems as pain disorders rather than sexual dysfunctions and as such to approach them with a new paradigm in management.

A search of the Cochrane library provides little evidence for effective managements. The pelvic floor physiotherapist has a key role in the management of these conditions due to the privilege of being able to perform internal examinations and treatments but an understanding of modern neuroscience underpinning chronic pain processes is essential. A case will be presented for the management of these pelvic pain conditions using concepts developed for the management of non-specific chronic low back pain and increasingly for other pain disorders.

### References:

Labat J-J et al. Diagnostic criteria for pudendal neuralgia by pudendal nerve entrapment (Nantes Criteria). *NeuroUrol Urodyn* 2008;27:306-310

Binik YM. The diagnostic criteria for dyspareunia. *Arch Sex Behav* 2010;39:292-303

## Predictors of groin and lower limb injury across 4 codes of football.

Nicholson LL, Turner A, Colagiuri P, Shirley D, Adams RD  
(This study was funded by the NSW Sporting Injuries Committee).

**Question:** Can demographic, anthropometric and performance variables predict groin and lower limb injury across 4 codes of football? Design: Prospective cohort study.

**Participants:** 328 male semi-professional players (mean age 18.5 yrs SD 2yrs) from Australian Rules Football (91), Rugby League (88), Rugby Union (96) and Soccer (53) participated in the study. Four participants were lost to the study due to interstate moves or changing codes.

**Methods:** All players were injury free at inception and none had experienced previous groin injury. Baseline screening prior to season commencement quantified 14 possible predictor variables and all participants were followed weekly for a full competition season. Outcome measures: Loss of game &/or training time & inability to participate fully in training due to groin or non-groin injury musculoskeletal injury.

**Results:** Twenty participants incurred groin injuries over the season, eight of which occurred in Australian Rules Football. Ninety-eight players incurred non-groin injuries over the season. Univariate analysis determined which predictors were inter-correlated and could be excluded from the analysis. Regression analysis revealed that excessive internal hip rotation range and poor performance on a hop test predicted groin injury. Age, internal hip rotation range and weight were significant predictors of non-groin injury.

**Conclusion:** Predictors for both groin and general lower limb injury vary across the 4 codes of football commonly played in Australia. No single set of predictors explain the time lost to training and competition across the 4 codes and team medical staff would be wise to address code-specific predictors as outlined in the study.

## Action Research in Residential Aged Care

Nitz, J

**Question:** Can Action Research methods implementing evidence-based falls prevention interventions work in residential aged care?

**Design:** An action research approach facilitated through a facility-based action research group utilized evidence-based interventions to reduce rate of resident falls using a prospective cohort study approach.

**Participants:** Nine residential aged care facilities (670 residents and 650 staff members) from three Australian states.

**Intervention:** The project team (external to facilities) provided a range of standardized activities (scoping audit, environmental audit, training for key staff, project officer and funding for initiatives including environmental modifications, low-low beds, and hip protectors). Within each facility, the Action Research Group, led by the Falls Resource Nurse and facilitated by the project officer, tailored implementation of interventions considered most relevant to their facility.

**Results:** Falls data were collected across five six-month phases: pre-intervention, three intervention phases and a final sustainability phase. After completion of interventions pertinent to each facility statistical analysis showed a reduction in the number of residents who fell. This outcome was sustained in the six-month follow-up period. Pre-intervention to follow-up comparison of data reflected these within site outcomes but the overall number of falls was not reduced even though the number of residents who fell was.

**Conclusion:** Empowering staff to utilise an action research to solving resident care-related problems is a starting point for obtaining quality care for residents. Intrinsic fall risks are minimally impacted by current EBP fall prevention interventions. Falls will not be eliminated in residential care due to resident ageing and acquisition of additional co-morbidities.

## Patellofemoral Pain Syndrome in Adolescent Females

O'Sullivan, L, Twelve9teen Sports Physiotherapy,  
University of Melbourne

**Introduction:** Adolescence is a specific and unique developmental phase, defined by growth and development. Active adolescents differ, from adults and children, in the clinical presentation of sporting injuries and pain. Injuries and pain experienced during adolescence may have significant long term health implications. Patellofemoral pain syndrome (PFPS) is the most common overuse injury in sport.

**Purpose:** The purpose of this presentation is to provide a review of the literature relating to: (i) the incidence of PFPS in active adolescents; (ii) the normal physical changes which occur due to maturation, including alterations in neuromuscular control (NMC); and (iii) altered NMC during the single leg squat (SLSq) in female adults with PFPS. Findings: The incidence and severity of sporting injuries increases during adolescence with gender differences emerging, particularly in knee injuries. There is evidence of gender-specific alterations in strength, laxity and NMC associated with maturation, as well as altered NMC during the SLSq in female adults with PFPS. Increased apparent knee valgus occurs in both groups.

**Conclusions:** Gender specific alterations in NMC due to maturation appear to be similar to that demonstrated during the SLSq in adult females with PFPS. This may partially explain the gender specific injury profile about the knee in active adolescents. Furthermore, gender specific alterations in NMC which occur during adolescence, may remain into adulthood and contribute to gender specific injury profiles in adults. Clinical Implications: Identifying and addressing NMC in active female adolescents may prevent PFPS in this group and may also prevent PFPS in adult females.

## Management of Duchenne muscular dystrophy

Posselt, H  
Duchenne Foundation (Education Adviser)  
Muscular Dystrophy Queensland (Director)

*Physiotherapists play a major role in minimising the disabling effects of the secondary problems associated with neuromuscular conditions. They also provide physical evaluations and functional assessments to quantify the regressions made over time as a result of the disease process or chart improvements in function in the clinical trials of emerging therapies. Duchenne muscular dystrophy will be used as an example.*

Duchenne muscular dystrophy affects 1: 3500 live male births worldwide and is the most prevalent and the most disabling of the inherited neuromuscular conditions. While the primary disability is progressive loss of muscle power and function the secondary manifestations of joint contractures, spinal deviations, respiratory insufficiency, cardiac failure and cognitive deficits can be the most disabling.

An Increasing understanding the disease pathophysiology plus knowledge gained from research on animal models has led to a more cautious approach to exercise recommendations in conditions where the genetic mutation causes the loss of a muscle membrane protein, causing membrane instability. Evidence based advice on the best form of active exercise to maintain health and well-being and prevent atrophy is important.

Prophylactic interventions to limit the disabling effects of the secondary problems associated with most inherited neuromuscular diseases, will be discussed. Limiting joint contractures and spinal deformity, preserving respiratory function to reduce hospital admissions for respiratory crises, providing suitable equipment as or before it is needed will all assist alleviate impairment, reduce functional limitation, and increase societal participation.

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## **Novel forms of ventilation: Diaphragm Pacing – a new take on an old idea**

Rautela, L

Although the idea of “negative pressure ventilation” has been around for a long time, recent advances in technology have enabled this form of ventilation to be offered to a larger number of patients throughout the world.

Inserting wires to artificially pace the diaphragm can result in improvements in quality of life, speech, mobility and morbidity for some fully ventilator dependent patients.

A special grant from the Department of Health in Victoria allowed Austin Health to be the first health care facility in Australia to offer “direct diaphragm pacing” technology. Starting in 2009, the program has so far implanted seven patients.

Physiotherapists are involved in the process from the earliest stages of patient assessment to follow up in the community. In conjunction with the medical staff we are responsible for designing and monitoring the diaphragm re-training program and reprogramming the stimulation units as required.

Patient outcomes have been carefully followed and will be published later this year.

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## **Dry needling for patellofemoral pain syndrome workshop**

Rooney, J

This workshop will explore the research evidence and empirical clinical observations of the local, distal and proximal influences to patellofemoral pain syndrome. A clinically reasoned treatment protocol including dry needling of the knee and surrounding musculature, calf, gluteal muscles and lumbar spine will be presented from a Specialist Sports Physiotherapist approach.

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## **Panel Case Presentation – “East meets West”**

Rooney, J, Raymond-Yacoub, P & Cary, D

A complex upper quadrant patient will be presented and the panel will discuss the management and intervention from different Philosophies using needle insertion as a modality. Paula Raymond-Jacobsen will present a traditional oriental Medicine and Acupuncture approach and Jane Rooney will discuss a Western Dry needling approach to manage the patients’ problem.

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## **Looking backwards and forwards.**

Sapsford, R

This presentation will focus on my own experience of physiotherapy in Continence and Women’s Health.

Experience as an undergraduate at University of Adelaide and a clinician in Adelaide and UK was followed by moving to Brisbane to work as a clinical tutor for the University of Queensland. While the first research in Physiotherapy at UQ was undertaken in the mid 1960s it was a long time before any of it focussed on Women’s Health. But formal interest in Women’s Health started with the formation of the Obstetric Physiotherapists Association of Queensland in October 1967. Obstetric Physiotherapists organised a combined physiotherapy and general practitioner weekend in Toowoomba in 1978 at which I presented my first lecture on pelvic floor. The first Newsletter, containing articles by medical practitioners as well as reports etc, was produced for the Obstetric Special Group of Queensland in 1979. While working for Blue Nursing I attempted my first small research endeavour on post partum urinary incontinence in 1989. However, it was my time spent with Dr Michael Wynne, a University of Queensland Reader in Surgery at the Mater Hospital, who had a special interest in colorectal conditions that really introduced me to research, its literature, methodology and intricacies. He tested and treated many patients with anorectal problems. It was from then on that Sue Markwell and I collaborated on several projects with the first abstract presented at the APA conference in Brisbane in 1996. Many years and millions of words (spoken and written) later we are at 2011. So where to from here?

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## **Is chronic mild peripheral nerve compression sufficient to induce an immune-inflammatory response? Evidence from an animal model.**

Schmid AB, Coppieters MW, Ruitenber MJ, McLachlan EM

Patients with carpal tunnel syndrome (CTS) often have widespread symptoms which have been attributed to central mechanisms. Experimental nerve injuries with extensive axonal loss lead to invasion of immune cells locally, the associated dorsal root ganglia (DRG) and in the spinal cord, resulting in hyperexcitability and thus increased sensitivity or pain. Because CTS is thought to involve only minimal fibre loss, we investigated whether mild nerve compression is sufficient to cause a local and remote immune inflammation. Silastic tubes with a diameter of 1.3 and 2 mm were placed around the sciatic nerve of rats. Immunohistochemical markers for macrophages and T-lymphocytes in the nerve and DRG were examined after 12 weeks. A non-constrictive tube of 1.3 mm diameter caused extensive demyelination, sparing of large but some compromise of small axons which is consistent with findings in patients with CTS. The validity of the model was further supported by hyperalgesic responses to blunt pressure and cold allodynia. Despite the mild nature of the compression, macrophage and T-lymphocyte numbers were significantly increased in the sciatic nerve and the associated DRG at 12 weeks post-surgery. Furthermore, glial cell proliferation was present in associated DRG but not the spinal cord. A tube of 2 mm diameter, which was loose at the time of placement, induced only a minor inflammation locally. These findings suggest that mild nerve compression can induce a chronic local and remote inflammatory reaction, which is dependent on the extent of compression. This reaction may underlie the widespread symptoms found in CTS.

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## **Developing functional aquatic exercises incorporating buoyant force couples, a novel approach to management of impairment of spine, pelvis and hip.**

Shepherd, J

The aquatic management program termed Aquakinect is underpinned by the hypothesis that positioning in water to assist control of pain and instability is a positive base to develop specific functional low load aquatic exercise programs. Clinical reasoning is based on the hydrodynamics of balancing the body in a vertical position in water. In developing this management approach the aim was to find a partial closed chain position that assisted the patient’s postural stability. The second aim was to find a method of controlling pain responses which could have an inhibitory effect on muscle and exercise performance. Individual exercise prescription is based on manipulating the environment and patient to achieve specific therapeutic responses. In a novel approach body position is supplemented by vertical compressive forces generated by pressure of the hands down onto flotation devices. The devices are positioned at the sides of the body or a position close to the body to create buoyant force couples. It is hypothesized that buoyant force couples serve two purposes firstly when the forces are aligned close to the body they provide lateral vertical compressive forces assisting the body to stabilize over its base of support. A second purpose is that when force couple alignment is altered a trunk perturbation moment is created facilitating positive postural and joint stabilizing mechanisms. Once the specific low load functional and pain relieving vertical position is identified a dynamic functional exercise program is commenced.

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## Pain fundamentals: why they matter in pelvic pain

Slater H<sup>1,3</sup> PhD, FACP, Specialist Musculoskeletal Physiotherapist (as awarded by the Australian College of Physiotherapists in 2007)

<sup>1</sup>School of Physiotherapy, Curtin University, Perth

<sup>2</sup>Curtin Health Innovation Research Institute, Curtin University, Perth

<sup>3</sup>Pain Medicine Unit, Fremantle Hospital and Health Service, Perth

Women with persistent pelvic pain are clinically challenging: typically, there's no simple solution. In this presentation, a conceptual framework which incorporates a biopsychosocial model of pain is presented, with a spotlight placed on women with localised provoked vulvodynia (PVD). In this patient cohort, we explore why pain might persist, what the possible peripheral and central neuronal and non-neuronal mechanisms underlying persistent PVD might include and what physical and emotional 'load' factors often impact the pain experience in this cohort. Strategies are presented to help clinicians better articulate a neurobiologically plausible explanation for persistent PVD pain, to assist in the identification of pain "mixes" (nociceptive, neuropathic, visceral and functional) and identification of factors contributing to each women's pain and disability. These factors include pelvic floor muscle dysfunction, pain-related comorbidities (e.g.; irritable bowel syndrome, fibromyalgia, interstitial cystitis) and cognitive/affective dimensions (e.g.; irrational beliefs, fear, catastrophizing beliefs and maladaptive behaviours). A big picture view that shifts the clinical focus from a tissue-based model towards an integrated biologically-meaningful model, offers patients and clinicians a glimmer of hope. An understanding that the brain and the nervous system is not "hard wired" but capable of significant plasticity is discussed and the potential implications for clinical physiotherapy practice for patients with PVD is highlighted.

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## Prevention, Prematurity and Physiotherapy

Spittle J Alicia,<sup>1,2,3</sup>

<sup>1</sup>Murdoch Childrens Research Institute, Melbourne,

<sup>2</sup>Department of Physiotherapy, University of Melbourne,

<sup>3</sup>Royal Women's Hospital, Melbourne, AUSTRALIA

Advances in neonatal medicine over the past decades, have improved the survival rates for preterm infants, however, children born very preterm are at risk of a complex range of motor, cognitive, sensory, behavioural and health problems compared to children born at term. Rates of major disability for preterm infants have remained relatively constant with these advances in medicine, however, the incidence of infants with minor problems are increasing, especially for the smallest and most preterm infants.

Early intervention programs aim to prevent the excessive rates of neurological impairments in very preterm infants, however, the evidence for these interventions is poorly understood. We recently updated our Cochrane review of early intervention programs for preterm infants which demonstrated that preventative care programs improve both motor and cognitive development up to 2 years of age. However, these benefits are only short term for motor development.

Predicting which infants will have long term motor dysfunction can be challenging but it is important for ensuring appropriate referral for early intervention services, which are often limited. The final part of this presentation will discuss the role of three motor assessment tools which are used in both research and clinical practice for preterm infants within the first year of life, Prechtl's General Movements Assessment, the Neurological Sensory Motor Development Assessment and the Alberta Infant Motor Scale in predicting motor development at preschool age.

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## Functional Brain Imaging of Acupuncture – An Update

Strudwick, M, Dept of Medical Imaging and Radiation Sciences, Monash University, Clayton

Centre for Advanced Imaging, University of Queensland, St Lucia

There remains a high degree of scepticism about acupuncture since its theoretical basis has no clear reference in Western medical and scientific terms, making any associations between neurophysiology and specific acupuncture concepts difficult to determine. Using neuroimaging and engineering approaches to understand its physiological basis may engender greater acceptance of and improvement in the clinical application of acupuncture.

The aim of this paper is to present an overview of the published results which offer a new opportunity to test an ancient paradigm and introduce a provocative new paradigm for Western medicine.

Using search terms humans, clinical trial, meta-analysis, randomized controlled trial, and review in the PubMed database returns 72 studies since the first report of CNS response to acupuncture was demonstrated with fMRI in 1998. Of these, 43 are in English.

The results of these studies can be divided into three groups: 1) Those demonstrating a correlation between acupoint stimulation and cortical response; 2) Those demonstrating a different response elicited from different points; and 3) Analgesic responses implying activation of the pain network. The results of the studies published in English, when summarized, clearly demonstrate vague and sometimes contradictory outcomes. These discrepancies in findings may likely be the result of: 1) Significant differences in paradigms used, 2) Significant differences in thresholds used for data analysis, or 3) Failure to account for carryover response from initial needle insertion.

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## What is the Workability of the Australian Workforce?

Taylor, P

Managing ageing workforces is an issue that has begun to garner serious attention among public policymakers and many employers. Some occupations and industries are already beginning to feel the impact of workforce ageing, in particular those that have traditionally relied on young entrants, those with older workforces, or those without optimum working arrangements or conditions.

In some European countries the multifaceted *work ability* construct has been applied in organizations as it has been recognized that more can be achieved via holistic or 'joined-up' approaches. *Work ability* is an internationally recognized measure of a worker's fit with their work, and based on the interaction between an individual's resources (e.g. health, functional capacity, education) and their work (e.g. mental and physical demands, work community and work environment). A worker's individual resources are also affected by their values, attitudes, motivation and job satisfaction. Studies have shown that work ability has age-related trends and is closely associated with future health outcomes and the risk of work-related injury. The ageing of the Australian workforce raises important questions concerning the maintenance of a good person-organization fit over a working life. Research is underway to apply *work ability* in the Australian context with positive results. However, detailed industry and occupational case studies are lacking.

This paper will summarise findings from recent large surveys supported by the Australian Research Council and Safe Work Australia that have sought to measure work ability among Australian workers and to consider its correlates and also to outline a new project, supported by the NSW Office for Ageing, that will apply the work ability construct among a small group of employers across several industry sectors.

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## Clinical reasoning: modern theory and translation to practice

Thompson J, Specialist Continence and Women's Health Physiotherapist (as awarded by the Australian College of Physiotherapists in 2008)

Pelvic floor muscle training (PFMT) is the core skill of Continence and Women's Health physiotherapists; it is used as a therapeutic tool in the management of various conditions including bladder and bowel incontinence, voiding dysfunction, constipation, pelvic organ prolapse, vaginal, bladder, anorectal and pelvic pain and sexual dysfunction. Various PFMT programs have been described but no single method of PFMT has been found to be superior. In the treatment of female incontinence the International Continence Society recommends that clinicians should provide the most intensively supervised program within service constraints and that PFM exercises should be individually taught, intensively supervised and based on sound physiological and exercise science principles (Hay-Smith J, 2009). There is no evidence that using biofeedback, electrical muscle stimulation or the use of resistance devices improves PFMT outcomes (Hay-Smith J, 2009) but these treatments may be useful in specific patients. Therefore how do clinicians decide on the appropriate PFMT and treatment program for their clients?

The key to appropriate management relies on an accurate diagnosis of the PFM dysfunction and a clinically reasoned approach to management of the underlying conditions. There are multiple factors that need to be taken into account when designing an appropriate training program for individual patients. Treatment algorithms for clinical decision making for the management of continence and pelvic pain conditions will be discussed.

### References

Hay-Smith J, Berghmans B, Burgio K, Dumoulin C, Hagen S, Moore K, Nygaard I. 2009. Adult Conservative Management. In: Abrams P CL, Khoury S, Wein A, editor. 4th International Consultation on Incontinence. Paris: Health Publications.

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## Screening for high risk predictors of chronic pain and application to pelvic floor pain

Thompson, J, Specialist Continence and Women's Health Physiotherapist (as awarded by the Australian College of Physiotherapists in 2008)

In musculoskeletal pain conditions there is now a large body of evidence linking various psychological factors to a poorer prognosis for treatment outcomes (Linton and Shaw 2011). Studies that have used targeted interventions based on known psychological risk factors have more positive patient outcomes than interventions which ignored these risk factors or which provided interventions to people regardless of psychological factors (Nicholas, Linton et al.). Screening tools have been shown to be effective in clarifying the source of patients' concerns, in improving patient-centred care and identifying factors (such as depression) which are difficult to identify without specific questioning (Hill, Dunn et al. 2008). The use of the STarT back screening tool demonstrated that using a stratified management approach in a primary care setting delivered improved outcomes for patients with back pain and significant cost savings (Hay, Dunn et al. 2008).

In patients with chronic pelvic pain, such as provoked vestibulodynia and pelvic floor muscle pain, there is evidence linking various psychological factors such as catastrophizing, fear of pain, hypervigilance and low self-efficacy with a poorer prognosis for treatment outcome (Desrochers, Bergeron et al. 2011). Working within the framework of the biopsychosocial model of care, the importance of screening for known risk factors in this population and evaluating the effect of psychosocial factors on the presenting symptoms in each client will be discussed. It is proposed that screening pelvic pain clients may help in clinical decision making to ensure targeted interventions.

### References

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Hay, E. M., K. M. Dunn, et al. (2008). "A randomised clinical trial of subgrouping and targeted treatment for low back pain compared with best current care. The STarT Back Trial Study Protocol." *BMC Musculoskelet Disord* 9: 58.

Hill, J. C., K. M. Dunn, et al. (2008). "A primary care back pain

screening tool: identifying patient subgroups for initial treatment." *Arthritis Rheum* 59(5): 632-41.

Linton, S. J. and W. S. Shaw (2011). "Impact of psychological factors in the experience of pain." *Phys Ther* 91(5): 700-11.

Nicholas, M. K., S. J. Linton, et al. "Early identification and management of psychological risk factors ("yellow flags") in patients with low back pain: a reappraisal." *Phys Ther* 91(5): 737-53.

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## A literature review investigating the effect of Aquatic Physiotherapy on upper limb function after stroke

Thwaites, C

### Background

Impaired upper limb function is common after stroke and has been reported to lead to an increased burden of care, decreased participation in activities of daily living and poor quality of life outcomes. Aquatic physiotherapy is frequently used in clinical practice as a therapy approach for this population.

### Aim

To evaluate the effect of aquatic physiotherapy on upper limb function after stroke.

### Results

A case study involving four stroke patients was retrieved. In the absence of evidence within the stroke population the search was expanded to include musculoskeletal conditions involving the upper limb, as well as aquatic laboratory trials involving healthy subjects. The expanded search criteria resulted in a yield of 14 articles, with seven of these being expert opinion pieces or physiological research, with no individual randomized controlled trials. These results precluded any strong conclusions regarding upper limb management in the aquatic environment. Critical analysis of specific interventions and their potential effectiveness was restricted due to inadequate description. In the four articles where interventions were described, the use of immersion principles including hydrostatics and hydrodynamics in designing interventions was not strongly exhibited. This was in contrast to five of the reviewed expert opinion pieces. Limitations also lie in transferring conclusive evidence from the musculoskeletal population to the neurological.

### Conclusion

Key clinical outcomes including improvement in ADL's, pain management, burden of care and quality of life after stroke were not clearly addressed in the reviewed aquatic literature. Future investigations should also consider the optimal frequency of intervention, duration of sessions and ability to gain independence in the water.

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## Sensorimotor disturbances associated with neck pain-implications for Aquatic Physiotherapy

Treleaven, J

The receptors in the cervical spine have important connections to the vestibular and visual apparatus as well as several areas of the central nervous system. Dysfunction of the cervical receptors in neck disorders can alter afferent input subsequently changing the integration, timing and tuning of sensorimotor control. Measurable changes in cervical joint position and movement sense, eye movement control, vertical perception, static and dynamic balance and reports of dizziness and unsteadiness by patients with neck disorders can be related to this.

Afferent information from the cervical receptors can be altered via a number of mechanisms such as trauma, functional impairment of the receptors, changes in muscle spindle sensitivity, psychological stress and the vast effects of pain at many levels of the nervous system. Assessment and management of sensorimotor control in neck pain patients should be as important as lower limb proprioceptive retraining following an ankle injury. This also has important implications for assessing the neck in those with symptoms of dizziness, eye movement and balance disorders and or a falls risk, especially in the elderly. Recommendations for clinical assessment and management of sensorimotor control disturbances in neck disorders are presented with emphasis on aquatic therapy. The aquatic environment would appear to be particularly useful for the management of sensorimotor control disturbances from the neck due to the physical properties of water and the physiological consequences that immersion in water causes to the human body.

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## **Knee stability, joint loading and osteoarthritis**

van Deursen, R, Director of Research, School of Healthcare Studies, Cardiff University

As part of a multidisciplinary research programme we are investigating osteoarthritis from a bioengineering and biomechanical perspective. One of the projects is to follow patients for a number of years after an acute injury to identify factors that can be related to the development of osteoarthritis. Although still in the early stages, it is interesting to consider the mechanisms that may be involved. When focussing on anterior cruciate ligament (ACL) injury, it is important to develop an understanding of knee stability at the level of whole body movement, at the level of joint design and the level of the joint surface. Movement analysis provides insight into the net joint forces and moments during different functional activities that will challenge knee stability. However, further detail beyond the net effect is required to understand which anatomical structures work together to achieve joint stability during functional movement. Typically, the loads that these joint structures are exposed to are much higher than the net joint loads calculated from the movement analysis. This is predominantly related to the muscle contractions to control the movement and joint stability. As a result cartilage has to withstand high compressive loads on a routine basis. Net joint loading during functional movement is not necessarily increased in the presence of ACL deficiency. The question of abnormal joint loading may not be an issue of overall magnitude but more related to what aspect of internal control is altered to result in local changes of tissue loading and subsequently in early osteoarthritis.

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## **Keeping people with diabetic neuropathy on their feet**

van Deursen, R, Director of Research, School of Healthcare Studies, Cardiff University

A prominent problem in diabetic neuropathy (DN) is loss of protective sensation which together with increased plantar pressure can result in foot ulceration; frequently leading to loss of limb. In addition, the more general loss of peripheral sensation can result in postural instability which in turn can lead to stumbles and falls. Furthermore, people with DN display reduced levels of walking activity.

The recommendation for people with diabetes is that they should do regular walking exercises to help control their condition and prevent progression. However, in the presence of DN weight-bearing exercises should also be viewed as a potentially harmful activity if certain precautions are not taken. Special off-loading footwear is an important measure to protect the feet and there are various options available to achieve this. However, biomechanical analysis shows that the more effective off-loading options can be problematic with respect to balance and mobility. Arguably, non-weight-bearing and reduced weight-bearing exercises should play a more prominent role if DN is present. However, the vast majority of studies in diabetes investigating exercise interventions were carried out on people with diabetes and no neuropathy. Therefore little is known about the effects of exercise on neuropathic mechanisms.

Rehabilitation is not only about weight-bearing, but also about mobility, activity, and participation. Therefore management of diabetic neuropathy should involve a careful balancing of multiple factors so that people with DN can stay as fit and active as possible whilst controlling the risk of plantar ulceration, of falling and of any other diabetic foot complications.

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## **“Passing the Baton”: Physiotherapy in paediatrics and moving on to adult healthcare.**

Wilson, C

Optimal participation is an important aspect of the International Classification of Functioning and Disability (ICF) framework. The contribution of physiotherapy to participative lifetime capabilities is well acknowledged in a broad spectrum of diseases, disabilities, and impairments. “Ready, Set, Go”- moving through infancy, childhood, and adolescence fits well with ICF concepts. How do we pass the baton of the unique range of paediatric physiotherapy skills that arguably, are distinct from those involved in much of adult healthcare? It is challenging to teach these approaches, required for complex paediatric physiotherapy care, to parents or physiotherapists with little previous exposure to working with children. Processes for skill development in families or carers, approaches to upskill and mentor physiotherapists, and succession planning in the paediatric physiotherapy setting will be discussed. Preparation for transition applies to physiotherapists just as it does to our patients.

Transition of young people with chronic illnesses to adult healthcare is discussed frequently but studied rarely. Ideally it is a process rather than an event, commenced when the young person has some features of psychodevelopmental readiness. Programs applying this principle are being developed for certain chronic diseases such as cystic fibrosis, however there are many young people for whom structured approaches and behavioural readiness for individual skill-building and self management are unlikely to be possible. Chronic conditions can affect development, and adolescent developmental processes can have an effect on the condition. This informs some issues involved in preparation of young people and their families for moving from paediatric to adult healthcare.

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## **Intrinsic risk factors for patellofemoral pain syndrome: implications for prevention and treatment**

Witvrouw, E, Van Tiggelen, D and YThijs, Y, Ghent University, Ghent, Belgium

### **Introduction**

Despite the high number of scientific publications about patellofemoral pain syndrome (PFPS), there are rather few studies investigating risk factors for PFPS. The identification of risk factors is important concerning a better understanding of the etiology of PFPS. To improve our insight we have in our research centre set up several prospective studies over the last decade.

### **Methods**

We have set up a prospective study in students Physical education and examined several antropometrical, physical and psychological parameters. To improve the methodology used in this first prospective study we set up a new prospective study in which we focussed on dynamic foot malalignment, and neuromuscular dysfunctions as risk factors for the development of PFPS in a military population.

In addition we set up a prospective study in novice runners to evaluate if abnormalities in hip muscle strength can be considered as risk factors for PFPS. In order to evaluate the hypothesis that hip muscle abnormalities will lead to malalignment of the knee joint, an additional study was set up to correlate the hip muscle strength with frontal plane movement of the knee.

Binary logistic regression analysis was used to identify possible risk factors of PFPS. The data from these studies were analyzed by SPSS software.

### **Results**

The results of our first prospective study identified only four parameters as intrinsic risk factors for the development of PFPS. These parameters are: decreased flexibility of the Quadriceps; decreased explosive strength of the Quadriceps; altered neuromuscular coordination between VMO and VL; and a hypermobility of the patella. Striking was that we did not identify a malalignment parameter as a risk factor for the development of PFPS. Our second prospective study however identified a more lateral directed pressure distribution at initial contact during walking and a more laterally directed rollover as risk factors for the development of PFPS. In this prospective study we also observed (again) that a delayed activation of the VMO compared to the VL was identified as a risk factor for PFPS. In our third prospective study we were unable to identify hip muscle strength as a risk

factor for the development of PFPS. We were also unable to find a significant correlation between hip strength and frontal plane movement of the knee.

### Discussion

The results of our first prospective study identified four risk factors of PFPS: decreased flexibility of the Quadriceps; decreased explosive strength of the Quadriceps; altered neuromuscular coordination between VMO and VL; and a hypermobility of the patella. This implies that as well in the treatment, as in the prevention of PFPS therapists need to focus their examination and treatment protocol on these four important parameters.

The findings of our second prospective study show that a disturbance of the "normal dynamic foot alignment" significantly increases the risk for the development of PFPS. Therefore, this parameter needs also to be carefully examined and treated in the prevention and treatment of PFPS. The results of our last prospective study show us, in contrast to our hypothesis, that hip strength can not be considered as an intrinsic risk factor of PFPS. In addition, we could not find a significant correlation between the muscle strength and the movement of the knee in the frontal plane (knee valgus/varus). Further investigations need to be carried out to clarify the exact importance of the hip muscle strength in the etiology of PFPS. Without a doubt however is strengthening and a focus on the hip muscles an important aspect of the treatment of PFPS if the therapists clearly finds dysfunctions of these muscles. Important to remember is the fact that PFPS is a multifactorial pathology. Today's scientific insight in this pathology tends to show us that not every individual PFPS patient has the same "abnormalities". Therefore, a standard treatment for PFPS does not exist, and a tailor made approach is preferred.

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### Stretching and injury prevention: an ergonomic relationship

Witvrouw, E, Mahieu, N, McNair, P

It is generally accepted that increasing the flexibility of a muscle-tendon unit promotes better performances and decreases the number of injuries. Stretching exercises are regularly included in warm-up and cooling-down exercises; however, contradictory findings have been reported in the literature. Several authors have suggested that stretching has a beneficial effect on injury prevention. In contrast, clinical evidence suggesting that stretching before exercise does not prevent injuries has also been reported. Apparently, no scientifically based prescription for stretching exercises exists and no conclusive statements can be made about the relationship of stretching and athletic injuries. Stretching recommendations are clouded by misconceptions and conflicting research reports. We believe that part of these contradictions can be explained by considering the type of sports activity in which an individual is participating. Sports involving bouncing and jumping activities with a high intensity of stretch-shortening cycles (SSCs) [e.g. soccer and football] require a muscle-tendon unit that is compliant enough to store and release the high amount of elastic energy that benefits performance in such sports. If the participants of these sports have an insufficient compliant muscle-tendon unit, the demands in energy absorption and release may rapidly exceed the capacity of the muscle-tendon unit. This may lead to an increased risk for injury of this structure. Consequently, the rationale for injury prevention in these sports is to increase the compliance of the muscle-tendon unit. Recent studies have shown that stretching programmes can significantly influence the viscosity of the tendon and make it significantly more compliant, and when a sport demands SSCs of high intensity, stretching may be important for injury prevention. This conjecture is in agreement with the available scientific clinical evidence from these types of sports activities. In contrast, when the type of 444 *Witvrouw et al.* sports activity contains low-intensity, or limited SSCs (e.g. jogging, cycling and swimming) there is no need for a very compliant muscle-tendon unit since most of its power generation is a consequence of active (contractile) muscle work that needs to be directly transferred (by the tendon) to the articular system to generate motion. Therefore, stretching (and thus making the tendon more compliant) may not be advantageous. This conjecture is supported by the literature, where

strong evidence exists that stretching has no beneficial effect on injury prevention in these sports. If this point of view is used when examining research findings concerning stretching and injuries, the reasons for the contrasting findings in the literature are in many instances resolved.

### Pediatric outcome measurement:

### Just another 'good' idea or a change agent for the way that physiotherapists collaborate with children and their families?'

Wright, V

This presentation begins with a brief overview of the evolution and changes in outcome measurement approaches in pediatric rehabilitation over the last 30 years, and the impact that the International Classification of Functioning (ICF) has had on where physiotherapists are now and where we may be moving towards as far as measurement. While we like to think that our current outcome measures are both sensitive to change and reflective of the principles of family centred care, there are challenges to using them in a collaborative and effective manner with children and their families. Results of a survey of measurement of change approaches conducted by the presenter with paediatric physiotherapists, occupational therapists and speech pathologists in the province of Ontario, Canada will be shared as an illustration of the common challenges we still face and the approaches we might take to address barriers to collaborative measurement. The concept of use of standardized outcome measures serving as a goal sensitizer and intervention in themselves for children and parents will be discussed, drawing examples work that the presenter has done related to use of the *Pediatric Evaluation of Disability Inventory (PEDI)* with parents of children with disabilities. This talk will link directly to the Health and Wellness focus of the conference through a final discussion about the use of goal setting across the ICF to work on current and anticipated future goals related to participation and quality of life.

### Start early: Harnessing motivation and enhancing self efficacy in the delivery of services to children and families.

Ziviani, J

There is a strong emphasis on evidence-based intervention in health care. This has resulted in an imperative to compile specific, manualized interventions which can be tested with specific target populations. Relatively less attention, however, has been directed towards the *process* of therapeutic intervention and the various theoretical bases which inform sound practice. Practitioners will invariably confront clinical situations which pose unique configurations of client circumstances for which programmatic intervention is not always clearly obvious. Clinicians therefore require principles that can be applied to a range of clinical situations where engagement in therapy, behaviour modification and self efficacy are key the therapeutic outcomes.

There are now some well established trends in the provision of therapeutic interventions which are resulting in changes to the way services are being delivered: a move towards natural learning environments, a focus on strengths based interventions which focus on client selected outcomes and acknowledgement of the relationship base of change. Self Determination Theory (SDT) provides an overarching way of understanding personal motivation and can provide a framework in which to identify key elements of the therapeutic process. While SDT has been applied widely in adult settings, where behaviour change is the focus, it is also particularly pertinent for working with children and their parents. In this presentation the key elements of SDT: Autonomy, Relatedness and Competence will be dissected and their individual and combined contribution to how therapy is delivered explored. Practical examples will be used as a means of providing insights into how these principles apply in reality.



# ABSTRACT PRESENTATIONS

## 001

### Foot orthoses produce immediate pain relief in people with patellofemoral joint osteoarthritis

Natalie J Collins, The University of Melbourne

Hannah E Ozturk, The University of Melbourne

Anthony G Schache, The University of Melbourne

Rana S Hinman, The University of Melbourne

Kay M Crossley, The University of Melbourne

**Question:** What are the immediate effects of foot orthoses and flat shoe inserts on pain associated with patellofemoral joint (PFJ) osteoarthritis (OA) during performance of functional activities?

**Design:** Randomised, within-participant cross-over trial.

**Participants:** Twenty-three individuals (12M) with PFJ OA (anterior knee pain, osteophytes on skyline radiographs) recruited from the greater Melbourne community.

**Intervention:** Participants performed level walking and a step down task under three test conditions: i) running sandals (Nike Strap Runner); ii) sandals with prefabricated foot orthoses (Vasyli International); and iii) sandals with flat EVA inserts.

**Outcome measures:** Pain severity on an 11-point numerical rating scale (0 no pain, 10 worst pain imaginable).

**Results:** Significant main effects were observed for walking ( $p=0.041$ ) and step down ( $p=0.005$ ). Pairwise comparisons revealed that, compared to the sandal alone, significant reductions in pain occurred during both tasks for foot orthoses (walking: mean difference  $-0.78$ , 95% confidence interval  $-1.46$  to  $-0.11$ ; step down:  $-1.28$ ,  $-2.13$  to  $-0.43$ ) and flat inserts (walking:  $-0.83$ ,  $-1.46$  to  $-0.2$ ; step down:  $-1.35$ ,  $-2.15$  to  $-0.55$ ). The effects of the two inserts were not significantly different (walking:  $0.04$ ,  $-0.46$  to  $0.54$ ; step down:  $0.07$ ,  $-0.7$  to  $0.82$ ).

**Conclusion:** Shoe inserts, be it prefabricated foot orthoses or flat EVA inserts, can produce immediate and significant reductions in perceived pain during activities that typically aggravate PFJ OA symptoms. This suggests that shoe inserts are likely to be an effective intervention for PFJ OA, and warrant further investigation using randomised clinical trials to determine longer-term effects.

## 002

### Co-contraction of lower limb muscles in athletes with hemiplegia during running

Keren Faulkner, Australian Institute of Sport, Department of Physical Therapies

Peter Blanch, Australian Institute of Sport, Department of Physical Therapies

Doug Rosemond, Australian Institute of Sport, Department of Biomechanics

**Question:** Do athletes with hemiplegia co-contract opposing muscle groups in the lower limb more than able-bodied athletes during running?

**Design:** Prospective observational study.

**Participants:** 2 elite AIS sprint athletes with hemiplegia.

**Outcome measures:** Surface EMG, Vicon 3D imaging and force plate data was collected during running over 3 separate trials. Data was analysed using Vicon Nexus and Noraxon Gait analysis software.

**Results:** Seven muscles in the lower limb were recorded for EMG activity during running at the athlete's self selected race pace. Muscles were rated as 'on' when the EMG signal was recorded as above 10% of its peak for more than 10% of the gait cycle. For each period of the gait cycle paired muscles that have opposing actions across a joint were examined. In these two case studies, co-contraction was demonstrated at the ankle joint (tibialis anterior v soleus), the knee joint (biceps femoris v vastus lateralis) and the hip (rectus femoris v gluteus maximus). Previously published research demonstrates the absence of such co-contraction in able-bodied athletes.

**Conclusion:** This study demonstrates co-contraction of lower limb muscles in two hemiplegic athletes and provides a method for evaluating the effect of interventions in these individuals.

## 003

### Usefulness of the Dizziness Handicap Inventory in screening for BPPV in whiplash

Julia Treleaven, Division of Physiotherapy, School of Health and Rehabilitation Science, The University of Queensland, Brisbane.

**Questions:** Recently 5 specific items from the Dizziness Handicap Inventory (DHI) –looking up, in and out of bed, quick head movements, rolling in bed and bending over, or descriptors of dizziness (spinning and not lightheaded) have been suggested to be helpful in screening for Benign Paroxysmal Positional Vertigo (BPPV). However, these items might also be relevant to those who have cervicogenic dizziness. The aim of the study was to determine the frequency of responses of items on the DHI and dizziness descriptors in those with persistent whiplash.

**Design:** Observational study.

**Participants:** One hundred and nineteen subjects complaining of dizziness with persistent whiplash.

**Outcome measures:** Responses for each item of the DHI (short form) and the descriptors of dizziness.

**Results:** Twenty nine percent of the whiplash subjects reported all 5 of the BPPV items. Quick head movements (89%), bending over (85%) and looking up (84%) were most common. Sixty-nine percent reported all 3 of these items. Forty three percent of subjects did not report either turning in bed or getting in and out of bed. Lightheaded and not spinning (65.5%) was the most common descriptor and only 2 subjects reported spinning and not lightheadedness.

**Conclusion:** The results show that 3 of 5 items identified for BPPV are commonly reported in those with persistent whiplash. The combination of items of rolling in bed and in and out of bed in association with the descriptor of spinning might be more suitable for screening for BPPV in those with persistent whiplash.

## 004

### Identification of patients with cervicogenic dizziness during recruitment for a randomised controlled clinical trial

Sue A Reid, The University of Newcastle. Callaghan.

Darren A Rivett, The University of Newcastle. Callaghan.

Michael G Katekar, The University of Newcastle. Callaghan.

Robin Callister, The University of Newcastle. Callaghan.

**Background:** Dizziness is a broad term used to describe a variety of symptoms. Dizziness is a perception and since there is no objective test, we must rely on people's subjective descriptions. One type of dizziness is imbalance which can originate from dysfunction in the cervical spine. It has been postulated that if an unsteady feeling occurs with neck pain and is aggravated by neck movements or positions, and with other causes of imbalance eliminated, a diagnosis of cervicogenic dizziness can be made. However there is minimal evidence of the clinical utility of this diagnosis nor the prevalence of cervicogenic dizziness in a population complaining of dizziness.

**Objective:** The aim was to identify people with cervicogenic dizziness and establish the prevalence of this condition.

**Method:** Participants were recruited via a press release. They were screened via a phone interview and if thought to have cervicogenic dizziness were assessed by a physiotherapist and neurologist.

**Results:** Four hundred and thirty-one people contacted the researchers believing they may have dizziness of cervical origin. However on structured telephone screening, 345 (80%) were excluded with the main reasons being: rotary vertigo 131 (38%), light headedness 35 (10%), central causes 28 (8%), other medical problems 27 (8%) and migraines 24 (7%). A further 53 (12%) were excluded after physical examination mainly because of vertigo (18 people with a positive Dix-Hallpike manoeuvre).

**Conclusion:** Through careful questioning and a few physical tests, 34 people were diagnosed with cervicogenic dizziness representing a prevalence rate of 8% for this population.

## 005

### Individual responses to cervical mobilisation are specific to the treated location and can be distinct from group responses

Neil Tuttle, Griffith University

Kerrie Evans, Griffith University

Roger Adams, University of Sydney

**Question:** Are individual responses to cervical mobilisation related to treatment location and distinct from group responses?

**Design:** Randomized, single blinded double crossover.

**Participants:** Twenty individuals with neck pain of more than two weeks duration not currently receiving treatment.

**Intervention:** During one session, participants received two minutes of posteroanterior mobilisation twice to each of two locations: an active location that had been assessed as hypomobile and likely to be related to their symptoms; and a control location above or below and on the opposite side from the active location.

**Outcome measures:** Range of movement and pain on active movements and pressure pain threshold on each limb were measured before and after each treatment.

**Results:** No differences were found in group responses between the two treatment locations for any outcome measures. For range of movement and pain, change in one direction of movement following the second application of treatment to the same location was more likely to be in the same direction as the first ( $p = .03$  and  $.013$  respectively). For pressure pain threshold, individual responses were not dependent on the treated location, but for some individuals the threshold consistently increased while for others it decreased regardless of which location was treated or limb was assessed.

**Conclusions:** Individuals are likely to have consistent responses to mobilisation that are dependent on the treated location. Even though treating one location may not have a superior effect for a group of patients, for an individual it does make a difference where the treatment is applied.

## 006

### Neck pain prognosis: It's not all bad news

Andrew M Leaver, Faculty of Health Sciences, The University of Sydney

Kathryn M Refshauge, Faculty of Health Sciences, The University of Sydney

Christopher G Maher, The George Institute for International Health

James H McAuley, Neuroscience Research Australia

Gwendolen Jull, Division of Physiotherapy, The University of Queensland

Jane Latimer, The George Institute for International Health

**Objective:** To describe the clinical course of a new episode of neck pain and to evaluate factors associated with recovery.

**Methods:** 177 consecutive patients with a new episode of neck pain, who enrolled in a randomised controlled trial, were followed for 3 months. Participants received multimodal treatment from physiotherapists, chiropractors or osteopaths. Outcomes were the number of days to recover from the episode of neck pain and Neck Disability Index (0–50) score at 3 months.

**Results:** 54% of participants reported complete recovery from the episode of neck pain within 3 months, while the remainder reported some residual pain and disability. Pain scores improved from  $6.2 \pm 2.0$  (mean  $\pm$  SD) at baseline to  $2.5 \pm 2.1$  within 2 weeks and to  $1.5 \pm 1.4$  at 3 month follow-up. Disability scores improved from  $15.5 \pm 7.4$  at baseline to  $5.4 \pm 6.4$  at 3 months. A faster rate of recovery was independently associated with better self-rated general health, shorter duration of symptoms, absence of concomitant upper back pain or headache and being a smoker. Higher disability at 3 months was independently associated with higher disability score at baseline, the presence of lower back or upper back pain, older age and a past history of taking sick leave for neck pain.

**Conclusions:** Almost half of those who seek physical treatments for a new episode of neck pain do not completely recover within three months and relapse is common. In these patients however, the high pain scores that feature at initial presentation tend to rapidly improve to milder levels after commencing treatment.

## 007

### Cervical palpation and neurodynamic tests differ in a subgroup of unilateral lateral epicondylalgia with severe pain and disability

Brooke K Coombes, University of Queensland

Leanne Bisset, Griffith University

Bill Vicenzino, University of Queensland

**Question:** Do cervical palpation and neurodynamic test responses differ in unilateral lateral epicondylalgia patients of varying pain and disability?

**Design:** Cross-sectional, case-control cohort study, using cluster analysis to classify lateral epicondylalgia patients into mild, moderate or severe subgroups based on pain and disability (PRTEE).

**Participants:** 164 patients with unilateral lateral epicondylalgia and a lack of neck pain that interferes with daily activities, work and requiring healthcare practitioner attention. 62 age and gender matched healthy control participants.

**Outcome measures:** Cervical palpation (C4-5 to T12) and radial nerve neurodynamic tests.

**Results:** Positive radial neurodynamic tests were more frequent in severe lateral epicondylalgia (66.7%) than those with mild (23.1%) or moderate (33.7%) pain and disability ( $p < 0.001$ ). Cervical palpation differed between cervical levels and between groups ( $p < 0.01$ ). Positive responses were more common on the affected side at the C5-6 and C6-7 levels in moderate and severe lateral epicondylalgia ( $p < 0.01$ ) than an age matched healthy control population, while mild lateral epicondylalgia was no different to controls.

**Conclusion:** Cervical and radial nerve neurodynamic responses differ in patients with severe lateral epicondylalgia. This subgroup may benefit from treatment directed toward cervical and neural tissue in addition to tendon structures at the elbow.

## 008

### The relationship between age-related hyperkyphosis and the frequency of movement in the thoracic spine

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Teresa M Neeman, The Statistical Consulting Unit, The Australian National University

Paul N Smith, Trauma and Orthopaedic Research Unit and College of Medicine, Biology and Environment, The Australian National University

**Question:** How often do normal adults move their thoracic spine and is there a relationship between movement frequency and thoracic kyphosis.

**Design:** Prospective observational.

**Participants:** 56 participants (18 male: 38 female) aged  $62.4 \pm 11.1$  years.

**Outcome measures:** Movement frequency of the mid-thoracic spine measured with the flexible electrogoniometer (FEG) in both the sagittal and coronal planes for 6 hours. Outcome measures included the frequency of spinal movement  $> 5^\circ$  during the whole 6-hour period as well as during walking and driving. The effects of age, gender and kyphotic angle on the movement frequency were assessed.

**Results:** The frequencies were low. Sagittal plane frequency was approximately half of coronal (6-hr  $5.21 \pm 0.32$  cycles/hr vs  $10.44 \pm 2.88$  cycles/hr; walking  $6.13 \pm 0.58$  cycles/hr vs  $15.35 \pm 1.13$  cycles/hr; and driving  $2.98 \pm 0.41$  cycles/hr and  $5.58 \pm 0.71$  cycles/hr). Age was not correlated with frequency. Females had higher movement frequencies than males in both planes, but only significant in the sagittal plane ( $5.6 \pm 0.4$  cycles/hr vs  $4.4 \pm 0.4$  cycles/hr,  $p = 0.04$ ).

Decreased kyphosis was negatively correlated with 6-hour sagittal frequency (-0.44,  $p = 0.0008$ ) but not with coronal frequency.

**Conclusion:** This is the first time that the frequency of thoracic spine movement has been reported. The results show that thoracic spine movement frequency is very low, especially in males. Sagittal movement frequency was approximately half that in the coronal plane. Increased kyphosis is correlated with decreased movement frequency which may have implications for disc nutrition.

## 009

### A Randomised Controlled Trial of Strengthening versus Postural Re-education for Age-related Thoracic Hyperkyphosis

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Paul N Smith, Trauma and Orthopaedic Research Unit and College of Medicine, Biology and Environment, The Australian National University

**Question:** What is the relative efficacy of strengthening and postural re-education for reducing the angle of thoracic kyphosis.

**Design:** Single blinded randomised controlled trial with 2X2 factorial design. **Participants:** 69 adults (26 male: 43 female), aged 40–85 years.

**Interventions:** Participants were randomised into 4 groups: progressive resisted strengthening (STR), postural re-education (PED), 'both' and control. Outcome was assessed at baseline and at 12 weeks.

**Outcome measures:** Angular measurement using the flexible electrogoniometer (FEG) which measured the thoracic angle between T3 and T11 and the inclinometer which measured between T1 and T12. Secondary outcomes included back extensor strength (BES), 10m walk, TUAG, X5 sit-to-stand (X5 STS) and the stair-test.

**Results:** Neither intervention group demonstrated significant angular reductions compared to the control but the inclinometer angle reductions were markedly greater in the STR group than they were in the PED group. BES and physical function significantly improved in the STR group only (BES:  $0.6 \text{ N/kg} \pm 0.2 \text{ N/kg}$ ,  $p < 0.01$ ; 10m walk:  $-0.3s \pm 0.6s$ ,  $p < 0.05$ , X5 STS:  $-0.9s \pm 0.6s$ ,  $p < 0.05$ ). Change in BES was not related to change in kyphotic angle. Both FEG and inclinometer angles did not improve in subjects aged  $>70$ .

**Conclusion:** Neither intervention was significantly effective at reducing kyphosis but STR significantly increased BES and improved function. The effect of strengthening on inclinometer angles compared to FEG angles suggests that the upper thoracic segments may be more susceptible to change. Increased BES does not necessarily lead to decreased kyphosis.

**Trial registration:** ACTR-number-ACTRN12611000447954

## 010

### Back extension exercises in prone lying may increase thoracic kyphosis – a preliminary study

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**Question:** How are the muscles of the trunk recruited during prone and sitting extension exercises?

**Design:** Randomised within-participant experimental study.

**Participants:** 20 healthy adults (10 F).

**Intervention:** Participants performed back-extension exercises in three prone-lying positions (P1 arms above head, P2 arms hanging at side, P3 arms alongside body) and two sitting positions (S1 sitting upright, S2 sitting upright with scapular retraction).

**Outcome measures:** Surface EMG of the lumbar erector spinae (LES) and the external oblique (EO) muscles. Back extension force measurement using a wall mounted dynamometer. The moments generated during each exercise were calculated from anthropometric data and the forces measured. The log-ratio of moment to LES activity acted as an analogue for thoracic erector spinae (TES) activity.

**Results:** The prone extension tasks resulted in significantly more LES activity than the sitting tasks ( $p < 0.001$ ). The LES amplitudes for P1 were significantly greater than for all the other tasks ( $p < 0.001$ ). The EO amplitudes in sitting were significantly lower than in prone ( $p = 0.006$ ) and significantly greater for P1 than for any of the other tasks ( $p < 0.001$ ). The log-ratio of moment to LES amplitude was significantly higher for the sitting tasks than for the prone tasks ( $p < 0.001$ ).

**Conclusion:** Prone extension induces a different pattern of activity from extension in sitting. When prone, more of the extension moment is the result of LES activity and the trunk flexors appear to stabilise the thoracic spine into more flexion with a paradoxical reduction in TES contribution.

## 011

### The prognosis of non-specific low back pain: a meta-analysis

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**Question:** What is the course of pain and disability in patients with acute or persistent low back pain?

**Design:** Meta-analysis of inception cohort studies.

**Participants:** Prospective studies that enrolled an inception cohort of patients with acute or persistent low back pain and measured pain, disability or recovery outcomes were included.

**Intervention:** Two independent reviewers assessed study quality and extracted data.

**Outcome measures:** Pain and disability outcomes were converted to a common 0–100 scale. Mixed models provided pooled estimates of pain and disability over time.

**Results:** The search yielded 23,293 potentially relevant studies; 40 articles reporting 30 discrete cohorts met all criteria and were included. The unadjusted variance-weighted mean pain scores (/100) at 6, 26 and 52 weeks after pain onset were 23 (95% CI 20.2 to 25.3), 11 (95% CI 8.2 to 14.6) and 6 (95% CI 2.2 to 9.7) for cohorts with acute pain and 37 (95% CI 32.1 to 42.9), 31 (95% CI 23.8 to 37.9) and 28 (95% CI 19.6 to 35.9) for cohorts with persistent pain respectively. High levels of person-to-person variability in outcomes were observed in most studies. The course of disability outcomes was similar to the time course of pain outcomes.

**Conclusion:** Patients who present with acute or persistent low back pain improve markedly in the first 6 weeks. After that time improvement slows. Low levels of pain and disability are still present at one year.

## 012

### Smudging the motor representation of paraspinal muscle fascicles in recurrent low back pain

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**Question:** There is functional specificity in different parts of the paraspinal muscles, but it is unclear whether this may be associated with discrete organisation at the motor cortex. Further, as loss of this differential control is common with recurrent low back pain, this may be associated with reorganisation at the motor cortex.

**Design:** Cross-sectional study.

**Participants:** Data were collected from nine individuals with recurrent unilateral low back pain and compared with eleven healthy participants.

**Outcome measures:** Fine-wire electrodes selectively recorded myoelectric activity from short/deep fascicles of lumbar multifidus and long/superficial fascicles of longissimus erector spinae, bilaterally. Motor cortical organisation was investigated using transcranial magnetic stimulation at different scalp sites to evoke responses in paraspinal muscles.

**Results:** Healthy individuals showed discrete motor cortical organisation between the deep multifidus and longissimus erector spinae. By contrast, individuals with back pain showed more posterior motor representation of longissimus erector spinae, which overlapped with that for deep multifidus on both hemispheres. Map volume was also reduced in LBP compared to healthy individual across all muscles.

**Conclusion:** The findings highlight discrete cortical organisation of inputs to back muscle fascicles with differential control. Increased overlap in motor cortical representation of distinct paraspinal fascicles (i.e., cortical smudging) with back pain may underpin loss of differential activation in this group. Evidence of discrete organisation of the motor cortex for different parts of the paraspinal muscles add further weight to the notion that different strategies may need to be considered during motor rehabilitation.

## 013

### Forward bending kinematics and trunk muscle activity in adolescents with and without non-specific chronic low back pain

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**Question:** To investigate the spinal kinematics and trunk muscle activation of adolescents with and without NSCLBP during a standing, forward bending and return to upright task?

**Design:** A preliminary cross-sectional comparative study of adolescents with NSCLBP and healthy controls.

**Participants:** 56 adolescent subjects, 28 with NSCLBP, were recruited.

**Intervention:** Each subject with NSCLBP was sub-grouped based on O'Sullivan's classification system into active-extension or multi-directional pattern disorder. Sagittal lumbo-pelvic kinematic data and muscle activity of three back extensors was recorded during throughout the task. Variables included standing and forward bending spinal posture, spinal range-of-motion through forward bending, muscle activation during task stages and two flexion-relaxation ratios.

**Results:** No differences were noted based on spinal kinematics during standing, forward bending, forward or return phases or range-of-motion amplitude between those with and without NSCLBP. When sub-classified, the active-extension sub-group displayed restricted range-of-motion in forward-bending compared to both the multi-directional sub-group and controls. Higher muscle activation levels were shown in iliocostalis during standing in those with NSCLBP compared to controls. Peak muscle activation, during the second quarter of the return phase of forward bending was the most discriminatory time epoch of the task differentiating sub-groups of NSCLBP and healthy controls.

**Conclusions:** The absence of flexion-relaxation observed in adults with NSCLBP was not a feature of adolescents with NSCLBP.

## 014

### Sitting postures and trunk muscle activity in adolescents with and without nonspecific chronic low back pain—a sub-classification based analysis

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**Question:** Sitting is an important consideration in adolescents with nonspecific chronic low back pain (NSCLBP): currently there are no reports investigating their motor control strategies in sitting. Therefore, the aim of this study was to investigate whether differences in spinal kinematic and trunk muscle activity exist in both usual and slump sitting in adolescents with NSCLBP?

**Design:** A preliminary cross-sectional comparative study of adolescents with NSCLBP and healthy controls.

**Participant:** Twenty-eight adolescents (14 female) with NSCLBP and 28 matched pain-free controls were recruited from a large cohort study.

**Intervention:** Pain subjects were subclassified based on O'Sullivan's classification system. Three-dimensional lumbo-pelvic kinematic data and the activation of 3 back and 2 abdominal muscles were recorded during usual and slump sitting. The flexion-relaxation phenomenon in sitting was also investigated.

Results. Spinal posture in usual and slump sitting were similar for adolescents with and without NSCLBP. However, differences were identified in both sitting conditions when those with NSCLBP were subclassified and compared with controls. Muscle activation differences were not consistently identified, with only lower levels of internal oblique activation in usual sitting in NSCLBP compared with pain-free controls showing significance. Flexion relaxation was observed in both iliocostalis and thoracic erector spinae in the NSCLBP group but not controls.

Conclusion. This study provides preliminary results. Differences with sitting posture are only seen when adolescents with NSCLBP are classified. Trunk muscle activation is not a sensitive marker for discriminating subgroups of NSCLBP during adolescence.

## 015

### Preferential recruitment of discrete regions of psoas major and quadratus lumborum during sitting postures in chronic low back pain

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**Question:** Are discrete regions of psoas major and quadratus lumborum activated differentially in sitting in chronic low back pain?

**Design:** Cross sectional study.

**Participants:** Ten volunteers with chronic low back pain and nine pain-free controls. Back pain patients were sub-classified into those with high and low erector spinae electromyographic activity when sitting with a lumbar lordosis.

**Intervention:** Participants adopted three sitting postures that involved different spine and hip angles. Fine-wire electrodes were inserted with ultrasound guidance into fascicles of psoas arising from the transverse process and vertebral body and anterior and posterior layers of quadratus lumborum.

**Outcome measures:** Amplitude of electromyographic activity normalised to maximum.

**Results:** When unclassified, participants with and without back pain had identical activity of psoas and quadratus lumborum in sitting postures ( $p = 0.59$ ). However, when sub-classified, those with low erector spinae activity had greater activity of vertebral region of psoas major and posterior quadratus lumborum in the flat posture and posterior quadratus lumborum in the short lordosis posture, compared to the pain-free group (all:  $p < 0.05$ ). For the high erector spinae activity group, activity of both regions of psoas major was less than the low activity group in short lordosis posture (all:  $p < 0.05$ ).

**Conclusion:** These findings suggest redistribution of activity between muscles that have a potential extensor moment in people with low back pain such that those with low erector spinae activity appear to rely more on activity of the more posterior regions of psoas major and quadratus lumborum.

## 016

### Behavioural treatment for chronic low-back pain: an updated Cochrane systematic review

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**Objective:** This update of a Cochrane systematic review aimed to determine if behavioural therapy is more effective than other treatments for chronic low-back pain (CLBP).

**Methods:** A electronic database search for randomised trials was performed up to February 2010. Two authors independently selected studies, assessed the risk of bias, and extracted data. If sufficient homogeneity existed among studies, a meta-analysis was performed. The quality of the evidence in each comparison was determined using the GRADE approach.

**Results:** Thirty-two randomised trials were included in this review, 11 of which were added since the previous review. Only 15 of the trials (47%) had a low risk of bias. When compared to waiting list controls, there was moderate quality evidence that operant therapy (SMD -0.43; 95% CI -0.75 to -0.11) is more effective for pain relief in the short term. There is also moderate quality evidence that operant therapy is no more effective than cognitive therapy or a combination of behavioural therapies for short to intermediate term pain relief. When compared to other interventions, there is moderate quality evidence that behavioural treatment is more effective than usual care for short-term pain relief (WMD -5.18; 95% CI -9.79 to -0.57), but there is no difference on functional status.

**Conclusions:** No specific type of behavioural treatment was shown to be more effective than any other type. Because of a lack of large, high quality studies it remains difficult to make firm statements about the actual or comparative value of different components of behavioural therapy.

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## 017

### The effect of motor control exercises versus graded activity in patients with chronic low back pain: a randomised controlled trial

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**Question:** Is motor control exercise more effective than graded activity in improving pain and function for patients with chronic low back pain?

**Design:** Randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** 172 individuals who had non-specific low back pain of >12 weeks duration.

**Intervention:** Participants in both groups received 12 sessions of individualised supervised exercise over 8 weeks with follow-up sessions at 4 and 10 months. The motor control exercise program was based upon that reported by Hodges et al and the graded activity program was based upon that reported by Lindstrom et al.

**Outcome measures:** Primary outcomes were average pain intensity over the last week (0 to 10 scale) and function (0 to 10 Patient Specific Functional Scale) measured at 2, 6 and 12 months. Secondary outcomes were patient's global impression of change, disability, quality of life and durable recovery. All data were double-entered and blinded analyses performed on a locked data file.

**Results:** Follow-up was greater than 90% at all time points. The estimates of treatment effects from the mixed linear models revealed that there were no statistically significant, or clinically important, differences between treatment groups for any of the outcomes at any of the time point. For example at 2 months the effect on pain was -0.01 (-0.8 to 0.8) and for function was 0.2 (-0.5 to 0.9).

**Conclusion:** Motor control exercise and graded activity have similar effects for patients with chronic low back pain.

**Trial registration:** ACTRN1260700043215.

**Results:** There were four withdrawals. For the Quebec score, both groups showed significant improvements, but there was no significant difference between the groups, the difference being -3.5 (95%CI -7.3, 0.3,  $p=0.07$ ) in favour of the clinical pilates group. The results were similar for the secondary outcomes.

**Conclusions:** An individualised, 6-week Clinical Pilates program is as effective as traditional, general exercises used by physiotherapists for the management of CLBP.

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## 019

### A comparison of registered protocols and published reports of randomised controlled trials in physiotherapy

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**Question:** What proportion of randomised trials of physiotherapy interventions are registered on clinical trial registers? Are the registered protocols consistent with the published reports?

**Design:** Survey of trial reports and their registered protocols.

**Method:** 200 reports were randomly selected from those published in 2009 and indexed on the Physiotherapy Evidence Database (PEDro). Each report was checked for evidence of registration. If no evidence was found, we contacted the authors and checked relevant clinical trial registers. For each registered trial, two independent investigators extracted details of the registration process, the data collection period, and the outcomes nominated in the registered protocol and included in the published report.

**Data analysis:** We calculated the proportion of trials that were registered and the proportion that stated this in the report. For each protocol, we classified the primary outcome(s) as unambiguous if the method and time point(s) of measurement were both clearly defined. We classified each protocol as adequate if it was registered before data collection began and all primary outcomes were unambiguous.

**Results:** The proportion of trials that were registered was 67/200 (34%), of which 48 (72%) mentioned registration in the published report. Five of the 67 reports were secondary analyses and were not analysed further. Of the remaining 62 trials, 28 (52%) reported unambiguous primary outcomes but only 4 (6%) had been adequately registered.

**Conclusion:** Few randomised trials of physiotherapy interventions are registered. Most registered protocols specify insufficient detail prospectively to allow identification of deviations from the original protocol.

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## 018

### Clinical Pilates for the management of chronic low back pain: a randomised controlled trial

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**Objective:** Clinical Pilates has entered mainstream physiotherapy practice as a popular choice of exercise therapy for CLBP, but the evidence base is marginal. A six-week clinical pilates program was compared with a general exercise program on outcomes such as back disability, pain and function in adults with CLBP.

**Methods:** 87 (39 M, 48 F) adults aged 18–70 were assessed at baseline by a blinded outcome assessor and randomised to clinical pilates or general exercise groups. Both groups had exercise programs prescribed by a project physiotherapist and attended supervised group sessions for one hour twice weekly for 6 weeks. The clinical pilates group received an individualized program. The general exercise group were all given the same exercises. Both groups were given home exercises. The primary outcome was back pain/disability, measured with the Quebec Back Pain Disability Questionnaire. Secondary outcomes were pain, patient-specific function, pain self-efficacy, quality of life and global perceived effect of treatment. Participants kept a diary of home exercises, adverse events, change in medications or co-interventions. Data were analysed in blinded fashion after the intervention with independent t-tests using intention-to-treat.

## 020

### A systematic review of orthopaedic physical examination tests of the hip: diagnostic performance and study quality

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**Question:** What are the levels of diagnostic accuracy of the physical tests used in orthopaedics to identify local hip pathology?

**Design:** Systematic review of diagnostic studies conducted to determine the sensitivity and specificity of physical tests of the hip.

**Participants:** Adults who are suspected of having hip pathology and would be expected to consult a medical clinician.

**Intervention:** Physical tests were defined as specific, non-invasive procedures, beyond inspection, point tenderness and palpation, which increased the probability of a diagnostic classification.

**Outcome measures:** Sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios. Methodological quality was assessed using a modified version of the Quality Assessment of Diagnostic Accuracy Studies tool.

**Results:** 112 articles met our inclusion criteria with 16 containing methodologically acceptable data relating to 65 independent physical test-pathology combinations. Studies performed satisfactorily with regards to eliminating basic procedural biases, but performed poorly with respect to the reporting of inter and intra-tester reliability, withdrawals, uninterpretable results and standardised index test procedures. Based on their positive and negative likelihood ratios, the best performing tests were the patellar-pubic percussion test for detecting hip fractures and the hip abduction sign for detecting sarcoglycanopathies in patients with muscular dystrophy.

**Conclusion:** There is insufficient evidence to make conclusive recommendations about the clinical utility of most of the orthopaedic physical tests used to examine the hip. Clinicians using specific provocation tests for identifying and differentiating hip pathology need to be aware of the limitations of the available tests.

## 021

### Are the clinical diagnostic tests used for chronic mid body Achilles tendinopathy valid?

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**Objective:** Differential diagnosis around the Achilles tendon is not straight forward. The aim of this study was to evaluate the accuracy and reproducibility of ten clinical tests identified from the literature to diagnose a chronic mid body Achilles tendinopathy (ultra sound scanning was used as the reference standard).

**Method:** Three orthopaedic specialists performed the ten identified tests on 21 subjects with and without a chronic mid body Achilles tendinopathy. The sensitivity, specificity, positive and negative predictive values were calculated for each test, using the two-way contingency table method. Reproducibility (intra and inter investigator agreement) was determined using the Kappa coefficient.

**Results:** The most valid tests are palpation and location of pain (Kappa 0.74 & 0.69 respectively, sensitivity 85 & 79 % respectively, specificity 78 & 81 % respectively). The least valid tests are crepitus and passive dorsi flexion of the ankle (Kappa 0.34 & 0.17 respectively, sensitivity 7 & 13 % respectively, specificity 87 & 89 % respectively). The validity of the remaining tests; morning stiffness, tendon thickening, Royal London test, Arc sign, resisted plantar flexion and hopping can be considered adequate and should be used with caution. Combining of tests did not further increase sensitivity and specificity.

**Conclusion:** A number of clinical tests are used by clinicians to diagnose a mid body Achilles tendinopathy, however, this study found only two of the tests, the location of pain and palpation to be sufficiently reliable and accurate, and therefore recommended for use.

## 022

### Clinical prediction rules in the physiotherapy management of low back pain: A systematic review

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**Objective:** To identify, appraise and determine the clinical readiness of diagnostic, prescriptive and prognostic clinical prediction rules in the physiotherapy management of low back pain.

**Design:** Systematic review with qualitative synthesis.

**Method:** MEDLINE, EMBASE, CINAHL, AMED and the Cochrane Database of Systematic Reviews were searched from 1990 to January 2010 using sensitive search strategies for identifying clinical prediction rule and low back pain studies. Citation tracking and hand-searching of relevant journals were used as supplemental strategies. Two independent reviewers used a two-phase selection procedure to identify studies that explicitly aimed to develop one or more clinical prediction rules involving the physiotherapy management of low back pain. Diagnostic, prescriptive and prognostic studies investigating clinical prediction rules at any stage of their development, derivation, validation, or impact-analysis, were considered for inclusion using a priori criteria.

**Results:** 7453 unique records were screened with 23 studies comprising the final included sample. Identified studies were qualitatively synthesised. Twenty-five unique clinical prediction rules were identified, including 15 diagnostic, seven prescriptive and three prognostic rules. The majority (65%) of studies described the initial derivation of one or more clinical prediction rules. No studies investigating the impact phase of rule development were identified.

**Conclusions:** The current body of evidence does not enable confident direct clinical application of any of the identified clinical prediction rules. Further validation studies utilising appropriate research designs and rigorous methodology are required to determine the performance and generalisability of the derived clinical prediction rules to other patient populations, clinicians and clinical settings.



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## 023

### Predicting success with physiotherapy management of full-thickness rotator cuff tears: a preliminary clinical prediction rule

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**Question:** Can information obtained from baseline clinical assessment predict those more likely to experience success with conservative physiotherapy management of full-thickness rotator cuff tears?

**Design:** Retrospective cohort study.

**Participants:** Hospital outpatients (n=104, mean age 65.7 years) who underwent physiotherapy management for a symptomatic, full-thickness supraspinatus tendon tear.

**Outcome measures:** Successful outcome was defined as discharge from physiotherapy without orthopaedic follow-up or surgery. Baseline predictors included patient demographics; subjective and physical examination findings; patient-reported measures of quality of life, anxiety and depression, and pain self-efficacy; number of physiotherapy sessions, and co-interventions.

**Results:** Potential predictors identified by univariate analyses were age, gender, previous cortisone injection, symptom onset, diabetes, flexion range of motion, Hawkins-Kennedy test outcome, Pain Self-Efficacy Questionnaire score, Health Assessment Questionnaire Pain Scale score, co-intervention use, and number of physiotherapy sessions. Logistic regression identified the following clinical prediction rule for success with physiotherapy: age > 66 years, no previous cortisone injection, negative Hawkins-Kennedy test, and initial flexion range > 90 degrees. Pre-test success rate of 63% increased to 89% in those with three of these factors (positive likelihood ratio 4.61, 95% confidence interval 1.76 to 12.03), and 100% in those with all four factors.

**Conclusion:** Older patients with symptomatic supraspinatus tears who have more than 90 degrees flexion, a negative Hawkins-Kennedy test, and have not received cortisone injections are more likely to experience success with conservative physiotherapy management. Physiotherapists can use this preliminary clinical prediction rule to flag at the outset those who are more likely to require orthopaedic management.

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## 024

### Ultrasound Measurement of Non-Physiological Movement in Sternal Instability: Reliability and Validity

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**Question:** Does Ultrasound provide reliable and valid measures of the distance between bony sterna in-vitro and of sternal separation in patients with sternal instability following cardiac surgery?

**Design:** Randomized experimental and randomized within-participant experimental study.

**Outcome Measures:** Vernier Callipers provided the gold standard measure of the distances between two bony sterna. These measures were compared with Ultrasound measures made in vitro. Further ultrasound measures were taken in vivo from patients during upper limb movements.

**Results:** Ultrasound measures differed from those taken by the Vernier callipers to a maximum of 1.2mm, thereby establishing good validity. The obtained regression equation between the two sets of scores accounted for 99.8% of the variance in the ultrasound scores and indicates close correspondence. Reliability estimation of the ultrasound measure on bony sterna gave ICC (2, 1) values > 0.99, and reliability estimates for the sternal separation measure in the patient group gave ICC (2, 1) values between 0.90 and 0.93. An important outcome of this study was visualization of the dynamic, multiplanar separation of the sternum demonstrated in this patient group during upper limb movements.

**Conclusion:** Measurements of sternal separation by ultrasound can objectively reflect the extent of bony separation occurring in a group of patients with sternal instability. Being able to use Ultrasound to accurately measure the degree of sternal separation at rest and during movement can promote better monitoring of patients with sternal instability and enable future research to determine optimal sternal closure methods, and guidelines for post-sternotomy activity and exercise.

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## 025

### Measuring subacromial pressures: implications for clinical testing of shoulder impingement

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**Question:** Recent evidence suggests shoulder impingement syndrome arises from primary rotator cuff pathology and may be related to the inability of the rotator cuff to prevent superior humeral head migration in shoulder elevation. It involves compression of the subacromial structures, including the rotator cuff. Previously, clinical tests have been shown to be inaccurate in diagnosing rotator cuff impingement. A lack of anatomical validity might explain the inaccuracy of these tests. This study analysed the subacromial compression forces generated and observed structures impinged in various shoulder positions.

**Design:** Observational case series.

**Participants:** Nine cadaveric shoulders dissected to expose rotator cuff tendons.

**Intervention:** Pressure transducers were placed deep to the coracoid process, coracoacromial ligament, the anterior acromion and the posterior acromion. Shoulders were moved into internal and external rotation from the positions of flexion, abduction and extension.

**Outcome measures:** At each position, pressure readings were recorded and structures being compressed were observed.

**Results:** Highest pressures were recorded in flexion/internal rotation at the coracoacromial ligament, in abduction/internal rotation at the coracoid process (both involving the rotator interval) and in abduction/internal rotation at the coracoacromial ligament (involving supraspinatus). Supraspinatus was also observed to be compressed in extension/external rotation (against the anterior acromion). Infraspinatus was compressed in extension/external rotation (against the posterior acromion), while subscapularis was compressed in flexion/internal rotation and flexion/external rotation (both against the coracoid process).

**Conclusion:** This study identifies shoulder positions likely to impinge particular rotator cuff tendons that may form the basis of more accurate clinical testing for shoulder impingement.

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## 026

### Economic evaluations of diagnostic tests and treatment methods for lateral ankle sprains: a systematic review

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**Question:** Are diagnostic procedures and treatment methods for lateral ankle sprains cost-effective?

**Design:** Systematic review of randomised controlled trials or economic modelling studies with full or partial economic evaluations.

**Participants:** Participants who presented with a suspected or confirmed lateral ankle sprain, or were at risk of sustaining a lateral ankle sprain.

**Intervention:** Any diagnostic tests, prevention or treatment for ankle sprains.

**Outcome measures:** Eligible studies had to present costs as an outcome, or relate cost data to a health outcome (i.e. present a cost-effectiveness, cost-utility or cost-benefit analysis).

**Results:** Eleven studies were included. Six studies conducted a full economic evaluation and five studies involved cost analyses. Five full economic evaluations were trial-based and one was a modelling study. The methodological quality of the full economic evaluations was fairly good. The Ottawa Ankle Rules and specially trained emergency nurses may be cost-effective for diagnosing lateral ankle sprains. Acute treatment with a (semi)rigid protective device appears cost-effective compared to existing hospital protocols. A proprioceptive training program seems cost-effective in preventing ankle (re-)injuries.

**Conclusion:** Results of this current systematic review supplements the evidence provided by reviews focusing solely on effectiveness. There is limited evidence to support the implementation of Ottawa Ankle Rules in the emergency setting, the use of (semi)rigid protective devices in the acute phase, and the prescription of a proprioceptive training program to prevent (re-)injuries.

## 027

### Power Doppler ultrasound in the early diagnosis of primary / idiopathic adhesive capsulitis

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Enhanced vascularity in the rotator interval area of the glenohumeral joint capsule has been suggested as a useful sonographic criterion for early diagnosis of adhesive capsulitis. The aim of this study was to determine if examination of the rotator interval area of the glenohumeral joint capsule with power Doppler ultrasound in subjects with early stage adhesive capsulitis was able to identify an increase in vascularity. Twenty-four subjects diagnosed as having adhesive capsulitis by a physiotherapist or medical practitioner participated in the study. As the early stage of this disorder was being investigated subjects were required to have had symptoms for less than nine months. Further, as only primary/idiopathic adhesive capsulitis was being investigated potential participants with a history of major trauma or previous shoulder surgery were excluded. Subjects were examined with a portable ultrasound machine by a trained physiotherapist in their clinic prior to undergoing intra-articular corticosteroid injection as part of normal clinical management. Ultrasound images were recorded and reviewed by two experienced musculoskeletal radiologists to determine if increased vascularity was present in the rotator interval area. Consensus was achieved on the presence of increased vascularity in one subject with disagreement in another. The use of ultrasound in the physiotherapy clinic is becoming widespread and early recognition of adhesive capsulitis in this setting might facilitate appropriate and timely clinical management. Whilst this study has demonstrated agreed increased vascularity in only one of 24 subjects, ongoing research will determine if these results remain consistent.

## 028

### Joint replacement reviews conducted by physiotherapists: a safe and effective model

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A physiotherapist led Joint Replacement Surgery (JRS) clinic was pioneered at The Royal Melbourne Hospital (RMH) in 2009 to improve the efficiency of the review process following primary and revision hip and knee arthroplasty surgery and improve outpatient access to orthopaedic consultation. A protocol for the JRS clinic was developed collaboratively by the physiotherapy and orthopaedic departments. The orthopaedic surgeons conduct the initial six week post operative review and an advanced practice physiotherapist conducts subsequent reviews at three, six and 12 months, and annually thereafter. Radiology credentialing allows the physiotherapist to assess and manage patients independent of surgeon input. The clinic is co-located with orthopaedics facilitating immediate

surgical involvement if required. Between October 2009 and April 2011, 348 single joint reviews were offered to 194 patients. The attendance rate was 85.9%. The physiotherapist discussed 27 cases with the surgeons with nine patients requiring transfer back to the orthopaedic unit for ongoing management. Four of these patients have subsequently been wait listed for revision surgery. There were no adverse outcomes reported and no nursing input was required for wound issues. A patient survey demonstrated high levels of satisfaction with the service particularly related to improved time efficiencies. Our service re-design demonstrates physiotherapist led JRS clinics in partnership with the orthopaedic department provide an efficient and effective alternative model of care for the long term management of patients following joint replacement surgery. The clinics assist in addressing the growing demand for orthopaedic services by increasing the surgeons' capacity to manage new referrals.

## 029

### Mobile phone short message service reminders can reduce non-attendance in physiotherapy outpatient clinics: a randomized controlled trial

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Kate Lawler, Physiotherapy Department, Angliss Hospital, Eastern Health, Ferntree Gully

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**Question:** Do short message service reminders reduce non-attendance in physiotherapy outpatient clinics?

**Design:** Prospective single blinded randomized controlled trial.

**Setting:** Physiotherapy outpatient departments in two metropolitan public hospitals.

**Participants:** Participants who had an appointment in a physiotherapy outpatient clinic, and provided a mobile phone number.

**Intervention:** Participants allocated to the intervention group received a short message service reminder before their next appointment, while participants allocated to the control group did not receive any reminder.

**Outcome measures:** The primary outcome was the non-attendance rate. Secondary outcomes were cancellation rates, and exploration of other factors associated with non-attendance.

**Results:** 679 patients were allocated to receive either a short message service reminder (n=342) or no reminder (n=337). Non-attendance rate for patients who did not receive a reminder (16%) was more than non-attendance for patients receiving the short message service reminder (11%) (Odds ratio 1.61 (95% CI 1.03 to 2.51); number needed to treat 19 (95% CI 9.4 to 27.5)). There was no difference in cancellation rates between the groups (Odds ratio 0.70 (95% CI 0.47 to 1.05)). Exploration of other factors found that patient factors of a younger age, and a neck and trunk musculoskeletal or a neuromuscular disorder, and scheduling factors of having an initial appointment or an appointment on a Monday or a Friday were significantly predictive of increased non-attendance.

**Conclusion:** Short message service reminders can reduce non-attendance in physiotherapy outpatient clinics.

**Trial Registration:** ACTRN12609000862246

## 030

### Physiotherapy Led Neurosurgery Screening Clinic – Implementing a New Model of Non-Surgical Spinal Pain Assessment and Care

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**Background:** As a response to growing Neurosurgical outpatient waitlists and the success of the Queensland Health state-wide Orthopaedic Physiotherapy Screening Clinic and Multi-Disciplinary Service (OPSC and MDS) model in managing non spinal conditions within the Gold Coast Health Service District (GCHSD), the Allied Health Division of GCHSD obtained funding via the Allied Health Models of Care Projects for a 12 month trial of a Physiotherapy led Neurosurgical Screening Clinic and Multi-Disciplinary Service (NSC). Project: The NSC team (comprising clinical leader, Physiotherapy, Occupational Therapy, Pharmacy, Dietetics and Psychology) commenced in July 2010. Neurosurgery referrals deemed as potentially appropriate for non-surgical management on the basis of referral information were allocated appointments with the NSC for assessment. Following assessment patients were deemed as requiring further investigation, appropriate for NSC multi-disciplinary team management or appropriate for discharge. Patients who accepted the offer of NSC multi-disciplinary care were re-assessed by clinical leaders following intervention to determine further management. **Outcomes:** Data analysis after 9 months of NSC activity reveals average monthly increase in new patient throughput for the Neurosurgical Outpatient Department (NSOPD) has been 70 %. Initial analysis of patient outcomes reveals over 58% of patients managed in NSC have been discharged without requiring any Neurosurgical Consultant input into management. Stakeholder surveys reveal a high level of satisfaction with the level of condition assessment and management provided by the NSC service. These outcomes indicate a significant role for a Physiotherapist led Neurosurgery Screening clinic in the assessment of patients referred to Neurosurgery with spinal pain, with further support for Physiotherapists to undertake advanced practice roles in health care.

**Conclusion:** A physiotherapy service for patients in an emergency extended care unit, as provided in this study, did not reduce the rate of hospital admission, rate of re-presentation to the emergency department, use of community healthcare resources or improve the rate of return to usual work/home/leisure activities or patient satisfaction.

**Trial registration:** ANZCTR12609000106235.

## 032

### Educating and upskilling regional health care professionals regarding spinal pain management: WA Musculoskeletal Health Network's 'Rural Roadshow'

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**Objective:** Spinal pain is among the top five causes of disease-related disability burden in Western Australia (WA). The Rural Roadshow project aimed to address this issue by upskilling health care professionals (HCPs) regarding the delivery of timely, evidence-based management to patients with non-specific low back pain (nsLBP).

**Methods:** Sixty HCPs (caseload nsLBP 18.8% ± 20.60) from four WA regional areas were recruited to this prospective cohort study.

**Intervention:** Health professionals participated in a 6-hour interactive nsLBP educational programme delivered by an interprofessional team.

**Outcome measures:** Measures were recorded at baseline and at 2 months post-intervention regarding attitudes, beliefs (modified Health Care Providers Pain and Impairment Relationship Scale (HC-PAIRS), Back Pain Beliefs Questionnaire (BPBQ)), and evidence-based clinical practice (knowledge and skills regarding nsLBP management, rated on a 5-point Likert scale with 1 = nil and 5 = excellent).

**Results:** HCP-responders (n=49 consented to participate; response rate post-intervention 53%) adopted more evidence-based beliefs and self-reported clinical approaches post-intervention, as evidenced by HC-PAIRS score differences (mean change = -4.2 ± 7.4, p<0.008; baseline 41.4 ± 9.0) and significant positive shifts on 11 of 12 measures of clinical knowledge and behaviours (p<0.001 for 10/11 questions; p=0.011 for 1). Self management strategies (p=0.04) and lifestyle changes (p=0.006) were recommended more frequently post-intervention. BPBQ scores did not change post-intervention (pre- mean 30.9 ± 6.9; post- 31.7 ± 7.2).

**Conclusion:** A targeted pain education programme encourages HCP-responders to adopt more evidence-based attitudes, self-reported clinical behaviours and beliefs regarding pain and impairment relationships when managing patients with nsLBP.

## 031

### A physiotherapy service to an Emergency Extended Care Unit does not decrease admission rates to hospital: a randomised trial

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Thomas Sullivan, University of Adelaide

**Question:** Does a physiotherapy service to an emergency extended care unit decrease rate of hospital admission, rate of re-presentation to the emergency department, visits to community healthcare practitioners, and improve return to usual work/home/leisure activities and patient satisfaction?

**Design:** Prospective, randomised controlled trial with concealed allocation, assessor blinding, and intention-to-treat analysis.

**Participants:** 186 patients in an emergency extended care unit who were referred for physiotherapy assessment/intervention. Referral occurred at any time during patients' admission. **Intervention:** All participants received medical/nursing care as required. The experimental group also received physiotherapy assessment/intervention.

**Outcome measures:** Rate of admission to hospital from the emergency extended care unit, rate of re-presentation to the emergency department, use of community healthcare resources, return to usual work/home/leisure activities and satisfaction with care were measured.

**Results:** The experimental group had a 4.3% (95% CI -17.8 to 9.2) lower rate of admission to hospital than the control group and a 3.5% (95% CI -5.7 to 12.7) higher rate of re-presentation to the emergency department, which were statistically non-significant. Differences between groups for use of community healthcare resources, return to usual work/home/leisure activities and patient satisfaction were small and statistically not significant.

## 033

### On-line education is effective in improving general practitioners knowledge of clinical guidelines for whiplash

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**Question:** Does online education improve general practitioners knowledge of clinical guidelines for whiplash? Can we identify factors that predict learning to inform future implementation strategies?

**Design:** Prospective pre/post intervention study.

**Participants:** 161 general practitioners participated in this study.

**Intervention:** All participants completed an on-line educational activity developed by the authors and hosted by the Royal Australian College of General Practitioners (RACGP).

**Outcome measures:** The primary outcome measure was change in professional knowledge measured by the difference between baseline and follow-up on-line questionnaires. A secondary outcome measure was confidence of knowledge. Predictors of learning were analysed using multiple linear regression.

**Results:** The mean (SD) change in knowledge was significant ( $p < .0001$ ) between baseline (4.8 (1.8)) and post intervention (7.0(1.3)) questionnaire scores. The effect was considered large with 55.9% of general practitioners demonstrating more than a 30% improvement in knowledge. Baseline knowledge was the only predictor of learning ( $F_{1,138} = 15.59, p < .0001$ ). The model explained 63.5% (adj  $R^2$ ) of the variance in learning. Variables such as confidence of knowledge, gender, age and accessibility were not predictors of learning.

**Conclusion:** Online education resulted in a significant and large effect on changing general practitioners knowledge to be consistent with clinical guideline for whiplash. Greater learning was observed in general practitioners with low baseline knowledge. Future implementation strategies for clinical guidelines involving general practitioners should consider online mediums due to accessibility, low cost and large effects on learning.

## 034

### Is everybody happy? Satisfaction survey results of the recently introduced Physiotherapy Arthroplasty Review Clinic

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**Introduction:** Patients following hip or knee joint arthroplasty (replacement) routinely have regular post operative appointments with their orthopaedic surgeon to check their progress and positioning of their prosthesis. In 2010, The Alfred Orthopaedic Unit and Physiotherapy Departments, supported by funding from the Victorian Department of Health, collaboratively introduced the Physiotherapy Arthroplasty Review Clinic. In this clinic a musculoskeletal physiotherapist reviews patients following hip or knee arthroplasty, a role that has traditionally been performed by the orthopaedic surgeon.

**Design and participants:** Satisfaction surveys of the clinic's patients, the patients' general practitioner, and The Alfred Orthopaedic Unit medical team, were undertaken. Ethics approval was granted from The Alfred Ethics and Research Unit. The results were collated by an allied health assistant not involved in the clinic.

**Results:** Ninety five percent of patients reported they agree or strongly agree that they were happy with the service provided by the physiotherapist. Of 12 orthopaedic consultants and four orthopaedic registrars, 11 orthopaedic consultants reported they agree or strongly agree that the clinic is a valuable addition to the orthopaedic outpatient clinic, one consultant and two registrars reported neither agree nor disagree and two orthopaedic registrars strongly disagree. The response rate from the general practitioners was poor with only 10 respondents (18%). One hundred percent of those who responded were supportive of their patients attending the clinic.

**Conclusion:** The recently introduced Physiotherapy Arthroplasty Review Clinic received a positive response from the patients, orthopaedic consultants and a small sample of general practitioners.

## 035

### Advanced Practice Musculoskeletal Physiotherapy Clinics: A framework and competency checklist

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Since 2004, The Alfred has successfully established six advanced practice musculoskeletal physiotherapy roles. These include: screening clinic roles in orthopaedics and neurosurgery units, post-operative reviews within orthopaedics and neurosurgery units, a primary practice musculoskeletal physiotherapy role in the Emergency and Trauma Centre as well as a soft tissue review clinic. A framework and competency checklist established during implementation has proven to be crucial to the success of these initiatives. All clinics have been integrated into the framework and each has a competency checklist. The framework encourages a patient centered approach that improves patient access to high quality care that is provided collaboratively from the physiotherapy and medical teams. The competency checklist is to ensure adequate training and education is provided for the musculoskeletal physiotherapist to deliver high standards of care whilst minimizing clinical risk. The checklist has three components. A set of core competencies identifies the requirements for musculoskeletal physiotherapists to work in any of the advanced practice roles. This includes for example: post graduate qualifications and completion of essential extra learning modules. The second component is an orientation program unique to the specific clinical areas. Finally the third component details the specific skills and training the physiotherapists undertake that is relevant to the field of practice. Advanced practice clinics are pushing the boundaries of traditional physiotherapy roles. A clear framework and set of competency standards are crucial for these roles to be successful and sustainable into the future.

## 036

### Are services delivered by physiotherapy practitioners in the emergency department comparable with doctors in the management of musculoskeletal patients?

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Kim A Brock, St. Vincent's Hospital, Melbourne

**Question:** Are services delivered by primary contact physiotherapists in the emergency department comparable with doctors in the management of musculoskeletal patients?

**Design:** Prospective observational study.

**Participants:** Five hundred and fifty-nine patients who were treated in the emergency department for non-urgent musculoskeletal complaints and discharged home. Two hundred and seventy five patients were treated by a primary contact physiotherapist and two hundred and eighty-four by a doctor.

**Outcome measures:** Wait time and total time in the emergency department, patient satisfaction of care in emergency, patient recovery and follow up care eight weeks post discharge.

**Results:** The mean wait time for patients seen by a primary contact physiotherapist was shorter than for patients seen by a doctor, 42 minutes (47) compared with 84 minutes (77),  $p < 0.001$ , (95% CI 32 to 54 minutes). The mean total time spent in the emergency department for patients seen by a primary contact physiotherapist was also shorter than for patients seen by a doctor, 131 minutes (72) compared to 205 minutes (115),  $p < 0.001$ , (95% CI 58 to 90 minutes). Patient satisfaction of their care in emergency and their recovery after eight weeks was overall positive for both groups. Follow up care was generally similar between groups.

**Conclusion:** Wait time and total time for musculoskeletal patients seen by a primary contact physiotherapist in the emergency department are substantially less than those for similar patients seen by a doctor. Patient satisfaction of care in emergency, patient recovery and follow up was similar for both groups.

## 037

### The impact of an inpatient group-based Physiotherapy gym program for patients post hip arthroplasty surgery

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**Question:** Does the implementation of inpatient group-based Physiotherapy gym program improve outcomes for patients post hip joint arthroplasty surgery?

**Design:** An observational study.

**Participants:** All patients who underwent total hip joint arthroplasty on a Monday or on a Thursday at St Vincent's Hospital in Melbourne.

**Intervention:** Patients in the intervention group (operated on a Monday) participated in a group-based hour-long exercise program in addition to their individual physiotherapy session. The control group were not able to be included in an exercise group over the weekend and received routine care of twice daily one-on-one physiotherapy sessions.

**Outcome measures:** Day of discharge from the Orthopaedic Unit, day first independent on a crutches, and 10 metre walk test day 4 post surgery.

**Results:** 72 participants were recruited to the study with a mean age of 64.6yr (SD 12.4). The intervention group had a shorter mean length of acute hospital stay of 3.75days (SD 0.8) whilst the control group had a mean length of stay of 4.57days (SD 1.3), ( $t = -2.8$ ,  $p < .01$ ). There were no significant differences between groups in the other measures.

**Conclusion:** The results indicate that a gym-based exercise program may be beneficial for patients post total hip replacement in reducing length of acute hospital stay.

## 038

### Adolescent low back pain is an important public health disorder

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**Background:** Chronic low back pain is a significant adult public health issue. Its prevalence rises rapidly during adolescence, reaching adult levels by age 18. Despite this it has been suggested that adolescent low back pain is benign with very limited impact.

**Methods:** This descriptive study investigated the experience and impact of low back pain in the Raine Study cohort at 17 ( $n=1283$ ). Subjects were divided into four groups; low back pain in the (i) last month, (ii) recurrently, (iii) chronically or (iv) with widespread body pain. Impact was ascertained via questions regarding seeking professional assistance, using medication, missing school/work, limited normal or recreational physical activity plus general health and wellbeing via the SF-36.

**Results:** Of the 32.2% reporting low back pain in the last month, 33% had three or more specific impacts. For recurrent low back pain (24.1%), 42% reported three or more impacts. For chronic low back pain (5.7%), 70% reported three or more impacts. For widespread pain (7.7%), 38% reported three or more impacts. SF-36 scores were significantly less for all low back pain categories compared to pain free subjects.

**Conclusion:** Adolescent low back pain, particularly when chronic, has a significant negative impact. It is commonly associated with impairments across a number of different domains including care seeking, medication use, school absenteeism and functional capacity. Health related quality of life during adolescence is adversely affected by low back pain. These findings support that adolescent low back pain is an important public health issue that requires attention.

## 039

### Low back pain related comorbidity clusters at 17 vary in health related quality of life and specific impacts

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**Background:** Low back pain comorbidities in adults may result in increased levels and duration of physical disability, contribute to poorer outcomes and increased medical costs. In contrast little is known of the presence and/or impact of low back pain comorbidities in adolescents.

**Methods:** Subjects from the Raine Study at 17 years of age ( $n=1391$ ) provided self report of diagnosed medical conditions as well as data on health related quality of life (SF-36) and low back pain impacts (taking medication, missing school/work, interference with normal activities, interference with physical activities). Latent class analysis was used to define clusters of comorbidities based upon diagnosed conditions. SF-36 was compared between comorbidity clusters ( $n=1191$ ). Specific impacts were assessed in each cluster.

**Results:** Four distinct clusters were identified: (i) low probability of low back pain or any other medical condition (79.7%), (ii) high probability of being diagnosed with low back pain and neck pain but low probability of other health conditions (9.6%), (iii) moderate probability of low back pain and high probability of an anxiety/depression disorder (6.9%), and (iv) moderate probability of low back pain and high probability of a behavioural/attention disorder (3.8%). These clusters were variably associated with reduced health related quality of life and negative impacts.

**Conclusion:** These findings in adolescents support previous adult studies linking low back pain, psychological status and disability levels. These findings suggest the drivers of pain and health care behaviours relating to low back pain develop at an early age.

## 040

### Chronic low back pain is associated with reduced vertebral bone mineral measures in community-dwelling adults

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**Background:** Chronic low back pain (CLBP) experienced in middle-age may have important implications for vertebral bone health. This study investigated the associations between disabling CLBP and dual energy X-ray absorptiometry (DXA)-derived vertebral bone mineral measures among community-dwelling, middle-aged adults.

**Methods:** Twenty nine adults with CLBP (11 male, 18 female) and 42 adults with no history of LBP in the preceding year (17 male, 25 female) were evaluated. Self-reported demographic and clinical data were collected via questionnaires. Areal bone mineral density (aBMD) was measured in the lumbar spine and left hip by DXA. Apparent volumetric (ap.v) BMD in the lumbar spine was also calculated. Multiple linear regression models were used to examine associations between study group and vertebral DXA variables by gender, adjusting for height, mass and age.

**Results:** There was no difference between groups by gender in anthropometrics or clinical characteristics. In the CLBP group, the mean (SD) duration of CLBP was 13.3 (10.4) years in males and 11.6 (9.9) years in females, with Oswestry scores of 16.2 (8.7)% and 15.4 (9.1)%, respectively. L3 lateral-projection aBMD ( $p=0.03$ ) and ap.vBMD ( $p=0.04$ ) were significantly associated with CLBP in males. Males with CLBP had significantly lower adjusted aBMD and

ap.vBMD than controls at L3 with mean differences of 0.09g/cm<sup>2</sup> and 0.02g/cm<sup>3</sup>, accounting for 47% and 44% of the variability in these measures, respectively.

**Conclusion:** The findings show that CLBP in males is strongly associated with some lumbar vertebral BMD measures and raise important questions about the mechanism and clinical impact of this association.

## 041

### Preventing the second fracture. Results of a pilot project screening for osteoporosis in people attending fracture clinic

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Australian evidence shows that only 16% of people over 40 with a minimal trauma fracture are screened for osteoporosis, despite demonstrated reduction in second fractures of up to 50% with good management. A medical records audit at Canberra Hospital revealed only 21% of appropriate patients were tested or treated for osteoporosis. We aimed to examine the prevalence of osteoporosis in fracture clinic patients towards whether a screening program should be instituted permanently. We recruited 115 participants over 40, with minimal trauma fractures from clinic (96 females, mean age 59 years). Patients were excluded who had known osteoporosis, were already on management. We screened by fracture risk score, a bone density (BMD) scan, and tested Vitamin D, Calcium and endocrinology. Patients with positive results were referred to the endocrinology bone clinic for follow up. BMD results for 107 participants showed 19 had osteoporosis, 57 had osteopaenia, 32 had normal BMD, and 15 with normal BMD had low vitamin D. 75% of patients screened needed specialist follow up for osteoporosis. Risk of a major osteoporotic fracture in this group was 15% (SD9%; range 3 to 53%). Number needed to treat analysis showed screening 18 people could prevent one fracture. Osteoporosis is not reversible, so early identification is critical. Best practice of screening also makes economic sense.

## 042

### Patient-health provider communication on satisfaction with care: a systematic review

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**Objective:** The aim of this systematic review was to summarise which verbal and nonverbal behaviours in the patient-health provider communication process are associated with satisfaction with care in primary care and rehabilitation settings.

**Methods:** MEDLINE, PsycINFO, EMBASE, PEDro, CINAHL, AMED, LILACS and Cochrane were searched, using optimized search strategies. To investigate the best communication factors associated with satisfaction, those factors reported as having at least moderate correlation ( $r \geq 0.41$ ) were grouped as patients' and health providers' verbal or nonverbal factors and interaction style.

**Results:** 3,053 titles were retrieved, 33 studies were eligible and 26 verbal/nonverbal and style factors with at least moderate correlation were grouped. Health providers involving (e.g. partnership talking), facilitating (e.g. back-channel, language reciprocity and nonverbal index) and supporting patients (e.g. supportive talk, psychosocial problems talk and sympathy) are positively associated with satisfaction ( $r$  ranging from 0.41 to 0.80). Patients talking psychosocial problems ( $r=0.45$ ), friendly and calm tone of voice ( $r$  ranging 0.44 to 0.52) have positive association, whereas cues are negatively associated ( $r=-0.42$  for patients' successful interruptions and overlaps). Length of interview and time spent discussing prevention have positive association ( $r$  ranging from 0.53 to 0.76), whereas time spent reading patient's chart has negative correlation ( $r=-0.69$ ).

**Conclusions:** Verbal and nonverbal behaviours during patient-health provider communication inform patients' satisfaction with care and, as modifiable factors, may be changed to improve specific communication skills for better patients' satisfaction with care.

## 043

### Risk factors for low back pain among twins – a web-based population survey

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**Questions:** What causes low back pain? What is the contribution of genetics and lifestyle risk factors for the condition? Is a web-based population survey in low back pain using twins feasible?

**Design:** Cross sectional and prospective longitudinal observational study.

**Participants:** Twins registered in the Australian Twin Registry with access to email (491 pairs; 982 individuals) were approached by email. A link to an electronic questionnaire was sent to invitees.

**Outcome measures:** Information on low back pain status and lifestyle factors (alcohol consumption, smoking, body mass index, and physical activity) was collected.

**Results:** One hundred and fifty six complete pairs (312 individuals – 32% of invitees) and 124 incomplete pairs (124 individuals – 25% of invitees) responded the questionnaire. Sixty four twin pairs (138 individuals) were discordant for low back pain and were used for the analysis. Alcohol consumption, smoking and body mass index were not associated with low back pain (OR ranging from 1.0 to 3.5). Engagement in moderate physical activity such as walking and recreational sports was not associated with low back pain (OR = .57 95%CI: .16 to 1.5  $p=.37$ ), however twins with low back pain were more likely to be involved in vigorous activity such as gardening or heavy work in the yard (OR = 4.2 95%CI 1.6 to 11.1  $p=.004$ ).

**Conclusion:** A web-based survey using twins to assess potential factors associated with low back pain is feasible. Engagement in vigorous daily activities such as gardening or other heavy work might function as triggers for the condition.

## 044

### Do age and gender influence the atlanto-dental interval in the normal population? A quantitative anatomical study

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**Background:** Atlantoaxial instability (AAI) may modify the clinician's approach to treating a patient's upper cervical disorder. AAI is clinically assessed by measuring the distance between the anterior arch of the atlas and anterior surface of the dens. Estimates of atlanto-dental interval (ADI) associated with pathology have been suggested, however variables influencing measurement in the normal population have not been examined.

**Question:** This study investigated the association between age, gender and ADI. **Design:** Quantitative anatomical study.

**Participants:** 269 lateral cervical radiographs with no demonstrated bony injury, taken as part of routine patient screening at a tertiary hospital. All images were taken in sagittal plane neutral. Subjects ranged from 18–91 years. Images were stratified by age with equal gender representation in each stratum.

**Outcome Measures:** ADI was defined as the mean of three measures (superior, mid and inferior) taken within the pre-dental space. ADI was analysed by age-group and gender. Correlation between ADI and age was assessed.

**Results:** ADI decreased by age-group from a mean 2.07mm (18–30 years) to 0.87mm (71 years and over). Between age-group comparisons were statistically significantly different ( $p < 0.01$ ). Correlation of ADI with age was high (Spearman's  $\rho = -0.74$ ,  $p < 0.01$ ). No association was evident between ADI and gender.

**Conclusion:** ADI is directly influenced by age in normal adults. It is not dependent upon gender. Age may confound the interpretation of this measure in clinical assessment of AAI whereby measures considered normal in a younger person could suggest AAI in an older person. Age appropriate norms should be considered.

## 045

### Sleep disturbance in patients with low back pain

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**Background:** Recently some researchers have reported that LBP patients report sleep disturbance as a result of their LBP. However as most of this evidence was obtained from highly selected groups of patients or from studies with small samples. It is also unclear whether sleep disturbance is more likely to be reported by patients with recent onset LBP than by patients with persistent LBP. Finally it is not known whether high pain intensity, the most relevant condition-specific variable, is associated with higher rates reported sleep disturbance.

**Objectives:** we aimed to determine the prevalence of reported sleep disturbance in patients with LBP, also aimed to determine whether sleep disturbance was associated with the duration of back pain symptoms and whether pain intensity was associated with reported sleep disturbance.

**Methods:** Data from 1941 patients obtained from 13 studies conducted by the authors or their colleagues between 2001 to 2009 were used to determine the prevalence of sleep disturbance.

**Results:** The estimated prevalence of sleep disturbance was 58.7% (95%CI 56.4% to 60.7%). Sleep disturbance was found to be dependent on pain intensity where each increase by one point on a 10-point Visual Analogue Scale (VAS) was associated with a 10% increase in the likelihood of reporting sleep disturbance.

**Conclusion:** Our findings indicate that sleep disturbance is common in patients with LBP. We found the intensity of back pain was only weakly associated with sleep disturbance, suggesting that other factors contribute to sleep problems for LBP patients.

## 046

### Know what you don't know – case presentation of a rare condition Pompe's Disease

Charles P Gabel, University of the Sunshine Coast

**Question:** What action should a primary contact outpatient physiotherapist take when a never seen before condition presents.

**Design:** Patient case study.

**Participants:** One patient previously seen three years earlier.

**Intervention:** Nil.

**Outcome measures:** Subjective status, function and objective visual assessment of movement patterns.

**Results:** The patient reported low grade pain and reduction in functional capacity for daily living over the preceding 3–5 years. He had been seen previously by three physiotherapists and two GPs. Previous treatment was focused on core stabilisation, with or without biofeedback such as EMG and PBF, and manual therapy with electrotherapy adjuncts. Analgesics and NSAIDs had been prescribed. Movement patterns indicated a significant Trendelenberg, maintenance of standing posture by wide base of support, anterior tilt and Lumbar extension. The treating physiotherapist's diagnosis was a potential neurological condition, possibly muscular dystrophy. The patient was returned to his GP with a letter for a neurological specialist opinion.

**Conclusions:** The treating physiotherapist had no idea of a diagnosis, only that it was not something they'd seen previously or recognised. Eventual further investigation confirmed a diagnosis some months later of 'Pompes disease'. This condition affects 1-in-40,000 and is an accumulation of glycogen in muscles. It is progressive and fatal as heart and skeletal muscle are affected. It is treated with expensive medication. The case-study patient is currently medical receiving treatment in Florida. Knowing you don't know the diagnosis leads to requesting further opinions that lead to the potential of a correct diagnosis and management plan.

## 047

### Retrospective study of the effects of inpatient rehabilitation on improving and maintaining functional independence in people with friedreich ataxia

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Terry P Haines, Southern Physiotherapy Clinical School, Monash  
University, Frankston. Allied Health Research Unit, Southern  
Health, Cheltenham.

**Questions:** Does inpatient rehabilitation improve functional independence for people with Friedreich ataxia (FRDA)? Are improvements sustained following discharge from inpatient care?

**Design:** Retrospective observational cohort study.

**Participants:** Twenty-nine people with FRDA, (17 male, 12 female, mean age 34.77 years), representing 42 admissions to inpatient rehabilitation. All participants in the study were referred by a specialist multidisciplinary FRDA clinic. On admission, nine participants were ambulant and 33 participants were non-ambulant.

**Intervention:** Participants received inpatient rehabilitation and were prescribed goal-related therapy on an individual basis by the multi-disciplinary team. This consisted of a range of treatment approaches.

**Outcome measures:** The Functional Independence Measure (FIM) was utilised to determine the efficacy of inpatient rehabilitation. Pre and post intervention scores were compared against FIM ratings collected by the FRDA clinic over preceding and subsequent years.

**Results:** Consistent with the progressive nature of the condition, FIM scores, as measured on an annual basis pre-intervention, declined by a mean of 0.80 points over time. However, FIM scores increased by a mean of 8.47 points during periods of inpatient rehabilitation and continued to increase by a mean of 5.20 points during the period immediately following rehabilitation. Results demonstrate these increases during and immediately following inpatient rehabilitation were significant ( $p < 0.001$ ).

**Conclusion:** This study provides the first evidence that a period of inpatient rehabilitation improves or halts the downward decline in function for people with FRDA. The benefits continued during the period immediately following inpatient rehabilitation, indicating these gains are more than just short-term achievements.

## 048

### People with Huntington's Disease are perceived by staff as more "frightening" than other neurological patients: a mixed methods study

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Susan Mathers, Calvary Health Care Bethlehem  
Fran Williamson

**Questions:** Is there a difference in the attitudes of staff towards patients of different diagnostic groups in an inpatient progressive neurology unit? Can specific behaviours be identified which may account for these differences?

**Design:** Staff were surveyed about their attitudes to three distinct progressive neurological patients groups (Huntington's Disease, Motor Neurone Disease and Multiple Sclerosis) using a five-point Likert scale. Focus groups involving nursing and allied health staff were conducted. A second survey was performed to validate the opinions expressed by staff in the focus groups

**Participants:** Thirty seven staff completed the first survey and 31 completed the second survey. Ten staff participated in three focus groups.

**Outcome measures:** Survey responses were analysed according to diagnostic group to permit group comparisons. Recorded verbal data from the focus groups were transcribed and analysed for themes.

**Results:** Staff identified feeling significantly more frightened by Huntington's Disease patients ( $p < 0.001$ ), finding them more aggressive ( $p < 0.001$ ) and more unpredictable ( $p < 0.001$ ) than patients with Multiple Sclerosis or Motor Neurone Disease. Compared to other patient groups, staff also identified that they were more fearful of Huntington's Disease patients falling ( $p < 0.001$ ) and found their facial expressions more difficult to read ( $p < 0.001$ ).

**Conclusion:** Staff clearly identified behavioural patterns in the Huntington's Disease patients which contributed to difficulties in managing these patients. This information is relevant to staff education and the development of appropriate management strategies in all settings which care for people with Huntington's Disease.

## 049

### Unlocking 'locked in syndrome'

Kim M Carmichael, Royal Brisbane & Women's Hospital

**Question:** Can intensive Physiotherapeutic input make a difference to a patient diagnosed with 'locked in syndrome'?

**Design:** Evaluation of physiotherapeutic clinical input over a period of several months with a single client presenting with bilateral ischemic Pontine strokes.

**Participant:** A 37 year old male diagnosed with 'locked in syndrome' given an extremely poor prognosis based on radiological evidence & initial ability to only communicate through eye movements.

**Intervention:** Persistent & novel Physiotherapeutic input, with the use of videotaping, photography & clinical documentation of physiotherapeutic input track the patients' functional physical gains & demonstrate the effectiveness of the creative, pragmatic, cooperative therapeutic clinical decision making process.

**Outcome Measures:** Basic Physiotherapeutic measures such as the assessment of muscle power, basic functional gains (sitting balance, head control, rolling ability) and endurance are used to track the progress of this patient over a period of several months.

**Results:** Despite an anticipated poor prognosis, physiotherapy intervention resulted in motor recovery in a highly motivated patient. Head control, sitting balance & the opportunity to use an Environmental Control Unit have all contributed to the patients' ability to interact within his environment in a meaningful way.

**Conclusion:** "Unlocking" 'locked in syndrome' is a rewarding therapeutic challenge & a rare privilege. There is very little documentation in the literature to guide the Therapist in the choice of Physiotherapy intervention for facilitating motor recovery and the subsequent functional gains possible. This case study demonstrates that when effective intuitive clinical reasoning prevails over dogma, extraordinary outcomes can occur.

## 050

### Adult spasticity management in Australia

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Barby Singer, The University of Western Australia  
Steve DeGraff, Epworth Hospital, Melbourne  
John Olver, Epworth Hospital, Melbourne

**Question:** What is the current status of service delivery of spasticity management within Australia?

**Design:** Survey of Physiotherapists and Occupational Therapists.

**Participants:** 123 (81 physiotherapists) members of the Neurological Special Interest Groups of the Australian Physiotherapy Association and Occupational Therapy Australia.

**Intervention:** Members were invited to login to a web-based survey and respond to a series of questions related to spasticity management.

**Outcome Measures:** Likert-type and free text response categories were mapped to the international consensus guidelines on spasticity management published in 2010.

**Results:** Respondents represented all states and territories, public and private service providers and acute to community based settings. The majority (62%) had greater than 10 years experience and reported they were confident in the assessment and management of spasticity. Around 53% were not familiar with the Pharmaceutical Benefits Scheme (PBS) indications for Botulinum toxin injection. Most patients (85%) waited less than 3 months for Botulinum toxin injection. With the exception of use of electrical stimulation, Australian therapeutic practice followed or exceeded the consensus guidelines. Cost of botulinum toxin treatment and referral options were the main barriers to this aspect of spasticity management. Access to, and costs of post injection therapy were identified as additional barriers.

**Conclusion:** Australian physiotherapists and occupational therapists report their clinical practice to meet international guidelines in almost all areas, yet identified several barriers to more effective service delivery.



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## 051

### Do rhythmic auditory cues improve walking in patients with neurological conditions other than Parkinson's disease? – a systematic review

Joanne E Wittwer, Musculoskeletal Research Centre and School of Physiotherapy, La Trobe University

Kate E Webster, Musculoskeletal Research Centre, La Trobe University  
Keith Hill

**Question:** Does synchronising walking to rhythmic auditory cues improve temporal and spatial gait measures in adults with neurological clinical conditions other than Parkinson's disease? **Design:** Systematic review with data from randomised and non-controlled studies synthesised in a best-evidence analysis. **Participants:** Adults with gait disorders of neurological origin, excluding Parkinson's disease. **Intervention:** Main component is intentional synchronisation of overground walking to externally generated rhythmic auditory cues (rhythmic music or metronome) with specified cue tempo and dosage, applied to improve gait performance. **Outcome measures:** Temporal and/or spatial gait measures, (ie cadence, stride length, velocity, symmetry, double support proportion of gait cycle) including variability measures. **Results:** Fourteen studies were identified, four of which were randomised controlled trials. Patient groups included those with stroke (six studies), Huntington's disease (two studies), spinal cord injury (two studies), traumatic brain injury (one study), dementia (one study), Multiple Sclerosis (one study) and normal pressure hydrocephalus (one study). The best-evidence synthesis found moderate evidence of improvement in walking speed and stride length of people with stroke following gait training with rhythmic music. Insufficient evidence of effectiveness of auditory cueing was found for other included neurological disorders due to the small number of studies and the poor methodological quality of some studies. **Conclusion:** Synchronising walking to rhythmic auditory cues can result in short term improvement in gait measures of people with stroke. These findings taken together with the feasibility of the approach suggest it should be considered when devising gait training programs after stroke.

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## 052

### Guillain-Barré syndrome: current physiotherapy practice and the patient's hospital experience

Rachel Mullins, Sir Charles Gairdner Hospital, Perth

Diane Dennis, Sir Charles Gairdner Hospital, Perth

**Question:** How are physiotherapists managing Guillain-Barré patients, and is it possible to assess our impact from the patient's point of view?

**Design:** Two part observational study involving a retrospective case-note audit and telephone survey.

**Participants:** All patients admitted to Sir Charles Gairdner Hospital with Guillain-Barré Syndrome between May 1st, 2005 and April 30th, 2010. Those who remained inpatients at the time of the study were excluded.

**Outcome measures:** Data on length and location of hospital stay, extent of illness, nature and timing of interventions and rehabilitation milestones were collected. A 45 question patient survey was developed to provide data on patients' satisfaction with inpatient physiotherapy.

**Results:** Median length of hospital stay was 18 days (SD 43.0) for 19 participants. Intensive care management utilising mechanical ventilation/tracheostomy was required in 21% of cases. Physiotherapy reviewed patients within 2 days from admission (SD 1.1) and on average documented improvements within 5 days (SD 2.8). Physiotherapists were most commonly first to mobilise patients to sit, stand, transfer and walk (79%, 79%, 78% and 89% respectively). The majority (79%) of participants could differentiate between health professionals and physiotherapists were remembered most frequently (85%) compared with medical, nursing, occupational therapy and speech pathology (80%, 80%, 48%, 53% respectively). Participants receiving physiotherapy (n=16) reported they were happy with management (87%), treatment frequency (88%), duration (94%) and timetabling (81%). They were unanimously happy with physiotherapists' professionalism and rapport.

**Conclusion:** Inpatients with Guillain-Barré Syndrome perceive that physiotherapists contribute significantly to their care and this is reflected in case-notes.

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## 053

### Aerobic exercise to improve cognitive function in adults with neurological disorders: A systematic review

Michelle N McDonnell, Sansom Institute for Health Research, University of South Australia

Ashleigh E Smith, Robinson Institute, The University of Adelaide

Shylie F Mackintosh, Sansom Institute for Health Research, University of South Australia

**Question:** Does aerobic exercise improve cognition in adults with neurological disorders?

**Design:** A systematic review of controlled clinical trials and randomised controlled trials.

**Participants:** Adults diagnosed with a neurological disorder such as stroke, multiple sclerosis, traumatic brain injury and Parkinson's disease.

**Intervention:** Studies were included if they compared a control group with a group involved in an aerobic exercise program to improve cardiorespiratory fitness.

**Outcome measures:** Any neuropsychologic tests designed to detect a change in cognitive function in any domain, for example memory, learning, executive function or the Mini-Mental State Examination.

**Results:** From the 67 trials reviewed, a total of 7 trials, involving 249 participants, were included. Lack of commonality between measures of cognition limited meta-analyses. Results from individual studies show that aerobic exercise improved cognition in people with dementia, improved attention and cognitive flexibility in patients with traumatic brain injury, improved choice reaction time in people with multiple sclerosis and enhanced motor learning in people with chronic stroke.

**Conclusion:** There is limited evidence to support the use of aerobic exercise to improve cognition in adults with neurological disorders. From the 67 studies retrieved less than half of these trials included cognition as an outcome and few studies continued the aerobic exercise programme long enough to be considered effective. Further studies investigating the effect of aerobic exercise interventions on cognition in people with neurological conditions are required.

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## 054

### How does cognitive impairment impact mobility after Acquired Brain Injury?

Simon J Mills, South Australian Brain Injury Rehabilitation Services

**Question:** What is the impact of cognitive impairment on performance, and training, of mobility after Acquired Brain Injury (ABI)?

**Design:** Literature review and application of current evidence.

**Results:** There is a paucity of evidence to demonstrate the impact of cognition on mobility skills or training after ABI. However, there is evidence describing approaches for training of other skills in the presence of cognitive impairment after ABI. Also, the literature describes many factors that influence learning after ABI, which can be applied to mobility training. Impaired self-awareness is a hallmark of ABI, which can limit identifying, correcting and compensating for difficulties during everyday activities. Applying principles for building awareness to mobility training could help effectiveness. Feedback has been shown to enhance learning of motor skills in some populations after ABI; however, in people with cognitive impairment, feedback has been shown to impair implicit learning. For physiotherapy, this may indicate that selecting when and how to provide feedback could influence learning. Consistent repetition of phrasing to describe a routine (a script) has been shown to enhance skill development after ABI, and can readily be applied to learning routines of mobility skills. Transfer of learning allows skills to be generalised to a new situation, and is often impaired after ABI. Enhancing skill transfer is highly relevant to mobility skills that are learned in a therapy setting, and strategies can be applied to support skill transfer.

**Conclusion:** Physiotherapists can use principles of cognitive training to enhance learning during mobility training after ABI.

## 055

### The Effect of Exercise on Mood Disturbance in Chronic Stroke

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**Question:** Does group exercise have a beneficial effect on mood in people with chronic stroke?

**Design:** This pilot study utilized a pretest-posttest quasi experimental design.

**Participants:** 27 community dwelling people with residual deficits from chronic stroke.

**Intervention:** Participants attended a 10 week small group exercise program. Exercises were performed once a week using a mixed training intervention model which focused on improving fitness, strength, mobility and balance. The program was conducted in a gymnasium and utilized the available exercise equipment when appropriate.

**Outcome measures:** Pre and post-intervention assessments of both physical function and mood status were conducted. This included the Six-minute Walk Test (6MWT), Timed-Up-and-Go Test (TUG), Step Test, Barthel Index, the Modified Rankin Scale (mRS), the Assessment of Quality of Life Scale (AQoL), the Hospital Anxiety and Depression Scale (HADS) and the Kessler-10 Scale (K-10).

**Results:** The results showed no statistically significant change between the median pre and post-intervention ratings of mood disorders on both the HADS and K-10. Significant improvements were made in the TUG ( $p=0.01$ ) and 6MWT ( $p<0.01$ ) post intervention.

**Conclusion:** At present group exercise cannot be endorsed as the primary intervention in the management of post-stroke mood disorders in chronic stroke survivors.

## 056

### Dual vs. single task training when walking in people with Parkinson Disease

Sandra G Brauer, The University of Queensland

Robyn M Lamont, The University of Queensland

Marjorie H Woollacott, The University of Oregon, United States

Meg E Morris, The University of Melbourne

**Question:** Can a program of dual task walking training in people with Parkinson Disease (PD) improve their ability to walk with added tasks more than single task walking training?

**Design:** Randomised trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** 49 people with PD who report reduced step length or difficulty walking. **Intervention:** Both groups completed 12 hrs over 4 weeks of one-on-one, progressive training that included tasks such as walking, turning and obstacle negotiation, with external and internal strategies to improve step length provided as needed. The dual task training group performed these gait tasks whilst also undertaking progressively difficult added tasks.

**Outcome measures:** The primary outcome was step length when dual tasking over 8m. Secondary outcomes included gait speed when dual tasking and step length and speed when single tasking over 8m. Measures were taken before and after training and six months later.

**Results:** After 4-weeks training, the dual task group showed greater improvements ( $p = 0.047$ ) pre to post training in step length (8.75cm vs. 5.5cm) and speed (improved by 22m/s vs. 10m/s) than the single task training group when walking with an added language task. Both dual and single task training groups improved their gait speed and step length when performing single tasks.

**Conclusion:** A one-on-one, individualised training program of dual task walking training improved gait speed and step length under certain dual task conditions more so than single task training in people with PD.

**Trial registration:** ACTRN12609000791235.

## 057

### Can aerobic exercise improve cognition following stroke?

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Ashleigh E Smith, Robinson Institute, The University of Adelaide

Adrian J Esterman, Sansom Institute for Health Research, University of South Australia

**Question:** Cognitive dysfunction affects the majority of people following stroke and significantly affects their rehabilitation outcomes, quality of life and ability to live independently. Aerobic exercise can improve cognition in healthy older adults but can it improve cognition in people following stroke?

**Design:** Cross-sectional study.

**Participants:** Seventeen adults with a mean age of 70 who had suffered a stroke an average of 9 years ago and were undertaking regular aerobic exercise participated in the study. Thirteen healthy older adults also took part in the study, mean age 69 years.

**Intervention:** All participants were exercising at the Centre for Physical Activity in Ageing at Hampstead Rehabilitation Centre at least once a week. **Outcome measures:** Tests of executive function (Trail Making Test B), memory (Free and Cued Selective Reminding Test), working memory (Paced Auditory Serial Addition Test) and information processing speed (Inspection Time) at two time points, 3–6 months apart.

**Results:** There was a significant improvement in memory and speed of information processing over this period in those who had suffered a stroke ( $p < 0.05$ ), which was not observed in the group of healthy older adults.

**Conclusion:** This uncontrolled study requires validation with a larger sample of people following stroke and with a control group, but this pilot study provides some evidence to support aerobic exercise to improve cognition in long-term stroke survivors.

## 058

### Therapist-directed exercise programs provided by family members for adult inpatients following an acquired brain injury: a feasibility study

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Margaret Killington, Brain Injury Rehabilitation Services, Hampstead Rehabilitation Centre

**Question:** Is it feasible to carry out additional family supervised exercise for adults with acquired brain injury in an inpatient setting?

**Design:** Mixed method study, a series of single case A-B-A designs (one-week baseline, a four-week intervention, and a one-week follow-up period) to examine the physical outcomes of clients with acquired brain injury as well as focus groups and interviews to explore stakeholders' views.

**Participants:** The participants included three clients with acquired brain injury and their family members as well as staff from an inpatient Brain Injury Rehabilitation Unit.

**Intervention:** A 30 minute, tailored, family supervised exercise programme carried out at least three times per week for four weeks. Two training sessions were provided to the client and their family members by the treating Physiotherapist.

**Outcome measures:** The Goal Attainment Scale (GAS), the Clinical Outcomes Variable Scale (COVS), and exercise adherence was monitored using exercise diaries.

**Results:** Using the two-standard-deviation band method to analyse the single cases study data all three clients' demonstrated significant improvement in the COVS, improvement with their GAS, and 100% or more adherence to their prescribed exercise programme. No adverse events were reported. From the interviews and focus groups, analysed thematically, all stakeholders indicated positive responses to the programme.

**Conclusion:** This pilot study showed that a family supervised exercise programme is feasible for clients with acquired brain injury who have family members willing to supervise exercise sessions.

## 059

### Use of audit, feedback and coaching to improve implementation of best-practice stroke guidelines by physiotherapists at Bankstown-Lidcombe Hospital stroke unit

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Angela Vratisstas, Bankstown-Lidcombe Hospital, NSW

Karl Schurr, Bankstown-Lidcombe Hospital, NSW

Annie McCluskey, The University of Sydney, NSW

**Questions:** What proportion of patients with stroke admitted to the stroke unit at Bankstown-Lidcombe Hospital are receiving best practice 1) sitting balance training and 2) treadmill training with body weight support? Can audit, feedback and 'coaching' increase the proportion of patients with stroke receiving best practice 1) sitting balance training and 2) treadmill training with body weight support?

**Design:** Uncontrolled before-and-after study.

**Participants:** A retrospective consecutive sample of 15 patients with stroke admitted to the Bankstown-Lidcombe Hospital stroke unit were selected for each audit. **Intervention:** Three medical record audits (n=15 files per audit) were conducted between 2009 and 2011. After the first audit formal feedback was provided, a focus group interview was conducted to identify barriers and enablers to best practice stroke evidence implementation, and several coaching sessions were carried out, with the stroke unit physiotherapists.

**Outcome measures:** The proportion of patients with stroke receiving best practice 1) sitting balance training and 2) treadmill training with body weight support based on 3 medical record audits; December 2009, November 2010, and May 2011.

**Results:** Between audits 1 and 2, the proportion of patients with stroke receiving best practice sitting balance training increased from 25% to 100% and for treadmill training with body weight support, did not change (18% to 17%).

**Conclusion:** Audit, feedback and coaching improved the proportion of patients with stroke receiving best practice sitting balance training but not the proportion receiving best practice treadmill training with body weight support. Results from the third audit will be available by October 2011.

**Conclusion:** Physiotherapists systematically overestimated total therapy time and active time but underestimated the total inactive time when compared with the video-recordings. The accuracy was found to be lower in CCT sessions.

## 061

### What do patients and staff members in inpatient stroke rehabilitation think about early supported discharge services?

Jacey Kraut

Barby Singer, University of Wetsren Australia

**Purpose:** To identify the attitudes and perceptions of people with stroke and staff in a stroke rehabilitation setting towards early supported discharge (ESD) and home based rehabilitation services.

**Design:** A qualitative research design utilising a standardised interview process. Responses were analysed using NVivo9.

**Participants:** Nine patients admitted following a stroke who were receiving multi-disciplinary care either on the acute stroke unit (five interviewees) or in a rehabilitation ward (four interviewees) were surveyed. A staff member who was directly involved in their care was interviewed separately (four allied health professionals and five nursing staff).

**Results:** All interviewees associated a greater number of positives than negatives with the idea of leaving hospital sooner and receiving rehabilitation in the home. They verbalised an awareness of some of the potential difficulties, but felt that these could be managed with appropriate supports in place. Patient responses particularly focused on the advantages of being in their own home and resuming 'normal' life, while staff responses described the contextual benefits for rehabilitation. Patients specifically described benefits related to ESD such as 'freeing up a bed', while staff did not consider this to be an advantage to the same extent. The majority of patients felt it was extremely likely they would leave hospital sooner to have rehabilitation in the home, while staff perceptions of likelihood depended on the patient's level of mobility.

**Conclusion:** Patients and staff in stroke rehabilitation expressed support for ESD and home based rehabilitation services but reasons for their views varied.

## 060

### Ummm, about an hour? How accurate are physiotherapists at estimating therapy time in stroke rehabilitation?

Gurpreet Kaur, University of South Australia

Coralie English, University of South Australia

Susan Hillier, University of South Australia

**Question:** How accurate are physiotherapists at estimating the total duration of therapy sessions for stroke patients, and the time that patients spend engaged in physical activity versus the time spent inactive? Are therapists more or less accurate in estimating therapy time for circuit class therapy (CCT) sessions compared to individual therapy (IT) sessions?

**Design:** Cross sectional, comparative, observational study.

**Participants:** Eight physiotherapists, two physiotherapy aides and 14 stroke patients.

**Outcome measures:** Therapists' estimations of therapy time compared to time measured from video recordings of the same therapy sessions.

**Results:** Intraclass correlation coefficient (ICC) scores comparing video-recorded and therapist-estimated data for total therapy time, active time and inactive time for all sessions (IT and CCT) were 0.95 (95% CI 0.91 to 0.97), 0.91 (95% CI 0.84 to 0.95) and 0.76 (95% CI 0.58 to 0.87) respectively. The mean (standard deviation [SD]) difference between therapist-estimated and video-recorded total therapy time, active time and inactive time for all sessions was 7.7 (10.5), 14.1 (10.3) minutes and -6.9 (9.5) minutes respectively. Bland-Altman analyses revealed a systematic bias of overestimation of total therapy time and total active time, and underestimation of inactive time by therapists. Therapists were less accurate in estimating therapy time in CCT sessions (mean [SD] difference 8.8(9.8)) compared to IT sessions (mean [SD] difference 6.2 (11.7)).

## 062

### The effect of community-based rehabilitation interventions on depression, participation and quality of life post-stroke?

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The University of Melbourne

Kim Brock, St Vincent's Hospital Melbourne

Keith Hill

Lynette Joubert, The University of Melbourne

**Question:** Are rehabilitation and/or care co-ordination interventions delivered in the community setting effective in reducing depression, facilitating participation, and improving health-related quality of life (HRQoL) after stroke?

**Design:** Systematic review (via four electronic databases) of randomised controlled trials. Best evidence synthesis and meta-analysis were utilised to determine the level of evidence.

**Intervention:** Interventions that were predominantly conducted by allied health or nursing professionals were selected. Categorisation of the studies was based on the type of community-based interventions that were conducted in the trials.

**Outcome measures:** Studies that incorporated validated measures of depressed mood, participation status, and HRQoL were reviewed.

**Results:** Fifty-four studies matched the inclusion criteria. The rehabilitation interventions were divided into nine broad categories. Community-based interventions targeting participation and leisure domains showed moderate evidence for improvement in global participation measures and HRQoL. Comprehensive rehabilitation demonstrated limited evidence for depression and participation, and strong evidence for HRQoL. Meta-analysis demonstrated significant reduction in depression with exercise interventions (n = 137; effect estimate SMD: -2.03, 95% CI: -3.22 to -0.85).

**Conclusion:** There is limited to moderate evidence supporting some rehabilitation interventions in affecting the outcomes of depression, participation and HRQoL post-stroke. Heterogeneity of the studies made evidence synthesis difficult. Further consideration needs to be given to the type and timing of outcome measures selected to represent the domains of participation and HRQoL. The increased use of measures of mood, participation and HRQoL may provide a more holistic picture of how stroke affects factors that are intrinsically important to the individual.

## 063

### Interactive web-based solutions for managing injury prediction and monitoring recovery

Charles P Gabel, University of the Sunshine Coast

**Question:** What is the available interactive web-based technology and how does it facilitates accurate outcome prediction within an evidence based context.

**Design:** Review of web-based programs with interactive capacity and status output synthesised in a narrative format.

**Participants:** Nil.

**Background:** Early identification of high risk, long term musculoskeletal patients is currently performed by physical examination and/or bio-psycho-social questionnaires. These dichotomise patients into high and low risk categories. New generation research produces accurate individual patient predictions through melding mobile interactive technology, integrated patient-reported outcome measures and screening within the bio-psycho-social health model.

**Methods:** A review of available web-ready, interactive software indicated >25 programs. However, few had 'time-based' prediction models with date specificity and integrated 'decision support systems'. These systems determine current and future status through integration of research concepts that incorporate screening with outcome measurement. They reflect on statistically analysed test-case data through correlation coefficients, regression analysis, and mathematical modelling.

**Results:** Only four systems provided interactive outcomes in a graphical chart based format. Only one, Adviserehab, provided prediction and outcome measurement with forecasted changes in status and the rates at which it does and will occur. This was both retrospective and predictive, with immediate output that was easy to use and able to be communicated instantly between all stake holders.

**Conclusions:** Future use of prediction and measurement methods must summarise data as clinical pathway indicators with meaning to the health professions and insurers. Decision support systems within an interactive web-based format are a critical future method of providing this information.

## 064

### Making manual handling easier: Differences in perceived effort and success rate between three push strategies

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Paul W Hodges, The University of Queensland, CCRE in Spinal Pain, Injury and Health, School of Health & Rehabilitation Sciences

**Question:** For lateral transfers of patients, are there better alternatives than current clinical training of a squat push strategy (straight spine with bent-knees)?

**Design:** Randomised cross-over trial to compare spontaneous push and two trained push strategies for patient lateral transfers.

**Methods:** Thirteen participants practiced lateral transfers of a patient on a slide sheet, then simulated the task with load applied to a mobile rig. Participants were blind to changes in load for each trial. Perceived exertion (visual analogue scale), success rates (to achieve a target distance) and kinematics (Vicon motion analysis system) were measured in participant's spontaneous push, squat push and a rockback push strategy (shoulders over ankles, with rearwards then forwards movement of the pelvis). Repeated measures analysis of variance and Duncan's multiple range test were used to compare perceived effort between push strategies and loads.

**Results:** Perceived effort was lower in the spontaneous and rockback strategies than the squat strategy (both:  $p < 0.0002$ ). Success rates pushing > 140 N showed that 12/13 participants succeeded on all trials with their spontaneous strategy and the rockback strategy, compared with 2/13 for the squat strategy. The spontaneous and rockback strategies were characterized by forward movement of the pelvis during the push phase, and forward inclination of the torso relative to the squat push.

**Conclusion:** The results suggest clinical benefits of the spontaneous and rockback strategies for lateral patient transfers in nursing and rehabilitation, with potential impact for other manual handling tasks that involve pushing.

## 065

### Pre-employment functional assessments predict musculoskeletal injury risk associated with manual handling in coal miners

Jennifer B Legge, The University of Queensland

Robin Burgess-Limerick, The University of Queensland

**Question:** Are pre-employment functional assessments predictive of musculoskeletal injury risk?

**Design:** Prospective cohort study.

**Participants:** Six hundred healthy males who had participated in a job-specific pre-employment functional assessment at a coal mine and were employed in the role for which they were tested.

**Outcome measures:** A pre-employment functional assessment (PEFA) score was assigned to each worker based on the worker's performance in the job-specific assessment. Workers who met the assessment criteria scored PEFA 1. Workers who did not meet the assessment criteria were scored PEFA >1. Injury statistics including nature of injury, body part, severity and mechanism of injury were collected annually for seven years.

**Results:** Four hundred and twenty-seven workers (71.2%) scored PEFA 1. A total of 121 workers (20.2%) from both groups reported an injury and 29 workers (4.8%) reported a back injury associated with manual handling. Relative to workers in the PEFA 1 group, the unadjusted odds of sustaining a musculoskeletal injury for workers in the PEFA >1 group is increased for any injury (OR 2.03, 95% CI 1.34 to 3.08), any manual handling injury (OR 2.50, 95% CI 1.40 to 4.45) and any back injury from manual handling (OR 3.24, 95% CI 1.52 to 6.90).

**Conclusion:** This is the first study to investigate the validity of pre-employment functional testing in healthy coal miners. The results demonstrate that the risk of musculoskeletal injury, particularly back injury associated with manual handling, is higher for workers who do not demonstrate the capacity to meet the inherent requirements of their job.

## 066

### A comparison of three document holders in terms of neck movement and cervical muscle activity

Sonya B Goostrey

Venerina Johnston, Division of Physiotherapy University of Qld

**Question:** How does the Microdesk (combined document holder and writing desk) compare against two commonly used document holders in terms of neck movement and muscle activity?

**Design:** Randomised, within-participant experimental study.

**Participants:** Twenty asymptomatic participants volunteered for this study (M age= 23 years; range 19–32years).

**Intervention:** Range of movement and activity of cervical musculature were recorded during three, five minute typing tasks where the document was placed on (1) a Microdesk; (2) a lateral holder attached to the computer monitor; and (3) the desktop. Active range of neck movement was measured with a 3D electromagnetic, motion-tracking device. Surface electromyographic activity was recorded bilaterally from the cervical extensor and upper trapezius muscles. **Outcome measures:** Myoelectric data was analysed using the 50th percentile of the Amplitude Probability Distribution Function. Repeated measures ANOVA was used to determine the difference in neck movement and muscle activity with each document holder.

**Results:** Typing from documents placed on the Microdesk required significantly more neck flexion than the lateral document holder ( $p=0.000$ ). The desktop holder required the most neck movement in all directions ( $p=0.000$ ). The lateral document holder produced the least amount of muscle activity while placing documents on the desktop produced the greatest level of activity in all muscle groups.

**Conclusion:** The Microdesk is a good compromise between the laterally placed document holder and the desktop as it has more than one purpose. Choice of document holder should be driven by user preference and specific needs.

## 067

### Finding the larger patient – the use of Units of Care to identify and track bariatric patients within an acute metropolitan hospital

Helen L Galindo, SA Health

**Design:** Descriptive cross sectional survey of patients admitted to wards of an acute metropolitan hospital.

**Outcome measures:** 3 bariatric units of care were added to the nursing care codes for patients weighing 120kg-149kg, 150kg-179kg and >180kg which nursing staff activated for relevant patients. Bariatric patients were matched by age, sex and Diagnosis Related Group to determine effect on average length of stay. Staff injury records were analysed to determine effect of patient weight on likelihood of injury.

**Results:** A time series data set was generated of the number of bariatric patient admissions and the locations. Patients weighing >120kg account for 0.3% of total admissions. Bariatric patients matched by age, sex and Diagnosis Related Group have average length of stay of 7 days compared to 4. The average number of wards transfers is 2 not counting emergency department or intensive care. The relative risk of injury to staff caring for bariatric patients is 19:1.

**Conclusion:** A simple addition to nursing care codes has increased understanding of bariatric patient journeys and is informing decision making about how best to plan for these patients care within the facility.

## 068

### Context matters: Manual handling training

Rose Boucaut, University of South Australia

Gisela Van Kessel, University of South Australia

“Establishing the context” is an important part of the risk management process (Risk management – Principles and guidelines AS/NZS ISO 31000:2009). This short presentation aims to stimulate the audience to investigate the factors, both external to and within an organisation, which may influence their delivery of manual handling training. The authors plan to draw the audience’s attention to matters beyond training session content per se, based on the premise that there are relevant organisational factors which influence effectiveness. The presentation will outline a framework to use as an analytical tool to inform session planning.

## 069

### Side differences during neurodynamic testing. How different is normal?

Kerry J Staples, Australian Institute of Sport

Stine V Høiby, Norway

Tord MP Moen, Norway

Scott A Murphy, Ireland

Inga MG Erke, Norway

Michel W Coppieters

**Question:** To determine the magnitude of normal side differences for the median nerve neurodynamic test (ULNT1MEDIAN). Several researchers consider a larger than 10 degree deficit sufficient for the ULNT1MEDIAN to be positive, irrespective of whether symptoms are reproduced and irrespective of the effect of structural differentiation.

**Design:** Cross sectional study.

**Participants:** 41 asymptomatic participants between the ages of 18 and 65.

**Interventions:** The ULNT1MEDIAN was performed bilaterally for all participants.

**Outcome Measures:** Elbow extension range of motion (ROM) was measured at the occurrence of first resistance, onset of pain, and endpoint of the ULNT1MEDIAN. Distribution, intensity and quality of sensory responses were also compared between sides.

**Results:** Side differences for first resistance and onset of pain were not significant. Endpoint of the ULNT1MEDIAN occurred significantly later on the dominant side (2.9 +/-8.2 degrees), but this difference is probably not clinically relevant. Although the mean absolute side difference was small (6.9 +/-5.2 degrees), 20% of participants had differences larger than 10 degrees. Distribution of sensory responses was identical or largely comparable in 68% of participants. Pain quality and intensity were not significantly different between sides.

**Conclusion:** The ULNT1MEDIAN is largely comparable between sides for the majority of asymptomatic people. However, observed differences in 20% of healthy participants question the validity of a range of motion criterion. Reproduction of symptoms, which can be altered with structural differentiation, is a more plausible criterion for neurodynamic tests to be positive.

## 070

### Development of a specific evidence-based injury prevention exercise program for professional orchestral musicians

Cliffton Chan, Discipline of Biomedical Sciences, Faculty of Medicine, University of Sydney

Tim Driscoll, Sydney School of Public Health, Faculty of Medicine, University of Sydney

Bronwen Ackermann, Discipline of Biomedical Sciences, Faculty of Medicine, University of Sydney

**Questions:** What evidence and clinical practice protocols exist to formulate an exercise program targeted towards commonly occurring musculoskeletal problems in professional orchestral musicians?

**Design:** A literature review on exercise therapy of the deep neck, scapular and abdominal regions, lower back and hips was performed. Current best practice included national training programs, expert opinion from academic and clinical physiotherapists experienced in exercise therapy, and commonly taught preventative and rehabilitation exercises from two established undergraduate physiotherapy curriculums in Australia. The exercise program was based on core stability and motor control principles and addressed five commonly reported musculoskeletal problems in musicians. Progressions were used to evaluate each participants' progress. The five series of exercises were reviewed by a group of physiotherapists recognized to be experts in exercise prescription and not involved in the initial development. The exercises were presented to the reviewers in random order and they were asked to rank the progressions and provide feedback. Reviewers were blinded to each other's responses.

**Participants:** Four physiotherapists, each with over 20 years of experience, reviewed the professional musician exercise program.

**Results:** Three out of the four physiotherapists agreed on the exercise series and the progressions. Where there were discrepancies, adjustments to the program were made based on the feedback received. A revised progression of these exercises was then re-evaluated by the reviewers.

**Conclusion:** Using available evidence on exercise prescription in collaboration with clinical consensus and current best practice, a specific exercise program was developed for implementation and subsequent evaluation with professional orchestral musicians.

## 071

### Injury patterns and injury rates amongst students at the National Institute of Circus Arts (NICA)

David D Munro, Absolute Physiotherapy/Swinburne University, Melbourne

Penny Dayan, Absolute Physiotherapy/Swinburne University, Melbourne

**Introduction:** NICA commenced in 2001 and offers a three year full-time Bachelor Degree comprising 63 students who maybe classified as elite athletes. In addition, an estimated 400+ other part-time students, children and adults undertake various short courses each year. Very little is known about specific circus related injuries. Much of our present knowledge has been largely anecdotal and based on other disciplines, such as gymnastics and dance.

**Aim:** To clearly identify and describe the injury pattern, rate and incidence incurred by students at NICA. **Methods:** Data was gathered on the mechanism of injury, apparatus involved, type of injury, body area affected, treatment sessions required and gender.

**Results:** 47% of all new injuries involved females and 53% males. Ankle injuries accounted for 32% of all new injuries, spinal injuries 19%, shoulder 17% and knee 15%. However, in terms of total treatments, ankles accounted for 17% of sessions, and spinal injuries 44%. Females accounted for 75% of all hip injuries, and males 73% of all forearm injuries and 59% of all ankle injuries. The main apparatus/acts involved during injury were: acrobatics/tumbling 38%, Chinese poles 15%, warm-up 10% and handstands/adagio 10%.

**Conclusion:** Male and female students are equally injured at NICA. However, the body area injured differs greatly, possibly reflecting the differing types of training and acts undertaken. Although ankles are the most commonly injured body part, spinal injuries required the highest amount of ongoing treatment. This suggests preventative ankle injury programs and more effective spinal treatment strategies should be considered.

## 072

### Risk factors for noncontact ankle injuries in amateur male soccer players

Karrin L Evans, The University of Newcastle, Newcastle

Suzanne J Snodgrass, The University of Newcastle, Newcastle

Robin Callister, The University of Newcastle, Newcastle

**Question:** Does decreased dorsiflexion range of motion (ROM) and poor balance in preseason assessments increase the risk of sustaining a noncontact ankle injury in male soccer players during competition?

**Design:** Prospective case control.

**Participants:** Amateur male soccer players (n=180).

**Intervention:** Age, height, weight, ankle injury history, ankle taping/bracing, team competition level and measures of dorsiflexion ROM were obtained in the preseason. Balance measurements were collected on a subset (n=65). Players were monitored prospectively over the competition season with injuries recorded at time of occurrence.

**Outcome measures:** Dorsiflexion ROM was measured via a standing lunge test and a single leg incline squat test. A computer-interfaced wobble board evaluated double leg balance. Noncontact ankle injuries were defined as any incident causing an ankle injury that was not the result of collision with another player or object and that resulted in a missed game or training session.

**Results:** Eleven (6.1%) of the 180 players sustained one or more noncontact ankle injuries during competition. Regression analysis indicated players with poor preseason balance scores were at a significantly greater risk of incurring a noncontact ankle injury (OR=0.29, 95% CI 0.12 to 0.87, p = .02). This finding was obtained in a sample of players (the subset) with no previous ankle injury history. No other factors were significant.

**Conclusion:** Poor preseason balance was a significant predictor for sustaining a noncontact ankle injury in amateur male soccer players. This suggests that clinicians should assess balance in the preseason and address this factor to potentially prevent injury.

## 073

### Injury incidence in elite junior Australian Rules Football and correlation with screening findings and training loads: a pilot study

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Mary E Magarey, University of South Australia, Adelaide

Sam M Chalmers, University of South Australia, Adelaide

Hazel Anderson, University of South Australia, Adelaide

Eva Bosch, University of South Australia, Adelaide

**Questions:** What is the rate of injury in elite junior Australian Rules Football players? Do the injuries correlate with musculoskeletal screening assessment and fitness testing findings? Do the injuries correlate with training loads for elite level players? How do injury rates compare with non-elite junior ARF players?

**Design:** Retrospective observational study.

**Participants:** Forty players from nine South Australian National Football League clubs across metropolitan Adelaide playing for South Australia in the 2010 National Under 18s Australian Rules Football Championships.

**Outcome measures:** Injury profile; fitness test results; musculoskeletal screening results.

**Results:** The forty players consistently performed well in the fitness testing. Only two of these players demonstrated sound musculoskeletal screening test results, with twenty-seven having abnormal findings. Of this latter group, twenty-two reported injuries during the championship program.

**Conclusion:** The injury rates in the squad were high and there was some positive correlation with adverse musculoskeletal screening findings. The effect of playing load on these players is difficult to measure but worthy of further consideration. The findings of this pilot study highlight an area requiring further research, which will be ongoing with this playing group.

## 074

### Prevalence and risk factors of low back pain in adolescent field hockey players

Lauren Pember

Lynn Jensen, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University, Perth

Natasha Bear, Department of Paediatric Rehabilitation and Physiotherapy, Princess Margaret Hospital, Perth

**Question:** What is the prevalence of low back pain in adolescent field hockey players and what are the risk factors?

**Design:** Cross sectional prospective study.

**Participants:** One hundred and fifty one male and female adolescents between the ages of 15 and 17 years from the Western Australian metropolitan field hockey competition.

**Outcome Measures:** Composite questionnaire comprising of the Nordic, Oswestry and Young Person's Activity questionnaires as well as questions detailing field hockey information (training and playing time and surface).

**Results:** Respondents reported a 52% lifetime prevalence of low back pain and a 42% yearly prevalence of hockey related low back pain. Females reported more hockey related low back pain in the previous 12 months (51%) compared to males (35%) ( $p = 0.02$ ), with females being two times more at risk of low back pain compared to males ( $OR = 2.06$  [95% CI 1.01 to 4.23]  $p < 0.05$ ). Those reporting hockey related low back pain spent more time training ( $p = 0.04$ ), with each additional hour performed increasing their risk of low back pain by 31% ( $OR = 1.31$  [95% CI 1.07 to 1.61]  $p = 0.008$ ). No significant associations were found between low back pain and playing surface.

**Conclusion:** Low back pain is prevalent among adolescent field hockey players and is greater than that reported in the normal adolescent population. Training duration and gender appear to be risk factors in the development of low back pain in this population.

## 075

### The diagnosis of persistent pain arising from the attachments of the pubic arc in athletes

Michael K Drew, University of Newcastle

Peter G Osmotherly, University of Newcastle

Pauline E Chiarelli, University of Newcastle

**Question:** What validated clinical tests are available for the diagnosis of athletes with chronic groin pain?

**Participants:** Professional and semi-professional athletes who have experience groin pain for greater than six weeks.

**Intervention:** MeSH terms were searched in MEDLINE, CINAHL, EMBASE, and SportsDiscuss and included if they were diagnostic studies related to chronic athletic groin pain, professional or semi-professional athletes, symptoms lasting more than six weeks, and not limited in age or gender. A priori exclusion criteria were utilised to ensure consistency and quality.

**Outcome measures:** The quality of included studies was measured using the QUADAS tool. Sensitivity and specificity, likelihood ratios, predictive value of the tests and investigations were derived from the included studies.

**Results:** 577 journal articles were identified. Five studies met the requirements and were evaluated. Sensitivity and specificity of physical assessments ranged from 30–100% and 88–95% respectively with negative and positive likelihood ratios between 0.15–0.78 and 1.0–11.0 respectively. Sensitivity and specificity of investigations (MRI, herniography, and ultrasound) ranged between 68–100% and 33–100% respectively with negative and positive likelihood ratios between 0–0.32 and 1.5–8.1 respectively.

**Conclusion:** Valid tests are lacking for clinicians working with athletes experiencing chronic groin pain. Clinical tests for pubic bone marrow oedema are valid and render MRI unnecessary. MRI is recommended for adductor muscle pathology. Palpation, herniography and dynamic ultrasound give minimal to no benefit in diagnosis of inguinal canal pathology. Future diagnostic studies should include a reference standard and report sufficient data to calculate diagnostic statistics that the clinician can use.

## 076

### Can we reliably measure golf swing kinematics in the field using an electromagnetic 3D motion capture system?

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Sean Horan, Griffith University, Gold Coast Campus

Robert Neal, Golf BioDynamics Inc, United States

Rod S Barrett, School of Physiotherapy and Exercise Science, Griffith University & Musculoskeletal Research Program, Griffith Health Institute

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Field-based methods used to evaluate the three-dimensional nature of the golf swing offer coaches and researchers the opportunity to assess players in context-specific environments. The aim of this study was to establish the test-retest repeatability of upper body kinematics during the golf swing using an electromagnetic motion capture system, a system suitable for field-based analysis. Two experienced testers measured 20 golfers (handicap = 8 strokes) on two occasions, one day apart. On each occasion, participants performed 10 swings (five swings each with a 5-iron and driver) in an indoor and outdoor location. Repeatability of temporally normalised thorax and pelvis kinematic waveforms were quantified using a waveform similarity statistic called the coefficient of multiple determination (CMD). Inter-trial, between location (indoors/outdoors), between-tester and between-day repeatability was evaluated. CMDs for inter-trial repeatability exceeded 0.928, indicating high levels of within-subject repeatability. When CMDs were compared across conditions using MANOVA, there were no significant differences between inter-trial and between-location repeatability however inter-trial repeatability was significantly higher than between-tester and between-day repeatability. Across all conditions, CMDs exceeded 0.854 for all variables except pelvis forward bend for between-day (5-iron: 0.523; driver: 0.602) and between-tester (5-iron: 0.566; driver: 0.628) conditions. Overall findings support this method of analysing upper body golf swing kinematics in the field, and offer an avenue for exploring other complex functional movements and field-based sporting tasks.

## 077

### A postoperative shoulder exercise program improves function and decreases pain following open thoracotomy: a randomised trial

Julie Reeve, AUT University, Auckland, New Zealand

Kathy Stiller, Royal Adelaide Hospital

Kristine Nicol, Auckland District Health Board, New Zealand

Kathryn McPherson, AUT University, Auckland, New Zealand

Paul Birch, Auckland District Health Board, New Zealand

Ian Gordon, University of Melbourne

Linda Denehy, University of Melbourne

**Question:** Does a physiotherapist-directed postoperative exercise program, including shoulder exercises, improve shoulder function, pain, range of motion, muscle strength and health-related quality of life after elective pulmonary resection via open thoracotomy?

**Design:** Prospective, randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** Seventy-six patients who had undergone pulmonary resection via open thoracotomy.

**Intervention:** All participants received standard medical/nursing care which followed a clinical pathway. The experimental group also received physiotherapy interventions that included daily supervised progressive exercises until discharge and a postoperative exercise booklet on discharge.

**Outcome measures:** Function (Shoulder Pain and Disability Index), pain (numerical rating scale), and health-related quality of life (SF-36v2) were assessed preoperatively and up to three months postoperatively. Shoulder range of motion (digital inclinometry) and muscle strength (hand-held dynamometry) were measured in a subgroup. **Results:** The experimental group had 7.6% (95% CI 1.7 to 13.6) better function at three months, 1.3 units (95% CI 0.3 to 2.2 to) less shoulder pain (scored /10) and 2.2 units (95% CI 0.2 to

4.3) less total pain (scored /30) at discharge, which were statistically significant. The SF-36v2 physical component score was 4.8 points (95% CI -0.3 to 10.0) better for the experimental group at three months, approaching statistical significance. Differences between groups for range of motion and strength measures were small and statistically non-significant.

**Conclusion:** A physiotherapist-directed postoperative exercise program resulted in significant benefits in shoulder function and pain over natural recovery alone for patients following pulmonary resection via open thoracotomy.

**Trial registration:** ANZCTR N12605000201673.

## 078

### Manual Clinical Assessment of the Sternum Following Median Sternotomy For Cardiac Surgery: Validity and Reliability of the Sternal Instability Scale (SIS)

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Linda Denehy, University of Melbourne

Gordon Waddington, The University of Canberra

Roger Adams, University of Sydney

**Question:** Does manual assessment of the sternum conducted by health professionals using the Sternal Instability Scale (SIS) provide valid and reliable measures of sternal stability in patients following a median sternotomy for cardiac surgery?

**Design:** Blinded, randomized within-participant experimental study with 8 health professionals rating 60 patients on sternal instability diagnosed by Ultrasound.

**Outcome Measures:** The Sternal Instability Scale (SIS), a 4 point manual test scaling sternal stability from 0 (stable sternum with no detectable motion) to 3 (completely separated sternum with marked increase in motion of the sternal edges) was utilized.

**Results:** Validity: patients diagnosed with sternal instability were rated higher on the SIS with a significant mean difference of 2.35 SIS grade points over those not diagnosed. The inter-rater reliability for all 8 assessors over the two occasions of testing yielded an ICC (2, 1) mean value of 0.88. Intra-rater reliability estimates for manual sternal assessment in the patient group gave ICC (3, 1) values between 0.92 and 0.99.

**Conclusion:** The SIS is a noninvasive, practical, manual clinical assessment tool that can be administered reliably by health professionals to patients following a median sternotomy. Manual assessment of the sternum promotes the early detection of sternal non-union to enable optimal and timely management, better monitoring of patients with sternal instability throughout their postoperative recovery, as well as providing a platform for the development of guidelines for activity, exercise and rehabilitation conducted by health professionals.

## 079

### Clinical application of the Melbourne risk prediction tool in a high risk upper abdominal surgery population: an observational study

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Laura Browning, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, Melbourne

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Linda Denehy, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, Melbourne

**Questions:** Can the Melbourne risk prediction tool be applied following upper-abdominal surgery to predict the risk of developing a post-operative pulmonary complication (PPC)? Is it valid for clinical use in a medically defined high risk population? What is the incidence of post-operative pulmonary complication (PPC) in this cohort?

**Design:** Nested observational cohort study.

**Participants:** Fifty-two participants (61.5% male), mean±SD age 66.5±12.6 years who underwent upper abdominal surgery.

**Procedure:** PPC development was screened daily for seven days using the seven-point Melbourne Group Scale. Risk prediction was calculated according to the previously published model, but administered post-operatively rather than pre-operatively.

**Outcome Measures:** 1) Risk prediction tool score and 2) PPC incidence determined by Melbourne Group Scale.

**Results:** Fifty-two participants were consented between March–June 2010. Sixty-five percent (n=34) underwent hepatobiliary or upper gastrointestinal surgery. Mean±SD anaesthetic duration was 6.3±2.7 hours. Mean±SD predicted VO<sub>2</sub>max was 13.0±7.8 ml/kg/min with 58% (n=30) self-reporting walking greater than one kilometre pre-operatively. The risk prediction tool classified 85% (n=44) as high risk and 15% (n=8) as low risk of developing PPC. Overall PPC incidence was 42% (n=22). The risk prediction tool was 91% sensitive and 20% specific with a 50% chance of correct classification.

**Conclusion:** This is the first study to cross validate the Melbourne risk prediction tool in a medically defined high risk population. The cohort had a higher incidence of PPC than previously reported in the literature. Results demonstrated poor validity of the tool in a population already defined medically as high risk and when applied post-operatively.

## 080

### Delayed mobilisation is associated with increased risk of post operative pulmonary complications following high risk upper abdominal surgery

Kimberley J Haines, Austin Health

Susan C Berney, Austin Health

Elizabeth H Skinner, Southern Health

**Question:** What is the incidence and factors contributing to post-operative pulmonary complications in a high risk open upper abdominal surgical cohort? What are the barriers to early mobilisation?

**Design:** Prospective observational study.

**Participants:** Seventy-two high risk patients following open upper abdominal surgery who were a sub-set of a larger trial evaluating an enhanced model of medical co-management post operative care.

**Outcome measures:** Melbourne Group Score (post operative pulmonary complications incidence) and details of physiotherapy interventions were recorded daily in the immediate post-operative period.

**Results:** The incidence of post-operative pulmonary complications was 38.9%. Logistic regression demonstrated incision type and time to mobilise away from the bed were independently associated with a diagnosis of post-operative pulmonary complications. For each post-operative day patients did not mobilise away from the bed, they were three (95% CI 1.2 to 8.0) times more likely to develop a post-operative pulmonary complication. Barriers to mobilisation away from the bed were seen in 52% of patients on day 1 and the most common barrier was hypotension.

**Conclusion:** The incidence of post-operative pulmonary complications in this study was higher than several previous Australian physiotherapy and international studies and was associated with an increased length of hospital stay. This study is the first to demonstrate an increased risk of post-operative complications with a delay in time to mobilise away from the bed. The most common barrier to mobilising away from the bed was hypotension. Attenuating these barriers may influence the incidence of post-operative pulmonary complications though this requires further investigation.



## 081

### Criteria to determine readiness for hospital discharge following colorectal surgery: an international consensus using the Delphi technique

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Linda Denehy, Physiotherapy, Melbourne School of Health Sciences, The Univer

**Question:** Which criteria should determine patient readiness for hospital discharge following colorectal surgery?

**Design:** Three round web-based international Delphi study.

**Participants:** 15 highly published international experts identified through a systematic literature search.

**Outcome measure:** 75% agreement by experts regarding discharge criteria and endpoints to determine when these criteria have been achieved.

**Results:** All 15 experts, from different countries spanning four continents, completed all three rounds of the Delphi process. After Round 3, experts reached consensus that patients undergoing colorectal surgery should be considered ready for hospital discharge when there is tolerance of oral intake, recovery of lower gastrointestinal function, adequate pain control with oral analgesia, ability to mobilise and self care and no evidence of complications or untreated medical problems. Specific endpoints were defined for each of these criteria. Experts also agreed that after these criteria are achieved, discharge may take place as soon as the patient has adequate post-discharge support and is willing to leave the hospital. If a stoma was constructed, the patient or his family should have received training on stomal care or had outpatient training arranged.

**Conclusion:** This Delphi study has provided substantial international consensus on hospital discharge criteria for patients undergoing colorectal surgery. We recommend that these criteria are: (1) used by the postoperative care team to guide decisions regarding patient discharge and (2) applied in future research to increase the comparability of results from studies assessing physiotherapy and other interventions to enhance short-term postoperative recovery.

## 082

### Time to readiness for discharge as a measure of short-term postoperative recovery following colorectal surgery: inter-rater reliability and construct validity

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Ian G Faragher, Division of Surgery, Western Hospital (Footscray)

Linda Denehy, Physiotherapy, Melbourne School of Health Sciences, The University of Melbourne

**Question:** Is time to readiness for discharge a valid and reliable outcome measure of short-term postoperative recovery following colorectal surgery?

**Design:** Prospective observational study.

**Participants:** Seventy patients who had undergone colorectal surgery participated in the construct validity study; 21 patients participated in the inter-rater reliability study.

**Outcome measures:** 'Time to readiness for discharge' was defined as the number of days patients took to achieve hospital discharge criteria, which was defined by international consensus using a Delphi process. Construct validity was investigated by testing the hypothesis that time to readiness for discharge is: longer in patients (1) undergoing open compared with laparoscopic colorectal surgery, (2) having lower physical status prior to surgery (American Society of Anesthesiology Score > 3), (3) who are elderly (>80 y.o.), (4) who have postoperative complications, (5) who undergo emergency surgery and (6) shorter than actual hospital length of stay. The inter-rater reliability was calculated by comparing measures of time to readiness for discharge by two independent assessors.

**Results:** The null hypotheses of all but one of the six hypotheses above were rejected ( $p < 0.05$ ). Inter-rater reliability was high (ICC2.1 = 0.99, 95%CI = 0.97–0.99).

**Conclusion:** The efficacy of physiotherapy and other interventions aimed at accelerating postoperative recovery is traditionally investigated through the assessment of hospital length of stay. However, it has been suggested that time to readiness for discharge may provide a better index of patient recovery. This study provides evidence that time to readiness for discharge is a valid and reliable outcome measure.

## 083

### Exercise training improves exercise capacity and quality of life in people with dust-related respiratory diseases: a randomised controlled trial

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**Question:** Does exercise training improve exercise capacity and quality of life in people with dust-related respiratory diseases?

**Design:** A randomised controlled trial was conducted with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** The inclusion criterion was a medical diagnosis of a dust-related respiratory disease, including asbestosis, silicosis and asbestos related pleural disease.

**Intervention:** Participants were randomised to an exercise training group (eight weeks, three times per week) or usual care (Control) (no intervention).

**Outcome measures:** Exercise capacity (six-minute walk test, incremental cycle test and endurance cycle test) and quality of life (St George's Respiratory Questionnaire (SGRQ)) were measured at baseline and at eight weeks.

**Results:** Thirty-five of 36 male participants completed the study, 18 in the exercise training group and 17 in Control. Characteristics of the combined groups were mean (SD) age 71 (7) years, FVC 86 (20)% predicted, DLCO 56 (14)% predicted. Compared to Control, the exercise training group significantly increased six-minute walk distance (mean difference 50 metres, 95% CI 29 to 71), peak work rate (mean difference 12 watts, 95% CI 5 to 18) and endurance cycle time (mean difference 225 seconds, 95% CI 92 to 359). Compared to Control, quality of life significantly improved in the exercise training group, SGRQ Total score (mean difference -7, 95% CI -12 to -1); SGRQ Symptoms score (mean difference -15, 95% CI -27 to -2).

**Conclusion:** Exercise training is an effective treatment option for improving exercise capacity and quality of life in people with dust-related respiratory diseases.

**Trial Registration:** ACTRN12608000147381.

## 084

### The effect of endurance training and strength training on arm exercise capacity in people with chronic obstructive pulmonary disease: a randomised controlled trial

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**Question:** What is the effect of arm endurance training; arm strength training; a combination of arm endurance and strength training; and no arm training, on endurance arm exercise capacity?

**Design:** Randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** Fifty-two people with COPD who had not completed pulmonary rehabilitation in the last twelve months.

**Intervention:** Participants were randomised into one of four groups to complete eight weeks training: 1) arm endurance training (Arm Endurance Group) consisting of supported and unsupported arm exercises, 2) arm strength training (Arm Strength Group) using weight machines, 3) a combination of arm endurance and strength training (Combined Group), or 4) no arm training (Control Group). All groups completed leg training.

**Outcome measures:** The primary outcome was endurance arm exercise capacity measured by an endurance arm crank test. Secondary outcomes were functional arm exercise capacity, arm strength, and quality of life. Measures were taken before and after training.

**Results:** Thirty-eight participants (73%) completed the study. Between group differences were only significant for the Arm Endurance Group to the Control Group, with an increase in endurance time of 5.9 mins (95% CI 1.5 to 10.4). Both the Arm Strength Group and Combined Group also had a clinically significant improvement in endurance time (endurance time >1.75 mins increase) when compared to the control group but this did not reach statistical significance.

**Conclusion:** The mode of training to be favoured to increase endurance arm exercise capacity is arm endurance training.

**Trial registration:** ACTRN012605000679684.

## 085

### Are pedometers tolerated by patients attending pulmonary rehabilitation?

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Claire Atkinson, Griffith University, Griffith Health Institute

Helen Seale, Physiotherapy Department, The Prince Charles Hospital

James Walsh, Physiotherapy Department, The Prince Charles Hospital

Lewis Adams, Griffith University, Griffith Health Institute

**Question:** Will chronic obstructive pulmonary disease patients (COPD) tolerate wearing a pedometer during a 7-week pulmonary rehabilitation (PR) program?

**Design:** Prospective longitudinal observational study.

**Participants:** Thirty one COPD patients (FEV1 % predicted = 51 ± 22, age = 69 ± 10yr, 21 Male) referred to a 7 wk outpatient PR program.

**Outcome measures:** Number of days per week patients wore pedometer (Omron HJ-720IT-E2) and total number of subjects who failed to wear the pedometer for any days during the week across the PR program.

**Results:** The median number of days of pedometer wear per week was significantly different across the program ( $\chi^2 = 22$ ,  $p < 0.01$ ) during the PR program (Pre: 6, IQR 1; Wk1: 7, IQR 1; Wk2: 7, IQR 3; Wk3: 7, IQR 0; Wk4: 7, IQR 0; Wk5: 7, IQR 0; Wk6: 7, IQR 2; Wk7 not included as pedometer removed day 5). There was also a steady increase in the number of subjects that failed to wear the pedometer at all during the week (n, (%); Pre: 0, (0%); Wk1: 0, (0%); Wk2: 4, (13%); Wk3: 2, (6%); Wk4: 3, (10%); Wk5: 3, (10%); Wk6: 4, (13%); Wk7: 7, (23%)).

**Conclusions:** These data demonstrate that the wearing of a pedometer is well tolerated in a group of COPD patients attending PR. While the number of subjects that failed to wear the device increased over the duration of the program, a majority of patients continued to wear the device and as such the device may serve as a useful adjunct to promote physical activity.

## 086

### Older recipients are more likely to have a delayed recovery in exercise capacity after lung transplantation

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**Question:** Which pre-operative or peri-operative factors identify lung transplant recipients who have delayed recovery in exercise capacity? Do these recipients with delayed recovery in exercise capacity catch their peers within the first 26 weeks post-operatively?

**Design:** Prospective observational study.

**Participants:** Sixty-five consecutive lung transplant recipients were assessed.

**Outcome measures:** Exercise capacity was assessed by six minute walking distance (6MWD) pre-operatively and at two, six, 13 and 26 weeks post-operatively. Delayed recovery in exercise capacity was defined as a recipient who decreased, from pre-transplant level, in 6MWD at two weeks post-operatively. Pre-operative factors studied included recipient age, sex, lung function, body mass index and quadriceps strength; with peri-operative factors including primary graft dysfunction, time to extubation, intensive care days (ICU) and hospital days.

**Results:** Sixty-five (57 bilateral lung, five single lung) recipients were studied. Forty-two recipients improved in their 6MWD at two weeks post-operatively and 21 recipients were decreased. In a multiple logistic regression, only older recipients (Exp(B) 1.187 (95% CI: 1.055–1.337)  $p = 0.004$ ), recipients with higher pre-operative 6MWD (Exp(B) 1.026 (1.009–1.043)  $p = 0.002$ ) and longer ICU days (Exp(B) 1.407 (1.044–1.897)  $p = 0.025$ ) identified who were more likely to have decreased in 6MWD at two weeks post-operatively. Recipients who decreased in 6MWD at two weeks, remained lower than their peers in mean 6MWD at 26 weeks post-operatively ( $p < 0.001$ ).

**Conclusions:** Older recipients and longer ICU days increase the risk of delayed recovery in exercise capacity. The higher pre-operative 6MWD finding is possibly due to a ceiling effect.

## 087

### Exercise training in non-cystic fibrosis bronchiectasis: a randomised controlled trial

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**Question:** Is exercise training effective in improving exercise capacity and health-related quality of life in patients with non-cystic fibrosis (CF) bronchiectasis?

**Design:** Prospective, randomised controlled trial across three centers.

**Participants:** Patients with stable non-CF bronchiectasis with a modified medical research council dyspnoea score  $\geq 1$ .

**Intervention:** Subjects were randomised to receive eight weeks of twice-weekly supervised exercise training or twice-weekly telephone support.

**Outcome measures:** Exercise capacity using the incremental shuttle walk distance (ISWD) and six-minute walk distance (6MWD) and health-related quality of life using the Chronic Respiratory Disease Questionnaire, Leicester Cough Questionnaire and Hospital Anxiety and Depression Scale with a blinded assessor for all measurements.

**Results:** Eight-five subjects with mean (SD) age of 64 (13) years, FEV1 of 73.5 (21.7)% predicted and median modified medical research council score of 1 (IQR 3) were included. Of those in the exercise training group ( $n = 42$ ), 34 (81%) completed the exercise training. There were no differences in the ISWD (61m, 95% CI -26 to 148m,  $p = 0.17$ ), or 6MWD (19 m, 95% CI -29 to 66 m,  $p = 0.44$ ) between exercise training and control. Exercise training significantly reduced dyspnoea ( $p = 0.009$ ) and fatigue ( $p = 0.01$ ) but there was no difference in cough-related quality of life or mood between groups.

**Conclusion:** Exercise training in non-CF bronchiectasis improves symptoms of dyspnoea and fatigue, but provides no additional benefit in exercise capacity based on the ISWD or 6MWD. Ongoing follow up will assess any changes in these effects over time.

## 088

### Sun-style Tai Chi achieves a moderate exercise training intensity in people with chronic obstructive pulmonary disease (COPD)

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**Question:** Does short-form Sun-style Tai Chi reach the minimal recommendation of exercise training intensity in people with COPD?

**Design:** Prospective observational study.

**Participants:** Nine participants (mean (SD) age = 77 (9) yrs) with a medical diagnosis of COPD (FEV1 % predicted 63 (15)%) and who had completed a 12 weeks, twice weekly Sun-style Tai Chi training program were tested.

**Outcome measures:** Oxygen consumption (VO<sub>2</sub>) and heart rate (HR) were measured during the incremental shuttle walk test (ISWT) and 15 minutes of short-form Sun-style Tai Chi performance, using a portable gas analysis system. The exercise intensity of Tai Chi was determined by comparing the mean VO<sub>2</sub> and HR during Tai Chi (averaged responses from minute 2 to 15) to the peak VO<sub>2</sub> and HR reached at the end of the ISWT.

**Results:** The VO<sub>2</sub> and HR during Tai Chi was 0.62 (0.14) L/min and 104 (19) beats/min respectively compared to the peak VO<sub>2</sub> and HR from the ISWT of 0.99 (0.19) L/min and 122 (20) beats/min. Thus the VO<sub>2</sub> and HR during Tai Chi were 64(16)% and 85(12)% of peak respectively.

**Conclusion:** The average exercise intensity of Sun-style Tai Chi was moderate and was within the minimal recommendation of exercise training intensity for people with COPD. These findings are important as they provide evidence to support the use of short-form Sun-style Tai Chi as a training mode in people with COPD.

## 089

### A change to the six-minute-walk test script reduces variability between tests in adults with chronic obstructive pulmonary disease

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**Question:** Does changing the six-minute walk test script mitigate the learning effect enough to allow for a single test assessment in patients with chronic obstructive pulmonary disease?

**Design:** Prospective, repeated-measures, assessor and patient blinded.

**Participants:** Forty eight chronic obstructive pulmonary disease patients awaiting Pulmonary Rehabilitation.

**Intervention:** The six-minute-walk test script was changed aiming to encourage peak performance. Patients were tested twice over two hours.

**Outcome measures:** Mean difference between walk one and two. The minimum clinical statistical difference was set at thirty two metres.

**Results:** The mean difference between walk one and two was not significant (mean distance = 17.88 m, 95% CI 10.90 to 24.85,  $p = 0.21$ ). Walk two exceeded walk one by more than thirty two metres in only 13 (27%) patients. Number of rests ( $p = 0.034$ ), duration of rest time (57.2 s; CI 36 to 78 s;  $p = 0.039$ ), and body mass index (CI 22.4 to 26.6 kg/m<sup>2</sup>,  $p = 0.006$ ) were significantly different in these thirteen patients. The Physiotherapists were good at predicting if the first test wasn't the best test ( $p = 0.024$ , sensitivity 51.4%, specificity 84.6%).

**Conclusion:** Using our modified script a physiotherapist could reliably assess a patient with chronic obstructive pulmonary disease with just one six-minute-walk test. A second test should be performed if the patient has a body mass index less than 26.6 kg/m<sup>2</sup>, rests more than 36 seconds during the first test, or the Physiotherapist feels that the patient did not give their best effort. Further validation of this script and predictive factors are recommended.

## 090

### Task-related training of arm use in chronic stroke: A pilot study

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**Questions:** Does improvement in upper limb function occur following an 8-week task-related training program? Will there be changes in cortical organisation?

**Design:** Single-group repeated measures study. Eight week non-intervention baseline period, 8 week training program and 12 week follow up.

**Participants:** Nineteen people who suffered a stroke greater than one year previously.

**Outcome measures:** Outcome measures were performed by a blinded assessor. Primary outcome measures for functional change were hand strength, the NK Dexterity Board for unimanual dexterity and the ABILHAND questionnaire for assessment of bimanual, functional tasks. Cortical reorganisation was measured using Transcranial Magnetic Stimulation (TMS).

**Results:** No statistically significant improvement in arm function. However, there was a non-significant trend towards improvement in the percentage change scores for all categories (small, medium and large items) of the NK Dexterity Board and for the ABILHAND questionnaire. This was followed by a non-significant trend of reduction in function toward baseline levels at the 12 week follow up. Treatment effect size (using partial eta squared) was calculated for the medium item category of the NK Dexterity Board (0.17) and for the ABILHAND (0.12). TMS results suggested a trend towards medial shift of the amplitude weighted centre of the map, indicating possible cortical reorganisation. This reverted back towards baseline at the 12 week follow up.

**Conclusion:** The trends indicate that functional improvement and cortical reorganisation may occur following a task-related training program in chronic stroke. The results support a larger scale research project to further investigate this topic.

## 091

### The effect of age, constraint and support on the kinematics of sagittal plane reaching

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**Questions:** Does age, limb constraint or support affect the kinematics of sagittal plane reaching?

**Design:** Experimental study.

**Participants:** Thirty-two (16 old) healthy adults **Outcome measures:** Kinematics of reaching under three support conditions (constrained by a splint and track, supported by a table, or free reach) was recorded using an OptiTrack™ 6-camera system. Passive markers were placed on the forearm, humerus, sternum, acromion and acromioclavicular joint. Variables measured included: reach distance, trajectory, trajectory ratio, mean velocity, peak velocity, time to reach peak velocity, elbow extension and peak shoulder elevation.

**Results:** Contrary to predictions, older adults reached further than young adults (mean: 0.38 m vs. 0.31 m) in all conditions, but particularly free reaching. They had greater peak velocity of movement in the free condition (young: 0.73 m/s; old: 1.08 m/s) with greater variability in peak velocity across all conditions ( $p = 0.004$ ). Older adults also demonstrated reduced elbow extension ( $p = 0.016$ ). When the different support conditions were examined, both groups demonstrated greater trajectory in the free condition (young: 0.35 m; old: 0.43 m) than the constrained condition (young: 0.33 m; old: 0.36 m). In the free condition there was greater variability in trajectory ( $p < 0.018$ ) and higher mean velocity ( $p < 0.003$ ) compared to the supported and constrained conditions when all data was pooled.

**Conclusion:** Age and support condition does have an effect on reaching kinematics. This identifies the need for age-matched controls in neurological experimental studies and supports use of constraint and support methods for stroke rehabilitation.

## 092

### Incidence and prediction of ambulation and upper limb function after stroke: a prospective cohort study

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**Question:** What is the incidence of ambulation and upper limb function six months after stroke? Can factors measured within four weeks predict ambulation and upper limb function six months after stroke?

**Design:** Prospective cohort study.

**Participants:** Consecutive sample of 200 people with stroke admitted to St George Hospital.

**Outcome measures:** Ambulation was measured with item 5 of the Motor Assessment Scale (MAS); patients scoring  $\geq 3$  could ambulate independently. Upper limb function was measured with items 7 and 8 of the MAS; patients scoring  $\geq 5$  could move a cup across the table and feed themselves with a spoonful of liquid with the hemiplegic arm. Potential predictors were age, severity of stroke, motor function, pre-morbid function and spasticity (for ambulation), and age, severity of stroke and motor function (for upper limb recovery).

**Results:** Of the 141 stroke survivors who were unable to ambulate initially, 80 (57%) achieved independent ambulation. Of the 65–69 stroke survivors who had not achieved upper limb function initially, 21–25 (32–36%) recovered. Models containing age and severity of stroke predicted ambulation and ability to move cup across table, whilst model containing severity of stroke predicted ability to feed self with a spoonful of liquid. All prediction models showed good discrimination (bootstrap-adjusted area under the receiver-operator curve: 0.73–0.83).

**Conclusion:** In our cohort, incidence of ambulation was higher than return of upper limb function six months after stroke. Using age and severity of stroke, it was possible to predict with some accuracy which patients would achieve functional recovery.

## 093

### What is the probability of patients who are non-ambulatory after stroke regaining independent walking? A systematic review

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Catherine Dean, University of Sydney  
Rosalyn Stanton, University of Sydney  
Gordon Waddington, University of Canberra

**Objective:** Patients after stroke who are non-ambulatory require substantial physical and economic resources and independent walking becomes a major determinant of the ability to participate in daily activities. The objective of this systematic review was to determine the probability of walking for patients who are non-ambulatory in the first month after stroke.

**Design:** Systematic review with meta-analysis of consecutive, prospective studies.

**Setting:** Rehabilitation and acute units.

**Participants:** Non-ambulatory patients within the first month after stroke.

**Outcome measures:** The primary outcome was the probability of achieving independent walking at 3, 6 and 12 months after stroke.

**Results:** Twenty-six studies were included. Eighteen studies comprising 2856 participants were included in the meta-analyses. For patients who are initially non-ambulatory after stroke managed in a rehabilitation unit, the probability of independent walking was 0.60 (95% CI 0.47 to 0.74) at 3 months, 0.65 (95% CI 0.53 to 0.77) at 6 months and 0.91 (95% CI 0.81 to 1.00) at 12 months. For patients managed in an acute unit, the probability of independent walking was 0.39 (95% CI 0.27 to 0.52) at 3 months, 0.69 (95% CI 0.46 to 0.92) at 6 months and 0.74 (95% CI 0.59 to 0.88) at 12 months.

**Conclusion:** For patients who are initially non-ambulatory, the probability of regaining walking is better for those managed in a rehabilitation unit than an acute unit, (60% compared with 39%). This information can be used clinically to make decisions about rehabilitation resources, education of patients and carers, and for discharge planning.

## 094

### Length of stay in an Australian stroke rehabilitation unit: a pilot study

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Rachel Harling, Hampstead Rehabilitation Centre

**Question:** How frequent is delayed discharge in a stroke rehabilitation unit? What are the most common reasons for delayed discharge? To what extent does delayed discharge impact on length of stay?

**Design:** Prospective observational study.

**Participants:** Ninety-eight patients in a stroke rehabilitation unit.

**Outcome measures:** Length of stay, frequency of delayed discharge and reason for delayed discharge were documented.

**Results:** Sixty (61%) patients had a length of stay that exceeded the Australasian Rehabilitation Outcomes Centre benchmark length of stays according to the Australian National Sub-acute and Non-acute Patient classification system. Delayed discharge was documented as occurring for 25 (26%) patients and resulted in a total discharge delay of 886 days. The most common reason for delayed discharge related to delays in the provision of community services. Even when patients with discharge delay were factored out of analyses, length of stay still exceeded benchmark figures for 39 (57%) of the 69 patients without discharge delay.

**Conclusions:** The lengths of stay of the majority of patients included in this study were longer than the benchmark figures. Most delays were due to difficulties with the provision of community services and had a marked impact on length of stay. Initiatives to address this problem have included the implementation of a proactive computerised tool that provides target lengths of stay and enables reasons for excessive length of stay to be more closely examined.

## 095

### Many participants in inpatient rehabilitation can accurately quantify their own exercise dosage: an observational study

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Karl Schurr, Bankstown-Lidcombe Hospital

**Objective:** To investigate whether inpatients undergoing rehabilitation who appear able to count exercises can accurately quantify the amount of exercise they undertake.

**Design:** Observational study.

**Participants:** Inpatients in an aged care rehabilitation unit and a neurological rehabilitation unit, who appeared able to count their exercises during a 1–2 min observation by their treating physiotherapist.

**Measurements:** Participants were observed for 30 min by an external observer while they exercised in the physiotherapy gymnasium. Both the participants and the observer counted exercise repetitions with a hand-held tally counter and the two tallies were compared.

**Results:** Of the 60 people admitted for aged care rehabilitation during the study period, 49 (82%) were judged by their treating therapist to be able to accurately count their own exercise repetitions. Of the 30 people admitted for neurological rehabilitation during the study period, 20 (67%) were judged by their treating therapist to be able to accurately count their repetitions. Of the 69 people judged to be accurate, 40 underwent observation while exercising. There was excellent agreement between these participants' counts of their exercise repetitions and the observers' counts, ICC (3,1) of 0.99 (95% CI 0.98 to 0.99). Eleven participants (28%) were in complete agreement with the observer. A further 19 participants (48%) varied from the observer by less than 10%.

**Conclusion:** Therapists were able to identify a group of rehabilitation participants who were accurate in counting their exercise repetitions. Counting of exercise repetitions by therapist-selected patients is a valid means of quantifying exercise dosage during rehabilitation.

## 096

### The Effect of Progressive Resisted Strengthening of the Thoracic Extensors in Stroke – A Single Case Study

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**Question:** What effect does progressive resisted strengthening (PRS) of the thoracic erector spinae (TES) have in a person with stroke?

**Design:** Single-subject AB design. Baseline measurements were taken at 0 and 12 weeks and then at 24 weeks following 12 weeks of PRS. **Participants:** A 71 year-old male three years after CVA, living in the community having completed both inpatient, outpatient and community-based rehabilitation. **Intervention:** PRS 3 times a week for 12 weeks at 60% of 1RM.

**Outcome Measures:** Four physical function tests (10m walk, timed up and go, X5 sit to stand, and the stair test) and the motor assessment scale (MAS) for stroke. Thoracic spine angle and movement frequency were measured with the flexible-electrogoniometer during 6hrs of a normal day. A pedometer measured the mobilisation rate (steps/min).

**Results:** The MAS was unchanged. However, physical function tests improved considerably and stairs were only possible after PRS. The mean thoracic angle was reduced and the range of movement was increased. Mobilisation rate and the mean frequency of spinal movement over 6hrs increased but coronal frequency during walking decreased.

**Conclusions:** Strengthening the TES improved function, range of movement and mobility and induced greater trunk stability during gait. Further study is warranted.

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## 097

### Barriers and enablers to implementation of best practice stroke rehabilitation guidelines for physiotherapists at the Bankstown-Lidcombe Hospital stroke unit

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**Question:** What barriers and enablers exist for physiotherapists in the implementation of best practice stroke rehabilitation guidelines for 1) sitting balance training and 2) treadmill training with body weight support at the Bankstown-Lidcombe Hospital stroke unit?

**Design:** Qualitative analysis of barriers and enablers to implementation of best practice guidelines identified via a focus group interview.

**Participants:** Five physiotherapists working on the stroke unit at Bankstown-Lidcombe Hospital were interviewed in August 2010.

**Outcome measures:** Barriers and enablers to implementation of best practice stroke guideline recommendations for 1) sitting balance training and 2) treadmill training with body weight support were extracted from a tape recording of a focus group interview.

**Results:** Barriers included entrenched habits and attitudes, lack of skills and knowledge, and lack of time and resources. Enablers included staff motivation and commitment to deliver evidence based practice.

**Conclusion:** Specific barriers and enablers to implementation of best practice guidelines for stroke rehabilitation by physiotherapists working at the Bankstown-Lidcombe Hospital stroke unit were identified. Strategies to address these barriers and improve compliance with guideline recommendations will be discussed.

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## 098

### Factors influencing the concept of recovery post-stroke: survivor and carer perspectives

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**Questions:** What are the factors that contribute to recovery post-stroke from the perspective of people who have had a stroke and their primary informal carers? Which of these factors present modifiable aspects that could be recommended to be addressed in community-based rehabilitation practice?

**Design:** Qualitative methodology via focus group sessions.

**Participants:** Fourteen community-dwelling participants were included in this study: 8 people who have had a stroke, and 6 associated carers.

**Analysis:** The focus group sessions were recorded and transcribed, and the data was coded using thematic analysis from which emerged main themes and sub-themes from a sequence of categories.

**Results:** Two main themes became apparent from the data: (1) Self-identity, and (2) Dyad relationships. The contributing sub-themes were: Essential elements of recovery, Returning home, and the Environment of rehabilitation. For people who have had a stroke, the term 'recovery' referred to both returning to previously valued activities and observing continued improvement over time. The predominant contentions to arise from this study surround

the concepts of 'returning to normality' for the person who has had a stroke, and the 'tension of providing care' for primary informal caregivers.

**Conclusion:** There is need to acknowledge the views of consumers and carers, and to utilise their perspectives to augment rehabilitation processes, especially during the transition phase from hospital to the home setting. Models of community-based care should adopt a rigorous client-centred approach, incorporating such strategies as individualised goal-setting to target valued activities, and active engagement of carers throughout the rehabilitation process.

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## 099

### Community mobility and falls after discharge from stroke rehabilitation

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**Questions:** How well do people with stroke walk in their home and community after discharge from rehabilitation? Does walking and standing balance capacity at discharge predict falls or avoidance of mobility tasks after discharge?

**Design:** Follow-up observational study.

**Participants:** Thirty community dwelling people with stroke who could walk unassisted when discharged.

**Outcome measures:** 6-Minute Walk Test, Four Square Step Test, Step Test, Environmental Analysis of Mobility Questionnaire, Falls Efficacy Scale-International and self-reported falls.

**Results:** Walking endurance significantly improved between discharge and follow-up: (MD = 110.1 m; 95% CI 70.8 to 149.4). Levels of avoidance for mobility tasks varied (Environmental Analysis of Mobility Questionnaire median = 2, IQR 1.3 to 2.9). Falls were reported by 12 (40%) participants. The cut-off scores calculated that identified people at risk of falling were: a fail or taking more than 15s on the Four Square Step Test; less than 10 steps on the Step Test; and walking less than 250m on the 6-Minute Walk test. These cut-off scores showed good sensitivity and specificity for falls. People performing below the cut-off values at discharge avoided more mobility tasks and were more concerned about falling at follow-up.

**Conclusion:** Walking endurance can improve after discharge from stroke rehabilitation. Despite this, people with stroke remain below average for walking endurance and many avoid mobility tasks in the home and community. Falls are common post discharge, and maybe predicted using cut-off values for clinical tests of dynamic standing balance and walking endurance.

## 100

### Conditions and consequences of falling in community-living people with Parkinson's disease

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Yee Chien Tay, The George Institute of International Health

**Questions:** Under what conditions do people with Parkinson's disease living in the community fall? What are the consequences of falls?

**Design:** Prospective observational study.

**Participants:** Two hundred and fourteen people with idiopathic Parkinson's disease who could walk independently (with or without an aid) and had fallen in the past year or were assessed to be at risk of falls.

**Outcome measures:** Fall data were prospectively collected for each individual over a 6-month period. Number of falls, location, activity, causes, and injuries suffered were recorded using a "falls calendar" verified by monthly follow-up phone calls.

**Results:** One hundred and forty three (67%) of the 214 participants reported falling one or more times: 39 (18%) participants fell once, 30 (14%) participants fell twice and 74 (35%) participants fell 3 or more times. A total of 1759 falls were reported. At least one fall when "on" medication was reported by 97% of fallers. The majority (88%) of the 1759 falls occurred at home and most falls (79%) were during weight-bearing activities such as standing, walking or turning. No injuries were reported for 87% of falls and 9 falls resulted in a fracture.

**Conclusion:** Falls are common and often recurrent in people with Parkinson's disease living in the community. The majority of falls occurred at home, when "on" medication and while walking. Clinical trials are needed to determine whether physiotherapy interventions can reduce falls in people with Parkinson's disease.

## 101

### Balance, mobility and falls risk in adults with cerebral palsy—what do we know?

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**Question:** What is known about balance dysfunction, falls risk factors and mobility in adults with cerebral palsy (CP)? Are there differences in balance and mobility between adults with CP who report gait decline and those who do not? Are there differences in balance and falls risk between adults with CP of different mobility levels?

**Design:** prospective observational study.

**Participants:** Twenty-five ambulant community dwelling adults with CP (mean age 41yrs), Gross Motor Function Classification System levels I (n=5), II (n=16), and III (n=4).

**Outcome measures:** self-reported prior falls and mobility change, timed up and go (TUG), Berg Balance Scale (BBS), Falls Risk for Older People—Community setting (FROP-Com), 6 minute walk test (6MWT).

**Results:** Fifteen participants (60%) reported mobility decline since age 18 years. The most frequent cause was reduced balance (80%), followed by reduced fitness and strength. Seventeen participants (68%) reported prior falls, although only six were classified as medium or high falls risk (BBS) and five as mild-moderate falls risk (FROP-Com). Performance on TUG, 6MWT and BBS did not differ between those who reported mobility decline and those who did not ( $p > 0.05$ ). Group differences were found between GMFCS levels and falls risk (FROP-Com,  $p = 0.013$ ), balance (BBS,  $p < 0.001$ ), and mobility (6MWT  $p = 0.001$ ; TUG,  $p = 0.003$ ).

**Conclusion:** This study supports accumulating evidence that adults with CP experience mobility decline in early to middle adulthood, with reduced balance performance and elevated falls risk. There is urgent need for further research into falls risk factors in adults with CP using prospective falls data.

## 102

### Feasibility of the Nintendo Wii-Fit and its effect on endurance, gait and balance in people with an acquired brain injury

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**Question:** Is training using the Nintendo Wii-Fit feasible? Does a Wii-Fit intervention, implemented in addition to usual therapy, lead to improvements in endurance, gait and balance deficits in people with a traumatic brain injury?

**Design:** Randomised 8-week crossover trial.

**Participants:** Five people with a traumatic brain injury and four following stroke.

**Intervention:** Four weeks of Wii-Fit in addition to usual therapy and four weeks of usual therapy alone.

**Outcome measures:** Feasibility was measured by examining compliance (number and duration of sessions completed), adverse events and average and maximum heart rate during sessions. Endurance was measured using a six-minute walk test, spatiotemporal gait parameters using a GAITRite system and balance using the Balance Outcome Measure for Elder Rehabilitation (BOEMER).

**Results:** Compliance with the Wii-Fit sessions was high (99%), majority of sessions reached the target duration (82%) and there were no adverse events. Heart rate was within the recommended intensity for cardiovascular fitness. Following Wii-Fit, six-minute walk distance improved 34 m (95% CI -42 to 111) more compared to usual therapy. Comfortable and fast gait speed improved 0.23 m/s (95% CI -0.08 to 0.54) and 0.04 m/s (95% CI -0.22 to 0.3) more respectively. BOEMER score improved 2 points ( $z = -1.46$   $p = 0.14$ ) more following Wii-Fit.

**Conclusions:** Wii-Fit is feasible to use in people with an acquired brain injury. Four weeks of Wii-Fit in addition to usual therapy, appears to improve endurance, gait and balance.

## 103

### Vestibular impairment following an Acquired Brain Injury: what does this mean for the person?

Maggie Killington

Julianne Stobie

Jane Kahlbaum

Kirsty Speck

Jolanta Fabian

Debbie Edwards

**Question:** What are the emotional and psychological responses experienced by community dwelling individuals who have vestibular impairments due to their acquired brain injury?

**Design:** A qualitative exploratory study was undertaken. Participants were interviewed using an interview guide so that questions were asked that were relevant to the topic; but provided flexibility so that each participant could discuss any issue relevant to their situation.

**Participants:** Six community living individuals, who experienced vestibular symptoms following an acquired brain injury which affected their engagement in chosen activities, were recruited into the study.

**Analysis:** A qualitative thematic analysis was undertaken. Interview summaries were checked by participants for accuracy prior to two researchers analysing the data separately to enhance dependability. Finally the two researchers collaborated to sort data, impose order, deal with rival explanations, make inferences, draw conclusions and attach meanings.

**Results:** A number of key themes emerged including identity, sense of self and changed perceptions of others. Many participants reported lack of recognition of the symptoms of a vestibular impairment by people in their close circle and wider community, including health personnel, and this lack of awareness resulted in confusion and frustration for clients.

**Conclusion:** Insights gained from this investigation may provide credence to individuals' attempts to understand and report their symptoms. Also, if clinicians better understand the emotional and psychological effects of a vestibular deficit, they may be able to better support their clients.

## 104

### Do the Upper and Lower lumbar regions move separately during sit-to-stand?

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Wim Dankaerts, Dept of Rehabilitation Sciences Faculty of Kinesiology and Rehabilitation Sciences University of Leuven, Belgium

**Question:** Is regional lumbar spine movement (upper and lower) important during sit-to-stand and are they affected by Body Mass Index, age and gender?

**Design:** Observational within and between subjects study.

**Participants:** Twenty-nine healthy adults.

**Outcome measures:** Lower, upper and combined lumbar flexion measured during sit-to-stand using an electromagnetic measurement device. Average minimum, maximum and excursion (range) were calculated for each lumbar region and compared using repeated measures ANOVA and linear regression.

**Results:** Regional differences were significant for maximum ( $p < 0.001$ ) and excursion angles ( $p < 0.001$ ). Maximum lower lumbar angles accounted for 61% ( $p < 0.001$ ), maximum upper lumbar angles accounted for 8% ( $p = 0.14$ ) of combined lumbar angle variance. Lower lumbar excursions accounted for 83% ( $p < 0.001$ ) but upper only 2% ( $p = 0.42$ ) of combined excursion variance. Age ( $p = 0.88-0.99$ ) and Body Mass Index ( $p = 0.19-0.89$ ) demonstrated no additional effect on angles. Gender showed no effect on maximum angles overall ( $p = 0.71$ ) however females achieved a more flexed maximum mean upper lumbar position ( $p = 0.01$ ). Males and females also had different mean lumbar excursions ( $p = 0.04$ ) with females having greater upper ( $p = 0.046$ ) and males' greater lower excursions ( $p = 0.003$ ).

**Conclusion:** This is the first study to demonstrate regional differences in the lumbar spine during sit-to-stand. Modeling the lumbar spine, as a single segment does not appear to adequately represent two functionally independent regions as indicated by the effect of gender on the lumbar spine during sit-to-stand.

## 105

### Effects of wearing a dynamic ankle orthosis on mobility and postural sway in people with Multiple Sclerosis

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**Question:** What is the effect of wearing a dynamic ankle orthosis (DAO) on functional mobility and balance in moderately disabled people with Multiple Sclerosis?

**Design:** Randomised cross over trial.

**Participants:** Twelve subjects (7 females, mean age 51 years) with moderate disability due to MS (Expanded Disability Status Scale score 3–6).

**Intervention:** Three separate assessment sessions each involving one of three 6 minute tasks presented in random order: (1) seated rest, (2) the six-minute walk test (6MWT) with a DAO (Foot-Up, Ossur) worn on the most affected ankle, and (3) 6MWT without a DAO. Postural sway was measured before and after each 6 min task by the trajectory of marker on the C7 vertebra using an 8 camera motion capture system (Vicon, UK). Differences between mean

sway parameters for the 3 assessment sessions were tested using a repeated measures ANOVA ( $p < 0.05$ ).

**Outcome Measures:** 6 minute walk test distance & postural sway.

**Results:** There was no significant difference in distance walked ( $383 \pm 130\text{m}$  vs  $374 \pm 133\text{m}$ ) for the 6 min walk tests performed with and without the DAO, respectively. However, postural sway (C7 path length) was significantly greater after walking without the DAO ( $p = 0.019$ ).

**Conclusion:** This preliminary data shows that DAO did not afford any functional benefit in terms of distance walked, however it can minimise increases in postural sway induced by walking.

## 106

### Health-related quality of life and caregiver strain in caregivers of people with Parkinson's disease

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**Questions:** Is there a relationship between caregiver strain and the health-related quality of life of caregivers of people with Parkinson's disease? Is there a relationship between caregiver strain and the health-related quality of life of the care recipient living with Parkinson's disease?

**Design:** Cross sectional observational study.

**Participants:** The sample was 97 ambulant Australian adults with Parkinson's disease and their caregivers ( $n=97$ ). Most caregivers were senior citizens with 65% over 60 years of age, and the majority (83%) were spouses of people with Parkinson's disease.

**Outcome measures:** Health-related quality of life data were obtained from caregivers and care-recipients using the EuroQol-5D. Health-related quality of life data were also obtained for care recipients using the Parkinson's Disease Questionnaire 39. Caregiver strain was evaluated using the Modified Caregiver Strain Index.

**Results:** No significant relationship was found between caregiver strain and care giver health-related quality of life using the EuroQol-5D. A moderate correlation was found between caregiver strain and care-recipient health-related quality of life using the Parkinson's Disease Questionnaire 39 ( $r_s=0.43$ ,  $p<0.001$ ). A weaker yet statistically significant negative correlation was found between caregiver strain and care recipient health-related quality of life ( $r_s=-0.18$ ,  $p=0.042$ ) using the EuroQol-5D.

**Conclusion:** Caregiver strain was significantly associated with reduced health-related quality of life of care recipients. Further investigations are recommended to examine these relationships in greater detail.



## 107

### Perinatal variables and motor outcome in non disabled ELBW children up to 12 years

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**Questions:** Which Perinatal events have relationship with motor outcome of ELBW infants at 1, 4 and 12 years? Which perinatal events best predict motor outcome at 12 years?

**Design:** Retrospective Audit study.

**Participants:** Fifty four ELBW infants (weighing <1000 gram) born at Mater Mother Hospital Brisbane, between 1992–1994, <29 weeks of gestation without any diagnosed neurological problems such as Cerebral Palsy, were included in this study.

**Outcome measures:** Perinatal variables, NSMDA and MABC score were audited from the children hospital files. Children with NSMDA score were classified as normal to mild movement dysfunction. Children with MABC score <5th centile was described as having definite motor problems.

**Results:** Mean (SD) gestation was 26.3 ( $\pm 1.9$ ) weeks and birth weight was 745.0 ( $\pm 144.7$ ) grams. Chronic Neonatal Lung Disease (CNLD) and Necrotising Enterocolitis (NEC) were correlated with motor outcome at 1, 4 and 12 years ( $r = 0.56$  to  $0.34$ ). Multiple regression analysis showed motor outcome at 12 years to be independently related to CNLD ( $p = 0.002$ ).

**Conclusion:** Motor outcome in non disabled children born ELBW is significantly related to CNLD and therefore ongoing surveillance is required for ELBW children diagnosed with CNLD.

## 108

### The validity of the Developmental Coordination Disorder Questionnaire for Kuwaiti children aged 5–9 years old

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Jan Piek, Curtin University, Perth

Lynn Jensen, Curtin University, Perth

**Question:** Is the developmental coordination disorder questionnaire/07 (DCDQ'07) a valid tool to detect motor difficulties for Kuwaiti children?

**Design:** Cross-sectional study.

**Participants:** Using a school-based population sample of 294 children (147 boys and 147 girls; mean age 92.89 months SD14.28 months).

**Method:** Parents completed the DCDQ'07 and consented their children to be assessed using the Movement Assessment Battery for Children – second version (MABC-2).

**Results:** DCDQ'07 had high internal consistency ( $\alpha = 0.87$ ) and significant correlation between the DCDQ'07 and the MABC-2 ( $r(292) = 0.22, p < 0.001$ ). However the construct validity did not meet and the fit of the component structure of the DCDQ'07 was poor. The sensitivity (42.4%) and specificity (78.97%) of the DCDQ'07 did not reach the state the value here referable value.

**Conclusion:** The DCDQ'07 was reliable and valid screening tool to be used in Arabic language to Kuwaiti children aged 5–9 years old. However, the Arabic translation needs to be revised and reworded based on the cross-cultural adaptation of instruments considering the adjustment of cultural words and idioms. Although the sensitivity and specificity did not reach the referable value suggested by American Psychiatric Association, its ability to detect 42% of Kuwaiti children from school-based population is worth considering especially that its agreement with the MABC-2 exceed the 50% and there is no one screening tool used before in Kuwait whether for parents or teachers to help in initial identifying children with motor coordination problems.

## 109

### The Neuromotor Behavioural Assessment (NMBA) for neonates at risk of developmental problems: the relationship with Cranial Ultrasound findings and the Neurosensory Motor Developmental Assessment (NSMDA) at 1 and 4 years

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**Background:** The Neuromotor Behavioural Assessment (NMBA) is an instrument to screen infants at risk of neurodevelopmental problems. It involves minimal handling of the infants, and can be completed and written up in about 15 minutes. The aim of the study was to compare the results of the NMBA with routine neonatal cranial ultrasound findings and also with the results of Neurosensory Motor Developmental Assessment (NSMDA) at 1 and 4 years

**Method:** 106 infants (GA < 28 weeks and/or BW < 1000grams) born July 1999 to October 2002 had an NMBA performed at 35 weeks corrected age and were classified as normal, suspect or abnormal. The results were compared with ultrasound results (normal or abnormal) and NSMDA at 1 and 4 years (normal, mild, moderate or severe disability). Cross tabulations with the weighted kappa value was used to assess the agreement between the NMBA and cranial ultrasound findings, and the results of the NSMDA at 12 months and 4 years.

**Results:** The kappa value of .33 and .303 while statistically significant suggest only fair agreement between NMBA at 35 weeks and NSMDA at 1 and 4 years. The cranial ultrasound kappa value was .69, demonstrating strong agreement with the NMBA.

**Conclusions:** The NMBA has been shown to agree strongly with cranial ultrasound results, but less evidence from this study to support its use as a predictive tool for later development. It provides information to the physiotherapist in the neonatal unit upon which to base early intervention strategies which may improve longer term outcomes.

## 110

### Quantification of risk of bleeding associated with physical activity in boys with haemophilia: A case-crossover study

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Julie Curtin, Department of Haematology, The Children's Hospital at Westmead

Simon Brown, Department of Haematology, Royal Children's Hospital, Brisbane

**Questions:** By how much does physical activity increase the risk of bleeds in boys with haemophilia? What is the relationship between factor levels and risk of bleeds? What is the induction period for bleeds caused by physical activity?

**Design:** Case-crossover study nested in a prospective cohort study.

**Participants:** 105 boys with moderate or severe Haemophilia A or B aged 4–18 years.

**Outcome measures:** Bleeds were monitored with weekly text messages over a one year period. Following a bleed, the child or parent was interviewed to determine exposures to physical activity in the 8 hour period immediately preceding the bleed and in 8 hour periods on the preceding two days. Factor levels were estimated with a pharmacokinetic model.

**Results:** The mean bleeds incidence (N = 434 bleeds) was 5.6 bleeds per person-year. Exposures to physical activity were higher in the period shortly preceding bleeds. Category 2 activities (e.g. soccer, surfing) transiently increased odds of bleeding by a factor of 2.7. Category 3 activities (e.g. judo, ice skating) transiently increased odds of bleeding by a factor of 3.7. The odds of bleeding were reduced by 2% for every 1% increase in factor level. Most bleeds caused by physical activity manifest within one or two hours of activity.

**Conclusion:** The transient risk of bleeds is moderately increased by physical activity. Careful scheduling of factor supplementation may reduce risk of bleeds associated with most activity to acceptable levels.

**Funding:** NHMRC.

## 111

### Quality of life of children with Joint Hypermobility Syndrome

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Roger D Adams, The University of Sydney

**Question:** Do children with Joint Hypermobility Syndrome who complain of knee pain have reduced quality of life compared to the general Australian paediatric population and children with Charcot-Marie-Tooth disease?

**Design:** Cross-sectional study

**Participants:** Twenty nine children aged 7–16 years presenting to a tertiary medical institution with Joint Hypermobility Syndrome and knee pain.

**Intervention:** The Child Health Questionnaire, a validated multidimensional generic quality of life measure, was completed by each participant's parent.

**Outcome measures:** Twelve 100 point domains within the Child Health Questionnaire measuring the child's physical, emotional and social well-being.

**Results:** Children with Joint Hypermobility Syndrome demonstrated significantly worse quality of life scores in all physical health domains ( $p \leq 0.005$ ) than that reported in the literature for normal Australian children. These children scored significantly worse than "normal" children particularly in the bodily pain domain (mean difference = 37.5 points, 95% CI 28.95 to 46.05,  $p < 0.0001$ ), and the physical functioning domain (mean difference = 22.69 points, 95% CI 14.42 to 30.96,  $p < 0.0001$ ). They also scored significantly worse than children with Charcot-Marie-Tooth disease in the bodily pain domain (mean difference = 20.8 points, 95% CI 11.79 to 29.81,  $p < 0.0001$ ).

**Conclusion:** Children with Joint Hypermobility Syndrome and knee pain have markedly reduced well-being compared to the general Australian paediatric population. This reduced quality of life is similar to or worse than that reported in children with Charcot-Marie-Tooth disease. A quality of life measure may be a useful instrument for physiotherapists evaluating the effectiveness of treatment methods in clinical and research settings.

## 112

### Does risk for developmental coordination disorder affect perceived competence and social acceptance in preschool children?

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Susan R Hillier

Adrian Esterman

**Questions:** Does the self-perceived competence and social acceptance of four year old Australian children at risk for Developmental Coordination Disorder (DCD) differ from those not at risk? Does gender influence the relationship?

**Design:** Observational study.

**Participants:** One hundred and eighty-six four year old preschool children (60 girls and 126 boys) screened for DCD using a two-step procedure. Fifty six children scored at or below the 15th percentile on the Movement Assessment Battery for Children, confirming their risk for DCD.

**Outcome measures:** The Pictorial Scale of Perceived Competence and Social Acceptance (PSPCSA) for children aged four to seven years. Resultant scores for each of the four domains (cognitive and physical competence and peer and maternal acceptance) range from one to four with higher scores indicative of more confident perceptions.

**Results:** Mean scores for each PSPCSA domain were lower for children at risk for DCD than children not at risk. Statistical significance was reached for perceived physical competence ( $p = 0.035$ ) and peer acceptance ( $p = 0.005$ ). Girls at risk for DCD had lower maternal acceptance than boys at risk for DCD ( $p = 0.002$ ). Differences in other domains between boys and girls at risk for DCD were not statistically significant.

**Conclusion:** Preschool children at risk for DCD have begun to perceive themselves to be less physically competent than their peers and less accepted by them. This finding supports early identification of children at risk for DCD so that services can be instigated to minimise the secondary effects.

## 113

### Idiopathic congenital talipes equinovarus the patient journey

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**Question:** How can we improve the journey for families of children diagnosed with idiopathic congenital talipes equinovarus?

**Design:** Retrospective observational study.

**Participants:** Forty-one families of children diagnosed with idiopathic congenital talipes equinovarus and treated partly or wholly at the Sydney Children's Hospital, Randwick.

**Intervention:** Questionnaires were sent to 84 families of children with idiopathic congenital talipes equinovarus.

**Outcome measure:** Effect of current level of information and support received by families in terms of timeliness, stressfulness, equipment provision, compliance and satisfaction.

**Results:** Questionnaires were returned by 41 families, a response rate of 49%. 90% had a prenatal diagnosis of talipes equinovarus at ultrasound of which 51% were not offered a prenatal appointment with a paediatric orthopaedic surgeon or a specialist clinic. 66% reported they wanted more information than was given. Casting started within the first three weeks from birth in 95% of responses. 93% proceeded to percutaneous tenotomy, 66% of which were performed in the clinic setting. The use of three brands of boots and bar brace was identified. A cost benefit analysis demonstrated a significant saving to the hospital if patients were fitted with the 'Ponseti AFO/Mitchell brace' at the commencement of the four year bracing period. 29% attended the newly created physiotherapist lead specialist clinic of which 92% reported this as a positive experience.

**Conclusion:** Management of babies with congenital talipes equinovarus needs a timely, consistent and coordinated approach. Our new physiotherapist lead clinic is effective and efficient and has improved the journey for our families.

## Reduced muscle strength and power in children with cystic fibrosis compared to children developing typically

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Christine Wilson, Royal Children's Hospital, Brisbane

Pauline Watter, The University of Queensland, Brisbane

**Question:** Is there a difference in muscle strength and muscle power in children with cystic fibrosis compared to children developing typically?

**Design:** Comparative observational study.

**Participants:** Thirty-seven children with cystic fibrosis (outpatients  $n = 27$ ; inpatients  $n = 10$ ) and 37 children developing typically were matched for age and gender. Ages ranged 7–12 years.

**Outcome measures:** Handheld myometry of strength of two upper limb muscle groups (elbow flexors, shoulder abductors) and four lower limb muscle groups (ankle dorsiflexors, knee extensors, hip extensors, hip abductors); field tests of muscle power of the upper limbs (seated ball throw) and lower limbs (vertical jump height).

**Results:** No significant differences were found between groups with respect to height, weight or body mass index ( $p = 0.05$ - $0.93$ ). Children with cystic fibrosis displayed significantly reduced strength of shoulder abductors and ankle dorsiflexors, and significantly reduced power of upper and lower limbs ( $p < 0.001$ - $0.03$ ). There were no significant differences in performance on other muscle strength measures ( $p = 0.31$ - $0.93$ ). Children with cystic fibrosis in the outpatient group showed no significant differences compared to the inpatient group for age, height, weight and body mass index, or muscle strength and power ( $p = 0.37$ - $0.95$ ).

**Conclusion:** The observed reductions in muscle strength and muscle power in children with cystic fibrosis compared to children developing typically supports the rationale for a proactive approach to assessment and intervention to address potential changes and optimize function in this population across the increasing lifespan.

## Participative Ergonomics Program effectiveness for 'food service' workers: a pilot study

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**Background:** A high incidence of musculoskeletal disorders (MSDs) and multiple MSD risk factors were identified in a group of hospital 'food service' employees.

**Objectives:** A pilot study was undertaken over 7 months in 2010 to identify (1) MSD risks for 'food services' workers and (2) the efficacy of a participative ergonomics program in reducing MSD risk.

**Method:** Ergonomic analysis involving a multi-mode risk assessment was performed by a Physiotherapist. This included a pre-intervention application of a standardised posture analysis tool and surveying a sample of workers for discomfort, work-load and psychosocial factors using previously published survey instruments. Numerous MSD risks were identified. An ergonomics change team was formed from a range of stakeholder representatives to consider possible interventions for reducing MSD risks. Nine controls involving work modification were trialed including task rotation, pacing, communication strategies, and engagement of an organisational Psychologist. Eleven other interventions were proposed, but not trialed. All measures were repeated post-intervention.

**Results:** There were no significant changes in work postures, self-reported discomfort, workload or psychosocial factors post-intervention ( $p > 0.05$ ). Limited stakeholder engagement, funding constraints and unclear stakeholder responsibility, accountability and decision-making authority were among multiple barriers identified to the implementation of effective risk treatments.

**Conclusions:** Stakeholder engagement and management support are key components of participatory ergonomics programs. The early identification of barriers to full engagement must be identified and overcome for successful MSD prevention. Further research with a longer follow-up period is recommended. Analysis of safety culture may help identify and address workplace barriers.

## The impact of a workplace-based weight loss program on work-related outcomes in overweight male shift workers

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Robin Callister, Newcastle University

Simon J Mitchell, Tomago Aluminium

**Objective:** To evaluate the impact of a workplace-based weight loss program (Workplace POWER-WP) for male shift workers on a number of key work-related outcomes.

**Method:** A randomized controlled trial of 110 overweight/obese (BMI 25–40) (mean [sd] age = 44.3 [8.6] years; BMI = 30.5 [3.6]) male employees at an Aluminium Smelter, aged 18–65. In October 2009, men were randomized in their work departments to either (i) WP program ( $n = 65$ ) or (ii) a 14-week wait-list control group ( $n = 45$ ). The WP program consisted of one 75 minute information session, program booklets, group-based financial incentives and instruction on how to use the study website for three months. Men were assessed at baseline and at 14-week follow-up for weight, BMI, quality of life, sleepiness, presenteeism, absenteeism and workplace injuries.

**Results:** Retention was 81%. Intention-to-treat analysis using linear mixed models revealed a significant intervention effect for weight after 14 weeks ( $P < .001$ ; Cohen's  $d = .34$ ). Significant treatment effects were also found for quality of life (mental) ( $P = .01$ ;  $d = .74$ ), presenteeism ( $P = .01$ ;  $d = .56$ ), absenteeism ( $P = .01$ ;  $d = .72$ ) and injuries ( $P = .04$ ;  $d = .50$ ). No significant group differences ( $P > .05$ ) were found for quality of life or sleepiness ( $d = .26$ ).

**Conclusion:** The WP program resulted in clinically important weight loss and improved a number of important work-related outcomes including presenteeism, absenteeism, quality of life and led to fewer on-the-job injuries in overweight male shift workers.

## Results of on site occupational health physiotherapy interventions in a manufacturing environment

David R Worth, ROSH

**The environment:** A manufacturer of automotive interiors with 250 employees working in line with Holden SA line. Products include seating, overhead systems, carpets and aftermarket.

**The problem:** at 2005, 76 open claims requiring vocational rehabilitation, 55 workers compensation claims in 2005, 12 employees requiring surgery for musculoskeletal disabilities, limited early intervention strategies, reactive approach to safety, culture of disbelief in company commitment to safety.

**Intervention:** In 2005 Rosh implemented its integrated injury management and prevention system at the South Australian division. This consisted of an occupational dictionary, job safety assessment, task demand analysis, training needs analysis, manual task competencies, ergonomic assessments, ergonomic guidelines for design of processes and equipment and on site early intervention physiotherapy management 3 days per week. The job safety assessment identified hazards and risk rated tasks, the task demand analysis classified and colour coded tasks by load and risk of injury to specific body parts. Controls for hazards within the hierarchy of controls were implemented with ratings higher than 3 on a scale from 0 to 6 mandated to engineering for implementation.

**Results:** at end of 2009 there was a 94% reduction in open claims requiring vocational rehabilitation, 27% reduction in workers compensation claims, 4 workers on rehabilitation, changed safety culture, layered safety audits, management review, safety committee review, management audits, management review, safety committee review, management direction on safety expectations, measured goals around safety performance, commitment to the on site integrated program. The on site integrated injury management and prevention system has been adopted by the company nationally.

## 118

### Making participatory ergonomics work at the coalface: from the corporate office

Karen N Davies, Queensland Health

**Questions:** What strategy and supporting material is needed to ensure a participatory ergonomics program can be implemented efficiently and effectively in Queensland Health, for manual tasks risk management? How can the program integrate the regulator's current participatory ergonomics program?

**Design:** Workplace policy intervention targeting manual tasks (not patient handling).

**Participants:** Queensland Health ergonomics coordinators, as the agents of change in their local work areas. Managers, supervisors and workers in local work areas where high risk manual tasks are performed. Queensland Health has approximately 80,000 workers spread across roughly 180 facilities in Queensland, many of whom perform high risk manual tasks.

**Outcome measures:** The program is to result in a shift toward effective and efficient manual tasks risk management in high risk work areas in Queensland Health.

**Results:** A toolkit was developed, containing resources designed to address barriers and provide enablers to a local participatory ergonomics program. The toolkit contains frequently asked questions, process diagrams, performance indicators, a readiness checklist and risk assessment tools. An awareness and professional development program was implemented with ergonomics coordinators. The resources developed by the regulator were integrated into the program and a close working relationship fostered. After 12 months, there has been some progress in local activities but a significant shift will take some time.

**Conclusion:** It is possible to develop and implement a strategy to enable a change in practice to use of a participatory ergonomics approach in a very large and geographically dispersed healthcare organisation. Widespread adoption of the approach will take time.

## 119

### Gross motor development at one year of age in children with congenital talipes equinovarus treated with the Ponseti method

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**Question:** The use of boots and bar is an essential component of the Ponseti method for treatment of congenital talipes equinovarus. Physiotherapists have debated that wearing of this brace may lead to delayed gross motor development. Do these children have comparable gross motor development to age norms?

**Method:** Pilot, observational study on a consecutive series of children. Two experienced physiotherapists assessed the gross motor development at 10–12 months of age, using the Alberta Infant Motor Scale and the Ages and Stages Questionnaire.

**Participants:** Children with idiopathic congenital talipes equinovarus, 10–12 months of age who are compliant with the Ponseti treatment.

**Outcome measures:** The primary outcome of developmental delay was defined as gross motor development less than two standard deviations below the mean on the Alberta Infant Motor Scale. We also sought to determine if those children identified with gross motor delay had concurrent reported delay in other developmental areas as measured on the Ages and Stages questionnaire.

**Results:** Eleven children were assessed. Two were identified with gross motor delay. Both of these children had reported concurrent delay in other areas suggesting that their delay may be global in nature.

**Conclusion:** Early data suggest that Ponseti treatment for congenital talipes equinovarus does not cause gross motor developmental delay in otherwise normally developing children.

## 120

### A review of developmental outcomes at 2 years for extremely preterm or extremely low birthweight infants

Jane L Orton, The Royal Women's Hospital

Alicia J Spittle

Jennifer McGinley

**Question:** What are the developmental outcomes at 2 years of age for extremely preterm or extremely low birth weight children?

**Design:** Review with data from quantitative studies synthesised in a narrative format.

**Population:** Infants born extremely low birth weight (<1000g) or extremely preterm (<28 weeks) who are assessed at 2 years of age.

**Outcome measures:** Standardised assessment of developmental outcomes and/or assessment of neurosensory impairment. Assessment time point from 18 months to 30 months corrected age.

**Results:** A systematic search of Medline, Cinahl and Embase 1995 to 2011 was undertaken. Nineteen studies were identified, all of which were cohort studies. The methodological quality was good for the majority of studies. There was some variability in infant population characteristics and the follow up rates range from 55% to 99%. There were 6 single centre studies, 6 multicentre, 4 geographic cohort and 3 with a national cohort. Seven studies had more than one time epochs. The most commonly used developmental assessment tool was the Bayley Scales of Infant Development however the definition of disability and severity varied between studies. Rates of Cerebral Palsy range from 5% to 23% at 2 years in the extremely low birthweight or extremely preterm population. The rates of disability were higher than the norm and increased with decreasing gestational age.

**Conclusion:** Follow up of extremely low birth weight or extremely preterm infants at 2 years is important as these infants are at considerable risk of developmental delay or disability.

## The test-retest reliability of the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition, Short Form in pre-primary children

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Leon M Straker, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University of Technology, Perth

Lynn M Jensen, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University of Technology, Perth

**Question:** What is the test-retest reliability of the Bruininks–Oseretsky Test of Motor Proficiency, Second Edition, Short Form (BOT-2-SF) in assessing motor competency in pre-primary children?

**Design:** Test-retest within subject.

**Participants:** One-hundred and seventy-four children aged four to six years attending pre-primary schools in metropolitan and regional Western Australia. Data were collected as part of a randomized controlled study investigating the effect of an intervention program, "Animal Fun".

**Measures:** Bruininks–Oseretsky Test of Motor Proficiency, Second Edition, Short Form (mean inter-test interval = 4.66 months, SD = 0.36).

**Results:** Data from the control schools only were used. Pre- and post-test mean (SD) Standard Scores were not significantly different ( $t = 1.50$ ,  $p = 0.14$ ) and were significantly moderately correlated ( $r = 0.59$ ,  $p = 0.00$ ). The Descriptive Category data showed 67.8% (pre-test) and 69.1% (post-test) of children had an average level of motor competency. Based on cross-tabulation and Kappa statistics the BOT-2-SF had moderate reliability (percentage agreement = 63.8%,  $\kappa = 0.41$ ). With the PABAK statistic = 0.94, the BOT-2-SF was indicated to have almost perfect test-retest reliability. However in depth analysis of the 14 items revealed that some items had floor and ceiling effects that affect interpretation of the BOT-2-SF scores.

**Conclusion:** Examiners using the BOT-2-SF are advised to use clinical judgment to accurately identify children aged four to six years in need of intervention.

**Conclusion:** This is the first study to document airway management for CSCI in Australia and is the first worldwide that provides data on extubation failure rates in this high risk cohort. Although external validation of the CART using an independent data set is necessary, potentially this algorithm is a useful aid in clinical decision making regarding airway management for patients with CSCI.

## Respiratory intervention in acute tetraplegia: a retrospective review of physiotherapy practice

Brooke M Wadsworth, Physiotherapy Department, Princess Alexandra Hospital

Claire M Hackett, Physiotherapy Department, Princess Alexandra Hospital

Emily M Iliff, Physiotherapy Department, Princess Alexandra Hospital  
Peter S Kruger, Intensive Care, Princess Alexandra Hospital

**Question:** What respiratory physiotherapy interventions do patients with tetraplegia receive on acute hospital admission?

**Design:** Retrospective review of medical records.

**Participants:** Twenty-seven patients with acute tetraplegia, admitted within 48 hours of injury from 2006–2009 to Intensive Care, Princess Alexandra Hospital.

**Intervention:** None.

**Outcome measures:** Neurological classification, cause of tetraplegia, surgery, intubation, extubation, tracheostomy and physiotherapy intervention.

**Results:** 25 of 27 patients were male and the mean age was 37 years. AIS neurological level was divided into C4 or above (60%) and C5-T1 (40%). Intubation occurred in 89% of patients at a mean time of one day post injury, with mean intubation length of three days. The mean number of physiotherapy treatments was 2.1 in the 24 hours prior to first extubation and 12 in the 72 hours after successful first extubation. 26% failed one extubation and were reintubated at a mean time of 31 hours later. Three patients failed a second extubation and progressed to tracheostomy. Mean length of stay in ICU was 25 days with tracheostomy compared to six days for patients who did not require a tracheostomy. Documented physiotherapy interventions included cough assist machine 56%, manual cough assist 86%, IPPB 89%, NIV 7%, percussion 15%, vibrations 89% and positioning 48%.

**Conclusion:** This retrospective review highlights the incidence of respiratory insufficiency and considerable involvement of respiratory physiotherapists with this patient group. Whether further education and the development of standardised clinical care pathways would improve outcomes is yet to be investigated.

## A classification and regression tree to assist clinical decision making in airway management for patients with cervical spinal cord injury

Susan C Berney, Austin Health, Melbourne Victoria

Ian R Gordon, Statistical Consulting Service, The University of Melbourne

Helen I Opdam, Austin Health, Melbourne Victoria

Linda Denehy, School of Health Sciences, The University of Melbourne

**Questions:** What factors influence clinical decision making in airway management for patients with acute cervical spinal cord injury (CSCI) in Australia? Can these factors be used to develop an algorithm to guide clinicians in decision making regarding airway management?

**Design:** Prospective observational.

**Participants:** One hundred and fourteen patients with CSCI who required intubation and mechanical ventilation and who were admitted to ICU in three tertiary hospitals in Melbourne between October 2004 and May 2009 and two other interstate hospitals between December 2004 and December 2005.

**Outcome measures:** Airway management was recorded as well as the rates of extubation failure. The clinician responsible for the airway management for each patient was asked to identify and rank factors that influenced their decision.

**Results:** Tracheostomy insertion occurred in 68 patients (59.6%). Using classification and regression tree (CART) analysis, three variables were identified that best predicted whether patients were extubated or required insertion of a tracheostomy. Forced vital capacity, the volume of pulmonary secretions and gas exchange were predictive of airway management on 82.3% of occasions. The extubation failure rate using this model was 8.7%.

## Oncology in the intensive care unit: a case study

Kim M Meden, Mater Adult Hospital, Brisbane

Alison M Tooth, Princess Alexandra Hospital, Brisbane

**Background:** Two patient groups increasingly surviving serious illness are cancer and intensive care unit survivors, but both may experience significant future impacts on their health.

**Questions:** Can a past history of cancer effect a patient's intensive care management later in life for an unrelated condition? What are the implications of prior bleomycin exposure for a patient with severe acute respiratory failure? **Design:** Single case review.

**Patient History:** A 33 year old man was admitted to intensive care with severe community acquired pneumonia. After a trial of non-invasive ventilation he deteriorated and required mechanical ventilation with high concentrations of oxygen. Previously, he had received treatment for metastatic testicular cancer with bleomycin, which in combination with oxygen therapy increases the risk of developing interstitial pneumonitis and pulmonary fibrosis. After his condition stabilised he was ventilated on FiO<sub>2</sub> 0.21, requiring high Positive End Expiratory Pressure (PEEP) and alterations to standard cardiorespiratory physiotherapy treatment.

**Results:** Weaning from mechanical ventilation occurred over a period of eight days in response to haemodynamic and chest radiographic improvements. Intensive care and hospital length of stay were 11 and 13 days respectively.

**Conclusion:** In this case, the immediate risk to life outweighed the potential risk of pulmonary fibrosis but oxygen was weaned at a much quicker rate than usual. Typical ventilatory weaning strategies and physiotherapy were modified considering risk of harm. Advancements in care have led to improved critical illness survival rates however when two events such as cancer and critical illness meet, management can be somewhat more complicated.

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### Expect the unexpected: a novel case of respiratory failure in neuromuscular disease

Alison M Tooth, Princess Alexandra Hospital, Brisbane

Kim M Meden, Mater Adult Hospital, Brisbane

**Background:** Neuromuscular weakness conditions are a common cause of respiratory failure and admission to intensive care, requiring frequent cardiorespiratory physiotherapy treatments to assist weaning from ventilation. Failed extubation can impact significantly on morbidity and hospital length of stay.

**Question:** When extubation failure occurs despite optimal medical and physiotherapy management, what other factors may be at play? How might two separate but concurrent neuromuscular conditions impact on recovery from respiratory failure?

**Design:** Single case review.

**Patient history:** 69 year old male with known facioscapulohumeral muscular dystrophy but no previous hospital admissions presented to the emergency department with acute onset of weight loss, dysphagia, dysarthria and absent gag reflex. He reported a history of declining exercise tolerance but was independent in gait and activities of daily living. Past history included osteoarthritis, proximal upper limb weakness and ataxia. Within 24 hours of admission, his condition progressed to aspiration pneumonia, respiratory arrest, acute pulmonary oedema and sepsis. He was admitted to intensive care and underwent bronchoscopy, seven days of mechanical ventilation and intensive physiotherapy. Extubation failed due to fatigue and secretion retention despite a barrage of physiotherapy treatments including mechanical insufflation-exsufflation. After reintubation and surgical tracheostomy, further investigation of his bulbar dysfunction revealed a new diagnosis of myasthenia gravis.

**Results:** After plasmapheresis he was successfully weaned and decannulated, despite a weak cough and vital capacity of 0.8 L.

**Conclusion:** When there is failure to improve despite optimal medical and physiotherapy management or an atypical presentation, consider the possibility of an alternate or additional diagnosis.

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### Long term implications following extracorporeal membrane oxygenation post hypoxic brain injury

Haylee J Kajewski, Queensland Health

**Objectives:** To investigate the possible long term consequences post extracorporeal membrane oxygenation and review the potential functional implications.

**Design:** Single Case Study Reflection.

**Participant:** 18 year old current inpatient of a slow to recover rehabilitation unit who suffered a hypoxic brain injury secondary to cardiac arrest and underwent extracorporeal membrane oxygenation during her intensive care stay.

**Outcome Measures:** Passive range of motion of upper and lower limbs measured by goniometer. Modified Ashworth Scale to measure tone and spasticity of upper and lower limbs. The Clinical Outcomes Variable Scale and mobility items of the Functional Independence Measure were used to review functional aspects of recovery. Measurements were taken on initial admission to rehabilitation and 20 months post admission.

**Results:** Passive range of motion, tone and spasticity demonstrated minimal improvement. Function also remained largely unchanged with Clinical Outcomes Variable Scores improving slightly from 15/91 to 17/91 and Functional Independence Measure mobility scores remaining at 5/35.

**Conclusion:** This case study investigates some of the potential future consequences following extracorporeal membrane oxygenation. Extracorporeal membrane oxygenation is a relatively new, and very complex procedure undertaken in intensive care units and involves prolonged static positioning, of which the long term outcomes including effect on function and discharge planning have not been explored within the physiotherapy context. This single case study suggests that the consequences of prolonged positioning may have an impact on not only range of motion but also future function of the individual.

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### Long term outcomes of patients receiving extracorporeal membrane oxygenation for severe ARDS: a retrospective study

Carol L Hodgson, Monash University and Alfred Health

Kate Hates, Alfred Health

Tori Everard, Alfred Health

Vin Pelegrino, Alfred Health

**Questions:** What is the outcome of patients receiving extracorporeal membrane oxygenation (ECMO) for severe acute respiratory distress syndrome (ARDS) at The Alfred Hospital, Melbourne from 2009–2010.

**Design:** Retrospective observational study.

**Participants:** Twenty patients who had undergone ECMO for severe ARDS.

**Outcome measures:** Mortality, intensive care and hospital length of stay and quality of survival, including discharge destination, independence at discharge, and quality of life measures using the SF36 and EQ5D.

**Results:** Twenty patients received ECMO for severe ARDS during the 2 year period. The mean age was 36.3 ( $\pm 12.4$ ) years. Eighty-five percent were retrievals from other intensive care units (ICU) and more the half were positive for H1N1 (55%). Seventeen of the twenty patients survived (85%) hospital. The ICU and hospital length of stay was median 19.9 (IQR 14.5–29.0) and 26.5 (18.0–33.0) days respectively. Most patients were discharged to other hospitals, 40% returned to rural hospitals and 5% to a rehabilitation centre. Forty % of patients were discharged home, and those patients were described as independent at discharge by the physiotherapist. Seventeen patients developed pressure areas during their stay in intensive care.

**Conclusion:** This is the first study to investigate the quality of survival after ECMO for severe ARDS in Australia. The results show that the survival is good regarding the severity of the pathology. However quality of survival is varied particularly with regard to pain, anxiety and decreased usual activities up to 12 months after discharge.

## Endotracheal suction procedure leads to transient lung derecruitment in ventilated preterm infants

Judith L Hough, Australian Catholic University

Andrew D Shearman, Critical Care of the Newborn Program, Mater Medical Research Institute

Helen G Liley, Critical Care of the Newborn Program, Mater Medical Research Institute

Caroline A Grant, Paediatric Critical Care Research Group

Andreas Schibler, Paediatric Critical Care Research Group

**Question:** Does endotracheal suction lead to lung derecruitment in ventilated preterm infants?

**Design:** Prospective observational clinical study

**Participants:** Preterm infants receiving mechanical ventilation in the Neonatal Intensive Care Unit (NICU) were admitted into the study.

**Intervention:** Endotracheal suction via a valved suction port.

**Outcome measures:** Change in end expiratory lung volume ( $\Delta$ EELV) and ventilation distribution were measured in ventilated preterm infants using electrical impedance tomography (EIT). Ventilatory parameters were downloaded from the Dräger Babylog 8000+ ventilator and oxygenation was recorded from the bedside monitors. Recordings were taken before, during, and each 15 minutes for 2 hours after suction was performed.

**Results:** Twenty infants were studied with a mean [SD] gestational age 26.6 [1.9] weeks; age 1.9 [1.2] days. By 15 minutes post-suction and for at least the next hour, EELV was 2% higher than pre-suction. Resistance was significantly lower 15 minutes post suction than before suction (118 to 98 cmH<sub>2</sub>O/L/sec;  $p < 0.01$ ) and remained lower for the next 2 hours. Systolic blood pressure was significantly lower 15 minutes after suction than prior to suction (46.7 to 41.3 mmHg;  $p < 0.05$ ) but had returned to pre-suction levels within 30 minutes. No other differences in physiological or ventilatory parameters were found.

**Conclusion:** Disconnection of the flow sensor from the ventilatory circuit results in a reduction in lung volume which is exacerbated by endotracheal suction. This was accompanied by changes in resistance and systolic blood pressure.

## Physiotherapy in Australian level 3 Intensive care Units: a survey of current practice

Carol L Jones, NSCCAHS Gosford Hospital, School of Health Sciences, The University of Newcastle, Newcastle

Catherine L Johnston, School of Health Sciences, The University of Newcastle, Newcastle

Jennifer H Mackney, School of Health Sciences, The University of Newcastle, Newcastle

**Question:** What are the current clinical management practices used, staffing structures, and factors affecting the role of the physiotherapist, in level 3 intensive care units (ICU) in Australia?

**Design:** A cross-sectional, observational study using a purpose-designed anonymous written survey. Ethics approval was gained from the University of Newcastle HREC.

**Participants:** Senior physiotherapists working in level 3 ICUs in public and private hospitals in all Australian states/territories ( $n = 71$ ).

**Outcome measures:** A questionnaire was custom designed for the purpose of this study. The questionnaire contained 54 questions in five sections (participant and site demographics, physiotherapy service provision, physiotherapy intervention and factors impacting on practice). Results were analysed descriptively.

**Results:** A total of 57 responses were received (80%). There was wide variation in the provision of physiotherapy services and staffing levels for similarly sized units. Respiratory care techniques most commonly used included body positioning for improving pulmonary ventilation (100%), positioning for enhancing secretion clearance (96%), chest vibration (96%) and percussion (91%). Techniques most frequently employed in the management of the musculoskeletal system were joint positioning (79%) and passive range of motion exercises (78%). Tilt-tabling (83%) and early mobilisation of mechanically ventilated patients (85%) were also common. Physiotherapists identified a number of factors such as poor staffing as having significant impact on their role and practice in ICU.

**Conclusion:** Physiotherapy management practices used in ICU are variable. Further role definition and evaluation of physiotherapy service provision, particularly definition of adequate staff to patient ratios, is required.

## Factors affecting physiotherapy service provision in Australian level 3 Intensive Care Units

Catherine L Johnston, School of Health Sciences, The University of Newcastle, Newcastle.

Jennifer H Mackney, School of Health Sciences, The University of Newcastle, Newcastle.

Carol L Jones, School of Health Sciences, The University of Newcastle, Newcastle, NSCCAHS Gosford Hospital, Gosford

**Question:** What are the factors affecting the role of the physiotherapist in level 3 intensive care units (ICU) in Australia?

**Design:** A cross-sectional, observational study using a purpose-designed anonymous written survey. Ethics approval was gained from the University of Newcastle HREC.

**Participants:** Senior physiotherapists working in level 3 ICUs in public and private hospitals in all Australian states/territories ( $n = 71$ ).

**Outcome measures:** A purpose designed anonymous questionnaire was used to survey senior physiotherapists working in intensive care units in public and private hospitals in all Australian states and territories ( $n = 71$ ). A total of 57 responses were received (80%).

**Results:** Physiotherapists are members of the multidisciplinary team of health care professionals managing critically ill patients in intensive care. There is however, a lack of definition of the physiotherapist's role within critical care. The ICU environment is generally closely controlled with specific patient-staff ratios stipulated for medical and nursing staff. These recommendations do not extend to allied health professionals such as physiotherapists. Respondents to this survey reported large variations in physiotherapy staffing levels, hours of service availability and role definition. Physiotherapists identified a number of factors, including poor staffing, as impacting on their role and clinical practice in intensive care.

**Conclusion:** Physiotherapy staffing and service provision in ICU is variable. Further evaluation of the effect of this variation is needed to ensure a clearer definition of the role of the ICU physiotherapist, optimise physiotherapy service provision and inform recommendations for adequate staff to patient ratios.

## 131

### Early mobility of patients in intensive care. Can we change culture?

Meg E Harrold, Curtin University/Royal Perth Hospital

Steven AR Webb, Royal Perth Hospital

Ben Noteboom, Royal Perth Hospital

Tim Leen, Royal Perth Hospital

Teresa A Williams

Garry T Allison, Curtin University

**Question:** Is the introduction of an intensive care unit wide, early mobilisation program for patients who are mechanically ventilated for three or more days is safe and feasible?

**Design:** To enable a change in culture to occur within the unit, a before/after study design was chosen.

**Participants:** Patients were 16 years or older and were mechanically ventilated on three or more consecutive calendar days. The study aimed to evaluate a change in practice therefore there were no specific exclusion criteria, only the inability to meet inclusion criteria.

**Intervention:** The introduction of an intensive care unit early mobilisation protocol.

**Outcome measures:** The primary outcome of this intervention was the estimation of an adverse event rate. For the purpose of this study adverse events were defined as: increasing fraction of inspired oxygen requirement; increased requirement for vasopressors; unplanned line/tube removal; unplanned return to bed and falls. Secondary outcomes were the degree of change in the mobilisation levels occurring after implementation of the protocol. This was measured by the number of episodes of mobility; number of minutes spent out of bed; percentage of patients mobilised with an endotracheal tube in situ, dialysis in situ and/or vasopressor support in situ.

**Results:** The adverse event rate for the study was 2/1469 or 0.14%. The percentage of patients mobilised with endotracheal tubes, dialysis and vasopressor support all increased significantly.

**Conclusion:** Early mobilisation of mechanically ventilated adults is both safe and feasible.

## 132

### Development of a respiratory physiotherapy model for teaching clinical reasoning to students – The problem is “what is the problem?”

Lyndal J Maxwell, Faculty of Health Sciences, University of Sydney

Elizabeth E Ellis

Carolyn A Gates, Faculty of Health Sciences, University of Sydney

Bredge McCarren

Martin G Mackey, Faculty of Health Sciences, University of Sydney

Jennifer A Alison, Faculty of Health Sciences, University of Sydney

Physiotherapy students can have difficulty with clinical reasoning in relation to patients with respiratory disorders. This presentation will discuss a model developed to assist students with articulating and analysing ‘problems’ for patients with respiratory disorders. From a physiotherapist’s perspective a ‘problem’ could be expressed as pathology (and/or signs and symptoms); pathophysiology; a movement disorder; or the consequences of the disorder from the patient’s perspective. The variation in how problems are expressed is highlighted in cardiorespiratory physiotherapy texts where a problem may be stated in terms of signs and symptoms (pain, dyspnoea), pathophysiology (reduced lung volume, airflow limitation) and loss of function (reduced exercise tolerance). For physiotherapy students this means they must become ‘multilingual’ and the ‘problem’ depends on who they are talking to, which adds to the complexity of learning clinical reasoning. This model incorporates the concept that physiotherapists deal with movement disorders, and links this concept to two of the specific functions of the lung: gas exchange (O<sub>2</sub> and CO<sub>2</sub>) and airway clearance. The model is presented as a graphic organiser that visually aligns the anatomy, biomechanics and physiology of the respiratory system and can be situated within the WHO 2002 Classification of Functioning, Disability and Health (ICF) framework. This facilitates expressing a problem in the ‘languages’ of body structure and function; activity; or participation. Use of the ICF framework also introduces the student to the broader role of cardiorespiratory physiotherapy in preventative health care and health promotion.

## 133

### High-fidelity simulation (HFS) is a cost effective model for achieving physiotherapy competency in paediatric critical care

Kris A Kelly, Royal Children’s Hospital – Brisbane

Phillipa Neads, Queensland Skills Development Centre

Louisa Woolley, Royal Children’s Hospital – Brisbane

Alexandra Ferguson, Royal Children’s Hospital – Brisbane

Sarah E Wright, Royal Children’s Hospital – Brisbane

**Objectives:** Physiotherapists require advanced knowledge and skills-based training to work in isolation in the paediatric critical care (PCC) setting. To achieve this, best practise dictates annual competencies are demonstrated and documented. Patient factors, staffing resources and individual skill level and experience present limitations; these can be overcome by use of simulation. The use of self-directed, context specific HFS for physiotherapist competency is cost effective and more efficient compared to standard task-based evaluation (ST).

**Methods:** Over two consecutive six month periods, a time- and cost-analysis was performed regarding the two training/assessment paradigms. A range of measures were used, including training scheduled, training executed and progression to competency.

**Results:** 18 physiotherapists service PCC per year and require assessment (target 9 per 6 months). For ST 8 new-graduates and no experienced staff (time constraints) were trained; HFS 6 and 4 respectively with 1 failed attempt. Training was not executed on 38% occasions for ST, 83% due patient limitations. Average session time 57mins ST and 30mins HFS, with 1 achieving competency for ST and all for HFS. Cost for ST \$2253 (1 staff + 1 supervisor) and HFS \$2926 (1 staff + 2 supervisors), equating to \$282 and \$293 per person respectively.

**Conclusion:** Achieving competency requires clinical reasoning as well as technical skills. ST is limited by availability of appropriate patients at a time convenient to staff. HFS provides a safe, planned environment specific to the needs and capability of the individual. High-fidelity simulation dramatically increases staff completing annual evaluation without additional cost.



## 134

### High-fidelity simulation (HFS) in paediatric critical care: improving physiotherapists' confidence through competence

Kristine A Kelly, Royal Children's Hospital–Brisbane  
Phillipa Neads, Queensland Skills Development Centre  
Louisa Woolly, Royal Children's Hospital–Brisbane  
Alexandra Ferguson, Royal Children's Hospital–Brisbane  
Sarah E Wright, Royal Children's Hospital–Brisbane

**Objectives:** Safe and effective physiotherapy management in paediatric critical care (PCC) is maximised through regular assessment of technical skills. Feedback on performance has been shown to enhance confidence and competence. Adverse events in PCC often originate from lack of non-technical skills rather than technical aspects of performance. By modifying the Anaesthetists' Non-Technical Skills (ANTS) System\* to reflect physiotherapy skill taxonomies, Physiotherapist Intensive Care Non-technical Skills (PINTS) was developed. Used with HFS it rates physiotherapists' performance, providing immediate, structured feedback in a time-efficient manner.

**Methods:** 10 physiotherapists (6 new-graduate, 4 experienced) underwent two HFS scenarios. Pre- and post self-efficacy questionnaires and feedback forms were completed. Individuals received assessment and debriefing using the PINTS System for situational awareness, decision making, communication and team co-ordination.

**Results:** On Wilcoxon test, new graduates' self-efficacy demonstrated a significant increase for decision-making and communication (both  $Z = -2.12$ ,  $p = .034$ ). Experienced physiotherapists' self-efficacy increased but not significantly because of a ceiling effect. PINTS showed competency was achieved but compared with experienced physiotherapists, new graduates had significantly lower ratings in team skills ( $F(7) = 14.4$ ,  $p = .007$ ) and decision-making ( $F(7) = 6.2$ ,  $p = .007$ ). ANOVA demonstrated that new graduates took a significantly longer time than experienced physiotherapists to complete scenarios (ventilated  $F(1) = 14.82$ ,  $p = .005$ , non-ventilated  $F(1) = 25.74$ ,  $p = .002$ ).

**Conclusion:** HFS in conjunction with PINTS is a specific, effective tool for determining individual areas for development from novice to expert. Physiotherapists' technical and non-technical skills can be reviewed to improve self-confidence and competence.

[\*Fletcher et al. Anaesthetists' Non-Technical Skills (ANTS): Evaluation of a behavioural marker system. *Br.J.Anaesth* 2003 May;90(5):580-8].

## 135

### An additional eight hour of cardiorespiratory physiotherapy simulation does not improve clinical performance but may raise self efficacy

Anne Jones, James Cook University

**Question:** Does an additional eight hours of training using low fidelity simulation improve cardiorespiratory physiotherapy self efficacy?

**Design:** Randomised controlled trial with concealed allocation, and assessor blinding.

**Participants:** Fifty third year undergraduate physiotherapy students from James Cook University.

**Intervention:** The intervention group received two four-hour sessions of cardiorespiratory simulation in addition to their normal cardiorespiratory physiotherapy education prior to attending their clinical placements. The control group received no additional training.

**Outcome measures:** The outcome measures were clinical performance as measured weekly on placement with the Assessment of Physiotherapy Practice (APP) and self efficacy as reported using a questionnaire.

**Results:** Between group comparison was undertaken with no significant difference found between groups. Significant correlations between clinical performance and self efficacy were all positive for the control group and all negative for the intervention group.

**Conclusion:** This study indicated that simulation, as undertaken in this manner, did not improve clinical ability but may have raised self efficacy in the intervention group for cardiorespiratory physiotherapy.

## 136

### A description of physiotherapy student cardio-respiratory clinical placements

Wendy Chesworth, University of Canberra

**Questions:** What do physiotherapy students see and do on a typical cardio-respiratory placement? How many and what type of clients do they see? What are the most common conditions seen?

**Design:** Prospective, observational study.

**Participants:** 52 GEM students enrolled in a Master of Physiotherapy at the University of Canberra.

**Intervention:** Students completed a 36 criteria log required by the University for all clients seen during each placement.

**Outcome measures:** Client demographics, presentation, number and student role.

**Results:** Students saw 55.7 (95% CI 50.1 to 61.3) clients over a four week placement. Students managed 56.9% of all clients, assisted 34.4% and observed/discussed 8.7%. 47.3% of clients were seen once. The mean number of repeat sessions was 2.75. Most clients were male (55.2%). 50% of clients were aged 66 to 80 years; 32% 41 to 65 years and 11% over 80 years. 60.8% of clients were in-patients on a ward and 28% were outpatients (mostly cardiac or pulmonary rehabilitation). The proportion of clients seen in intensive care by each student ranged from 18 to 66%, with a mean of 23% of clients. The most common categories were: medical chests (21%); cardiac rehabilitation (17%); pulmonary rehabilitation (13%); cardiac surgery (11%); and abdominal surgery (11%). 8.2% of clients spoke English as a second language.

**Conclusion:** This study quantifies a physiotherapy student's typical cardio-respiratory placement and provides a reference point for comparison. Placements provide significant exposure to intensive care, cardiac and pulmonary rehabilitation. This information is useful for planning student clinical experience.

## 137

### You can lead a horse to water but... academic versus student perceptions of best research evidence dissemination for cardio-respiratory techniques

Lucy K Lewis, University of South Australia

Marie T Williams, University of South Australia

Tim S Olds, University of South Australia

**Question:** What educational processes are used to convey the best research evidence underpinning cardio-respiratory treatment techniques to entry-level physiotherapy students?

**Design:** Descriptive cross-sectional national survey.

**Participants:** Cardio-respiratory academics and final year physiotherapy students.

**Outcome measure:** Purpose designed instrument with demonstrated reliability (Cohen's Kappa 0.66-1.00) and validity (discriminated between different teaching exposures). The instrument collected information on how the best research evidence underpinning 13 cardio-respiratory techniques was disseminated to students (ranging from 'reference list was supplied' to 'best research evidence was specifically mentioned and assessed') and awareness of the evidence for two common treatment techniques.

**Results:** Seven Australian tertiary institutions ( $n = 293$  students,  $n = 6$  academics) were involved. For 11 techniques, academics reported the level of dissemination to be higher than reported by students. In terms of dissemination of the evidence, the majority of students preferred lectures and tutorials (69%) and printed material (63%), with academics reporting using these methods (lectures 83%, printed material 100%). Five out of six academics reported assessing students' knowledge of the evidence, most commonly in a clinical report (50%), oral presentation (50%), or written assignment (50%). Students preferred to be assessed on the evidence in an assignment (46%) or clinical report (40%). The majority of students (> 80%) were not aware of the availability of systematic reviews for two commonly used techniques (breathing control and the active cycle of breathing technique).

**Conclusion:** All academics reported conveying the evidence underpinning at least one technique to students. There were differing perceptions about what was taught between students and academics.

## 138

### Training conditions influence walking kinematics and self-selected walking speed in patients with neurological impairments

Gavin Williams, Epworth Hospital, Melbourne and School of Physiotherapy, The University of Melbourne

Ross Clark, School of Physiotherapy, The University of Melbourne

Anthony Schache, School of Mechanical Engineering, The University of Melbourne

Natalie A Fini, Caulfield Hospital, Alfred Health, Melbourne

Liz Moore, Epworth Hospital, Melbourne

Meg E Morris, School of Physiotherapy, The University of Melbourne

Paul R McCrory, School of Physiotherapy, The University of Melbourne

**Question:** Which method of gait training for people following acquired brain injury best replicates the biomechanics of normal able-bodied walking?

**Design:** Randomised, within-participant experimental study.

**Participants:** Seventeen people (10 male) with an acquired brain injury who required assistance to walk were recruited.

**Intervention:** Each participant was exposed to seven different gait training conditions in a randomized order. These included therapist facilitation, using gait aids, unsupported treadmill walking, and four variations of body weight support treadmill training.

**Outcome measures:** Quantitative gait analysis was performed and Gait Profile Scores generated for each participant to determine which condition most closely resembled biomechanically normal walking. Gait Profile Scores for each condition were compared using one-way repeated measures ANOVA. This analysis was also used to compare gait speeds across each condition to investigate variations in self-selected walking speed.

**Results:** Body weight support treadmill training without additional therapist or upper limb support led to significantly worse gait deviations (Wilks'  $\lambda = 0.20$ ,  $F(6,6) = 3.99$ ,  $p = 0.047$ ). With the exception of therapist facilitation, the gait training conditions that achieved the closest approximation to normal walking required self-support of the upper limbs. When participants held onto a stable handrail, self-selected gait speeds were up to three times higher than those obtained for overground gait training conditions (Wilks'  $\lambda = 0.17$ ,  $F(6,7) = 5.85$ ,  $p < 0.05$ ).

**Conclusion:** Gait training protocols may need to prioritize reduction in self-support of the upper limbs in order to transfer training gains to overground walking.

## 139

### Obstacle crossing following stroke improves over one month when the unaffected limb leads, but not when the affected limb leads

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Mary P Galea, The University of Melbourne

Noel Lythgo, RMIT University

**Question:** Does obstacle crossing improve as gait improves following stroke?

**Design:** Prospective observational study. The study was approved by the hospital ethics committee.

**Participants:** 20 people undergoing rehabilitation for a recent stroke.

**Outcome Measures:** Spatiotemporal variables were obtained via three dimensional motion analysis as participants stepped over a 4 cm high obstacle.

**Results:** Unobstructed gait speed increased between the two tests ( $p = .012$ ), confirming that gait had improved between the two test sessions. When leading with the affected limb no changes in speed or other spatiotemporal variables while crossing an obstacle were observed. When leading with the unaffected limb, crossing speed significantly increased ( $p = .003$ ), as did affected trail limb swing time ( $p = .03$ ). While not significant, there were trends for lead and trail limb preobstacle distance to increase ( $p = .08$ ) and lead step ( $p = .069$ ) and swing time ( $p = .052$ ) to decrease.

**Conclusion:** Obstacle crossing does not necessarily improve as walking improves. Even though unobstructed gait was faster, when subjects stepped over the obstacle with the affected limb first no changes in obstacle crossing were observed. In contrast, when leading with the unaffected limb, subjects crossed the obstacle faster and lead and trail limb preobstacle distances were increased. These findings suggest that there may be a need for more targeted training of obstacle crossing, particularly when leading with the affected limb.

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## 140

### High lower limb exercise dosage is possible after stroke and is associated with improved mobility on discharge from rehabilitation

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Catherine Sherrington, The George Institute of Global Health

Karl Schurr, Bankstown-Lidcombe Hospital

**Objective:** To describe the dosage of lower limb exercise that stroke survivors can complete during inpatient rehabilitation and explore the relationship of exercise dosage with mobility outcomes.

**Participants:** 200 people admitted to Bankstown-Lidcombe Hospital stroke unit with an acute stroke, who required rehabilitation prior to discharge.

**Outcome Measures:** The dosage of exercise was quantified by tallying the repetitions of each lower limb exercise completed. Outcomes were the change in walking velocity and the Motor Assessment Scale walking item score during the admission.

**Results:** The average daily dosage of lower limb exercise was 278 repetitions (SD 242, range 0 to 1153). The average improvement in walking velocity during admission was 0.42m/s (SD 0.45). Univariate linear regression indicated that 30% of the variability in change in walking velocity was explained by the average daily exercise repetitions. Thirty-nine percent of the variability in walking velocity change was explained by a multivariate model including level of disability ( $p < 0.01$ ), co-morbidities ( $p = 0.13$ ), cognition ( $p = 0.52$ ), age ( $p = 0.03$ ), admission walking velocity ( $p < 0.01$ ) and average daily exercise repetitions ( $p < 0.01$ ). After correcting for other factors, for every hundred repetitions of lower limb exercise completed in a day there was an additional change in walking velocity of 0.08 m/s (95% CI 0.06 to 0.11,  $p < 0.01$ ).

**Conclusion:** Large dosages of lower limb exercise are possible after stroke and seem to relate to improved mobility outcomes. Caution in interpreting these results is needed due to possible confounding factors.

## Community mobility relates to walking speed post stroke: an observational study

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Austin Health, Melbourne

Noel Lythgo, RMIT University, Melbourne

Wayne Dite, Royal Talbot Rehabilitation Centre:  
Austin Health, Melbourne

Meg E Morris, The University of Melbourne, Melbourne

**Questions:** How does walking speed on level and sloped surfaces differ between people with stroke and healthy matched controls? Does community mobility relate to walking speed in people with stroke?

**Design:** Prospective observational study.

**Participants:** Fifteen community dwelling participants with stroke were compared to 15 healthy controls matched for age, sex and height.

**Outcome measures:** Walking speed was measured on level and sloped surfaces using the GAITRite system. Community mobility was self-reported using the Environmental Analysis of Mobility Questionnaire. This test rates the amount of "avoidance" and "encountering" of common tasks from 1 (never) to 5 (always).

**Results:** People with stroke walked significantly ( $p < 0.001$ ) slower on all surfaces than controls (eg. mean difference on level surface = 67.6 cm/s, 95% CI 45.0 to 90.1). Community mobility was reported to be significantly less for participants with stroke than controls ( $p < 0.001$ ). Median (range) Environmental Analysis of Mobility Questionnaire Avoidance scores were: 2.2(1.4 to 4.7) for stroke and 1.1(1 to 2) for controls. Encounter scores were: 2.6(1.5 to 4.1) for stroke and 4.1(3.5 to 5) for controls. For people with stroke, walking speed related strongly to both Avoidance ( $r_s = -0.81$ ) and Encounter ( $r_s = 0.81$ ) scores.

**Conclusion:** People with stroke walk slower on slopes and level surfaces than healthy matched controls. More avoidance and less encountering of common mobility tasks were associated with slower walking speeds in people with stroke. Attention to walking speed should occur in stroke rehabilitation as this may have implications for community mobility.

## Stroke physiotherapy outcomes in Queensland: 2001 to 2011

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Paul Bew, Subacute and Residential Services,  
Metro North Health Service District, Brisbane

Greg Morrison, Physiotherapy Department,  
Princess Alexandra Hospital, Brisbane

Sandra G Brauer, School of Health and Rehabilitation Sciences,  
The University of Queensland, Brisbane

**Questions:** Is there any difference in the characteristics of people with stroke admitted for rehabilitation between 2001 and 2011 in Queensland?

**Design:** Prospective cohort study with three data sets.

**Participants:** 600 patients admitted for inpatient rehabilitation following stroke in three cohorts (2001, 2005 and 2011).

**Outcome measures:** Routine physiotherapy clinical and demographic information was recorded including age, gender, length of stay, discharge destination and admission and discharge Motor Assessment Scale scores.

**Results:** In 2001, people admitted for physiotherapy rehabilitation following stroke were younger, 71 (SD 14) vs 74 (SD 11) years old; and had a longer length of stay, 43 (40) vs 36 (28) days than in 2005. In 2011, patients were younger, aged 68 (15) years. In 2001, 82% of participants were discharged home and nearly all (95%) were discharged home in 2011. Gender, diagnosis and time from onset of stroke to admission to rehabilitation were consistent across the cohorts. Admission Motor Assessment Scale scores were on average half a point higher for rolling, lying to sitting, sitting balance, walking and upper limb function in 2001 compared to 2005. In 2011, Motor Assessment Scale scores were the same or slightly higher compared to 2001.

**Conclusion:** It appears that there have been some changes in the characteristics of people admitted for physiotherapy rehabilitation following stroke from 2001 to 2011 in Queensland. In 2005, stroke survivors tended to be older and have lower functional ability compared to 2001. But in 2011, people admitted for rehabilitation had comparable functional ability to 2001.

## Development of a chronic stroke resource kit – putting evidence into practice

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Melissa A Thompson, St. Vincent's Hospital Melbourne

**Background:** In Australia, stroke is a leading cause of long-term, permanent disability. Issues of depression, limited participation in community life and poor quality of life are well documented in the literature pertaining to chronic stroke. There is evidence that community-based rehabilitation interventions can maintain or improve functional status, reduce depression, facilitate participation, and enhance health-related quality of life in chronic stroke survivors. There is an ongoing requirement for engagement of healthcare resources into the chronic phase post-stroke with a focus on client-centred and goal-directed practice.

**Objective:** To develop a resource toolkit for community-based clinicians that offers evidence-based guidelines regarding assessment, treatment, and overall management of survivors into the chronic phase post-stroke.

**Design:** The toolkit addresses the topics of: depression, health-related quality of life, goal setting, functional decline, falls prevention, cognitive issues, carer needs and prevention of secondary complications. A screening assessment tool accompanies the kit, in addition to an assessment and management summary for referrers, such as general practitioners.

**Conclusion:** This presentation relates to Stages 1 and 2 of this project, which involved a literature review of current evidence-based practice, and the development of a Chronic Stroke Resource Kit, inclusive of preliminary testing of components. The implementation

and evaluation of the tool more widely across Victoria forms Stage 3 of the project, under the auspices of the Subacute Committee of the Victorian Stroke Clinical Network. The development and use of this resource toolkit across Victoria will assist high quality care for chronic stroke survivors within the community setting.

## 144

### Levels of physical, cognitive and social activity are low and stable during a two week period of stroke rehabilitation

Heidi Janssen, University of Newcastle and Hunter New England Health

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Julie Bernhardt, National Stroke Research Institute

Patrick McElduff, Hunter Medical Research Institute

Michael Pollack, University of Newcastle and Hunter New England Health

Neil J Spratt, University of Newcastle and Hunter New England Health

**Questions:** What proportion of the day do patients recovering from stroke spend engaged in physical, cognitive and social activity? How much do activity levels change over a two week period? Where and with whom do patients spend the majority the day? How much of their day is spent alone and inactive (no physical, cognitive or social activity)?

**Design:** Longitudinal observational study.

**Participants:** Fourteen patients recovering from a stroke in a typical rehabilitation ward.

**Outcome measures:** Behavioural mapping was used to quantify the proportion of a 12 hour day engaged in each activity, time spent in each location and with various people over a two week period.

**Results:** On average the 14 patients spent 28% of the day in physical, 5% in cognitive and 32% in social activity. Over two weeks, there was a 4% increase in physical activity ( $p=0.29$ ), a 0.6% increase in cognitive activity ( $p=0.72$ ) and 3% decrease in social activity ( $p=0.35$ ). The majority of the day was spent by their bedside (78%) and with their visitors (17%). Fifty two percent of the day was spent alone and 36% of the day was spent alone and inactive.

**Conclusion:** This is the first study to quantify the physical, cognitive and social activity of patients recovering from a stroke in a rehabilitation setting. Activity levels are low and relatively stable over time.

## 145

### Does physiotherapy based on the Bobath concept, in conjunction with task practice, achieve greater improvement in walking ability in people with stroke compared to physiotherapy focused on structured task practice alone? A pilot RCT

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Gerlinde Haase, Germany

Gerhard Rothacher, Germany

Susan M Cotton

**Objective:** To compare the short-term effects of two physiotherapy approaches for improving ability to walk in different environments following stroke: (i) interventions based on the Bobath concept, in conjunction with task practice, compared to (ii) structured task practice alone.

**Method:** The study design is a randomised controlled trial conducted in two rehabilitation centres, in Melbourne Australia and Gailingen Germany. Twenty six participants between four and twenty weeks post stroke, able to walk with supervision indoors, were randomly allocated to two groups. Both groups received six one hour physiotherapy sessions over a two week period. One group received physiotherapy based on the Bobath concept, including one hour of structured task practice. The other group received six hours of structured task practice. The primary outcome measure was an adapted six minute walk test, incorporating a step, ramp and uneven surface. Secondary measures were gait velocity and the Berg Balance Scale. Measures were assessed before and after the intervention period.

**Results:** Following the intervention, there was no significant difference in improvement between the two groups for the adapted Six Minute Walk Test (89.9 (SD 73.1)m Bobath versus 41 (40.7)m task practice,  $p = .07$ ). However, walking velocity showed significantly greater increases in the Bobath group (26.2 (SD 17.2) m/min versus 9.9 (SD =12.9)m/min,  $p = .01$ ). No significant differences between groups were recorded for the Berg Balance Scale ( $p = .2$ ).

**Conclusion:** This pilot study indicates short-term benefit for using interventions based on the Bobath concept for improving walking velocity in people with stroke.

## 201

### Pre-operative characteristics have a stronger relationship with patient outcomes than inpatient progress following total knee joint replacement

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Lyn Pertich

Parveen Mulinti, Sandringham Hospital

Ann E Holland, Alfred Health and La Trobe University

**Question:** Do pre-operative characteristics or in-hospital progress affect patient outcomes following total knee joint replacement?

**Design:** Prospective observational study.

**Participants:** Forty patients who attended pre-admission screening clinic and underwent subsequent total knee joint replacement for osteoarthritis.

**Outcome Measures:** Passive knee extension, active knee flexion, quadriceps lag and knee circumference were measured at pre-admission clinic and on each day post-operatively until discharge from acute hospital. Daily adherence to a clinical pathway was documented. Anaesthesia type, drain tube presence, blood transfusion and analgesia type were recorded. The Risk Assessment and Prediction Tool was completed at pre-admission clinic. Discharge destination was recorded post-operatively.

**Results:** Poor pre-operative passive knee extension was associated with worse knee extension on hospital discharge ( $r = 0.61$ ,  $p < 0.001$ ). A similar relationship was evident between pre-operative active knee flexion and knee flexion on hospital discharge ( $r = 0.42$ ,  $p = 0.01$ ). There was no difference in acute length of stay between those who went home and those who went to inpatient rehabilitation (median 7 days in each group,  $p = 0.27$ ). The only significant predictor of discharge destination was the Risk Assessment and Prediction Tool ( $p < 0.001$ ). Inpatient factors such as meeting clinical pathway requirements, drain tube presence, anaesthesia type or sitting out of bed on day one did not affect length of stay.

**Conclusion:** Pre-operative characteristics had a stronger relationship to patient outcomes than inpatient progress following total knee joint replacement. Intervening pre-operatively to improve knee range of movement may improve a patient's outcome post-operatively.

## 202

### What effect does surgical approach in total knee replacement have on physical and functional outcomes? A randomized controlled trial

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Gwendolen A Jull, The University of Queensland

Philip A Dalton

Peter J Buttrum

Trevor G Russell

**Question:** Does the choice of surgical approach in total knee replacement affect physical and functional outcomes?

**Design:** Single centre, randomised controlled trial with concealed allocation, assessor blinding and intention to treat analysis.

**Participants:** 90 participants with knee osteoarthritis having total knee replacement eligible for the subvastus approach.

**Intervention:** The experimental group received the subvastus approach and the control group received the more commonly performed medial parapatellar approach. Both groups were assessed by physiotherapists pre-operatively and at 9 separate time points, including while in hospital, with an 18 months follow up period.

**Outcomes:** The primary outcome was the American Knee Society Score. Secondary outcomes were knee pain, extension and flexion range of motion, quadriceps lag, girth, Oxford Knee Score, 3 meter timed up and go test, days to straight leg raise, surgeon perceived difficulty, operation duration, tourniquet duration and length of stay.

**Results:** Analysis was undertaken on 76 participants revealing no significant difference with the primary outcome ( $p=0.076$ ; MP  $167.3\pm 36.6$ ; SV  $153.1\pm 36.6$ ) or any other outcome except for surgeon perceived difficulty, which favored the medial parapatellar approach ( $p=0.001$ ; MP  $3.3/10\pm 1.9$ ; SV  $5.4/10\pm 2.3$ ) and days to straight leg raise, which favored the subvastus approach by 0.9 days ( $p=0.044$ ; MP  $2.8\pm 1.9$ ; SV  $1.9\pm 1.6$ ).

**Conclusion:** While the subvastus approach did enable earlier straight leg raise, overall both procedure resulted in similar physical and functional outcomes in the medium to long term.

**Trial registration:** ACTRN12606000376549.

**Conclusion:** Though a 30-minute walk test is highly repeatable and illuminates the persistent subnormal ambulation seen post knee replacement, it is strongly predicted by the six-minute walk test, and the Timed up-and-go provides superior predictive ability for self-reported function. Serendipitously, this study supports the utility of the more typical (shorter) walk tests used to measure functional ambulation after knee replacement.

## 204

### Is the Step Quick Turn test a valid alternative to the timed up and go test in older transtibial amputees?

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**Background:** Turning is a difficult task for lower limb amputees and an objective clinical measure is essential. While the timed up and go test (TUG) is the widely employed test of balance and turning, the Step Quick Turn test (SQT) associated with the NeuroCom Balance Master® is an alternative that may assist in the understanding of turning. However its potential in lower limb amputees has not been explored as yet. This study aims to explore the validity and test-retest reliability of the SQT in older transtibial amputees.

**Design:** A cross-sectional study with repeated measures.

**Participants:** Fifteen transtibial amputees with a mean age of  $69.5\pm 6.5$  years completed the TUG and SQT on 2 occasions.

**Outcome measures:** SQT measures: the time (seconds) taken to complete 180° turn to the prosthetic and the sound side; the total sway (degrees) exhibited during the 180° turn (both sides) and, the time taken to complete TUG.

**Results:** The Spearman rank correlation coefficients were excellent between TUG and turn time of both sides ( $\geq 0.85$ ), turn sway of the prosthetic side (0.75), but only fair to good (0.58) for turn sway to the sound side. The ICC<sub>2,1</sub> (reliability) was excellent ( $\geq 0.85$ ) for all measures with an acceptable smallest real difference ( $< 30\%$  of mean) for the sound side measures.

**Conclusion:** All SQT measures were found to be reliable but the differences in the strength of the relationships between the sound and prosthetic side measures suggest underlying differences in the turning abilities in transtibial amputees.

## 203

### Is a thirty-minute walk test a useful measure of functional ambulation after knee replacement?

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Justine M Naylor, University of New South Wales

Jack Crosbie, University of Sydney

Ian A Harris, University of New South Wales

Anthony E Yeo, Ingham Institute for Applied Medical Research

**Questions:** What is the repeatability of a 30-minute walk test and comparative performance in patients 12–18 months after total knee replacement and in healthy age-matched controls? In patients, how does a 30-minute walk test correlate with shorter walk tests? Is a 30-minute walk test better at predicting self-reported function than shorter walk tests?

**Design:** Prospective, cross-sectional study.

**Participants:** 75 participants – 32 patients and 43 healthy age-matched controls.

**Outcome measures:** Thirty- and six-minute walk tests, Timed up-and-go, WOMAC function subscale.

**Results:** Thirty-minute walk distance was significantly shorter amongst patients (median 2862 m, 95% CI 2632 to 3063 m vs median 3066 m, 95% CI 2992 to 3145 m,  $p < 0.001$ ). Test-retest repeatability was high (ICC = 0.98, 95% CI 0.96 to 0.99). Amongst patients, correlations between the 30-minute walk distance and the shorter tests were strong (six-minute,  $r = 0.97$ ,  $p < 0.001$ ; Timed up-and-go,  $r = 0.82$ ,  $p < 0.001$ ). Multiple regression modelling found six-minute walk distance to be the only significant predictor ( $p < 0.001$ ) of 30-minute walk distance, explaining 96% of the variability. Only Timed up-and-go significantly predicted WOMAC function.

## 205

### Effect of an Intensive Rehabilitation Program-Delores-following Total disc Replacement

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This study compared clinical outcomes of people following Total Disc Replacement (TDR) who undertook an intensive rehabilitation program compared to a non-structured self-help program. 618 patients with single/multilevel degenerative disc disease who had single/multilevel arthroplasty or hybrid surgery (lumbar arthroplasty and arthrodesis) were prospectively studied. Diagnosis was confirmed by clinical history, MRI, electrophysiological studies, and discography. 184 patients (Mean age 45.3yrs) participated in intensive rehabilitation (Rehabilitation Group). 434 patients (Mean age 48.5yrs) had no organised rehabilitation (Control Group). Twice weekly interventions for 8–12 weeks included patient education, goal setting, psychological reinforcement, neurodynamics and activation of the local stabilisation system of the functional spinal unit –DELORES Rehabilitation Program. Measures included Visual Analogue Scale (VAS: 0–100) for Back/Leg Pain, Oswestry Disability Index (ODI:0–100) and Roland-Morris Disability Questionnaire (RMDQ:0–50). Patients were assessed pre-operatively and post-operatively (3, 6, 12 and up to 48 months). Data at baseline and 48 months reported. Back pain decreased from 71.3 to 16.8 (-76%, Rehabilitation) and from 74.1 to 23.9 (-68%, Controls). Leg pain decreased from 52.2 to 11.1 (-79%, Rehabilitation) and from 57.1 to 17.2 (-70%, Controls). The ODI score reduced from 45.5 to 11.5 after rehabilitation (-75%) and from 47.8 to 17.8 in the controls (-63%). RMDQ scores decreased from 16.2 to 2.6 in Rehabilitation Group (-84%) and from 16.1 to 5.0 in Control Group (-69%). Reduced pain and improved function were greater following intensive rehabilitation than following a non-structured self-help program. The clinical benefits of TDR can be enhanced by implementation of the DELORES rehabilitation program.

## 206

### Is there a difference in turning performance between older traumatic and dysvascular transtibial amputees as measured by the Step Quick Turn test?

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**Background:** Turning is an inherent challenge for all lower limb amputees as it demands a change in the direction of mobility without compromising stability. Clinical observations suggest that the turning performance of individuals with an amputation due to vascular problems is more compromised when compared with other amputees. To date, these differences have not been carefully quantified and thus the purpose of this study was to compare the turning performance between dysvascular and traumatic amputees.

**Design:** A cross-sectional case control study.

**Participants:** Twelve transtibial amputees (6 dysvascular and 6 traumatic) with a mean age of 69±6.2 years participated in the study.

**Outcome measures:** Measures generated from the Step Quick Turn test (SQT) performed on the Balance Master® force platform: the time (seconds) taken to complete a 180° turn to the prosthetic and sound side; the total sway (degrees) exhibited during the 180° turn to both sides and, the time (seconds) taken to complete the timed up and go test (TUG).

**Results:** Statistically (Mann-Whitney U) significant differences ( $p < 0.05$ ) were identified between the dysvascular and traumatic groups in turn time to the prosthetic ( $4.1 \pm 1.4$ ,  $1.7 \pm 0.46$ ) and sound sides ( $4.0 \pm 1.3$ ,  $2.1 \pm 0.5$ ). Similar results were also observed in turn sway to the prosthetic ( $70.7 \pm 14.2$ ,  $43.3 \pm 9.7$ ) and sound sides ( $72.5 \pm 16.1$ ,  $43.5 \pm 8.2$ ).

**Conclusion:** The instrumented measures associated with the SQT detected an inferior performance in turning in the dysvascular amputee group when compared to the traumatic amputees. However this was not the case with the conventional clinical measurement of turning balance (TUG).

## 207

### Scope for a 'one size fits all' rehabilitation approach after knee replacement? Heterogeneity in patient preferences makes this unlikely

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Jacqueline Milne, The University of NSW

Victoria W Ko, Orthopaedic Department, Liverpool Hospital

Ian A Harris, The University of NSW

Sam Adie, The University of NSW

**Questions:** What are patient preferences for rehabilitation after knee replacement amongst an experienced cohort? Is a 'one size fits all' approach possible?

**Design:** Qualitative study.

**Participants:** Public patients who had undergone sequential, bilateral knee replacement and who were exposed to different rehabilitation programmes after each procedure.

**Intervention:** Questions concerning treatment experiences, preferences and strength of attachment, and recommendations for service improvement, were asked via semi-structured group or individual interviews.

**Results:** Sixteen participants (100% of those eligible) participated. (average age, 64 y; average time between surgeries, 9 months; 8 males). Several exposure patterns (for first then second knee) were evident; primarily, group and 1-to-1 or group and home programme combinations. No overall preference for mode across the cohort emerged though there was an overall preference for treatment dose with participants preferring more than what is typically provided. All participants were strongly or moderately attached to their preferences. Participants revealed their decision for a particular therapy mode to be the outcome of a complex computation including the unique benefits perceived to be associated with different modes and the quality of patient-therapist interaction.

**Conclusions:** The differing benefits perceived by participants to be associated with alternative modes have varying degrees of importance at the individual level, possibly partly explaining the heterogeneity in treatment preferences. From the perspective of the healthcare provider, this means resource-driven service restructuring—such as a 'one size fits all' approach—may fall short of consumer expectation. Rather, there may be more value in identifying who befits what mode.

## 208

### An extensive physiotherapy program does have a better functional outcome after total knee joint replacement surgery

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**Question:** Does an extensive physiotherapy program have better outcome in patients after total knee joint replacement?

**Design:** Randomised, between-participant experimental study.

**Participants:** Sixty-two (36 F) adults. **Intervention:** A similar physiotherapy protocol including a supervised home exercise program and gentle soft tissue techniques on two groups of adults after discharge from hospital post total knee joint replacement surgery at their home over six weeks. The first group (n = 30) received 8 home visits (two visits in each of the first two weeks, followed by one visit over the following four weeks), the second group received one visit over six weeks.

**Outcome measures:** Pain (visual analogue scale), timed walking with one elbow crutch for 100 meters around the house without limping/discomfort (sec), range of motion in their affected/ surgical knee joint (degrees), timed static balance (eyes open, on floor, one finger on support, single leg stance on surgical leg) (sec), and timed moving up/ down 10 steps (sec).

**Results:** Compared to the second group, in the first group, pain was less (VAS = 2.3 vs 4.7) (p = 0.034), range of motion was more (93.25° vs 78.45°) (p = 0.023), static balance was better (25.55 sec vs 17.68 sec) (p < 0.01). There was no significant difference for timed walking and stairs.

**Conclusion:** Adding two home visits to the physiotherapy program post discharge from hospital in patients with total knee joint replacement will have a significant effect on some functional outcome such as pain, range of movement and balance.

## 209

### Spinal cord hyperexcitability in chronic musculoskeletal pain: a systematic review

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Michele Sterling, The University of Queensland

Andrew Stone, The University of Queensland

Bill Vicenzino, The University of Queensland

**Question:** Is there a difference in spinal cord excitability between people with chronic musculoskeletal pain conditions compared to healthy controls?

**Design:** Systematic review with meta-analysis of case-control observational studies.

**Participants:** Chronic musculoskeletal pain participants were categorised as (i) headache, (ii) fibromyalgia, (iii) osteoarthritic knee pain, or (iv) whiplash.

**Exposure:** Electrical stimulus was delivered to the sural nerve over the right lower limb in all participants.

**Outcome measures:** Nociceptive flexor reflex threshold.

**Results:** Eleven trials (involving 318 patients and 229 healthy controls) were suitable for inclusion in the meta-analysis. Agreement among the two reviewers was almost perfect (kappa = .919, p < 0.001). The methodological quality of the case-control observational studies had a mean score of 11.1 (range = 8–15) out of a possible 18 points. Compared to healthy controls, weighted standardized mean differences in NFR threshold were significantly lower in subjects with primary headache (-0.45; 95% CI -0.77 to -0.13, p = 0.005), fibromyalgia (-0.63; 95% CI -0.93 to -0.34, p < 0.001), osteoarthritic knee pain (-1.51; 95% CI -2.10 to -0.93, p < 0.001) and whiplash (-0.73; 95% CI -1.11 to -0.35, p < 0.001).

**Conclusion:** The nociceptive flexion reflex threshold is a more direct measure of spinal cord excitability which relies less on cognitive processes when compared to quantitative sensory testing. The results from this review support data from previous studies suggesting evidence of central hyperexcitability in people with chronic musculoskeletal pain.

## 210

### Evidence of spinal cord hyperexcitability in chronic lateral epicondylalgia

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Michele Sterling, The University of Queensland

Andrew Stone, The University of Queensland

Bill Vicenzino, The University of Queensland

**Question:** Is there a difference in spinal cord excitability between people with chronic lateral epicondylalgia and healthy controls? Does lateral epicondylalgia with positive neurodynamic test (radial nerve bias) display greater extent of spinal cord excitability compared to those without positive neurodynamic test?

**Design:** Case-control observational study.

**Participants:** Thirty-four (11F) lateral epicondylalgia participants and thirty-five (13F) healthy controls.

**Exposure:** Electrical stimulus was delivered to the sural nerve over the right lower limb in all participants.

**Outcome measures:** Nociceptive flexion reflex threshold.

**Results:** There was a significantly lower nociceptive flexion reflex threshold in the lateral epicondylalgia group compared to the control group (p = 0.03), after adjusting for age, gender and body mass index. The mean difference in nociceptive flexion reflex threshold between the lateral epicondylalgia and control group was 3.09mA (95% CI 0.316 to 5.87). There was no significant difference in nociceptive flexion reflex threshold between those with or without positive neurodynamic test (mean difference 2.4 mA, 95% CI -1.96 to 6.74, p = 0.270).

**Conclusion:** The results suggest evidence of spinal cord hyperexcitability in patients with lateral epicondylalgia, which is consistent with data from a recent review of other forms of chronic musculoskeletal pain (pooled mean difference 2.83 mA, 95% CI 1.31 to 4.35) from eleven trials; 318 patients and 229 healthy controls. Although those with positive neurodynamic test were not significantly different to those with a negative test, the magnitude of the difference was greater than reported between controls and musculoskeletal conditions.

## 211

### Reliability of pressure pain algometry is not affected by test protocol

Leanne M Bisset, Griffith University

Kerrie A Evans, Griffith University

**Question:** Are repeated measures of pressure pain threshold, and minimal detectable change, affected by test protocol?

**Design:** Observational study.

**Participants:** Two inexperienced testers; thirteen asymptomatic participants.

**Intervention:** Pressure pain threshold was measured by two testers using two different protocols: (1) three consecutive measurements over a single body location, repeated at four different body locations (cluster protocol) and (2) performing one measurement of pressure pain threshold over each body location (four in total), repeated three times (circuit protocol). Tester, body location, protocol, and direction of testing were randomized. A third person recorded all values obtained.

**Outcome measures:** Intra-class correlation coefficients, standard error of measurement, minimal detectable change scores.

**Results:** Both protocols were found to have good inter-rater reliability with coefficients ranging between 0.72–0.91 for the cluster protocol and 0.76–0.90 for the circuit protocol. Standard error of measurement values varied from 40kpa to 91kpa against an overall mean of 400kpa. There were no significant differences in intra-tester reliability for either protocol except when Tester 2 measured the left thoracic spine location using the circuit protocol (p = 0.01). There were significant differences between testers at one location using the cluster protocol and at two locations using the circuit protocol.

**Conclusions:** Both the cluster protocol and the circuit protocol have sufficient reliability for measuring pressure pain threshold in asymptomatic participants even when performed by different inexperienced testers. Depending on location, a difference of between 92kpa and 210kpa is necessary to be confident that a change in pressure pain threshold is not due to measurement error.

## 212

### Active spinal joint reposition task: A new interpretation of an old test

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William Gibson, School of Physiotherapy, Curtin Health Innovation Research Institute, Curtin University, Perth.

**Introduction:** The organisation of postural mechanisms may emerge from the interaction of task demands and individual factors. This study seeks to understand the effect specific task goals have on postural mechanisms during active spinal repositioning.

**Methods:** 17 controls and 17 participants with low back pain performed four sets of seven target-matching pairs of trials. Reposition accuracy and precision, and centre of mass sway amplitude were the dependent variables. Task demand (target versus matching) was an independent variable for sway amplitude.

**Results:** There was no significant difference in repositioning accuracy ( $p = 0.76$ ) and precision ( $p = 0.56$ ) between the two groups. Postural sway was significantly greater during the target, compared to the matching trials ( $p < 0.001$ ).

**Conclusion:** A typical postural sway may reflect the underlying coordinative dynamics of the body. A large sway could indicate the need to actively coordinate a large number of independent degrees of freedom. The goal of a target trial is to select from an infinite combination of spinal posture, a singular referent position. The goal of a matching trial aims to reproduce a predetermined spinal position. It is known that task goals may constraint coordinative dynamics. The need to match a referent position limits the number of possible postures the body could adopt. This reduces postural sway. A greater sway during a target trial emerges from the need to control a greater degrees of freedom to 'search' for the referent posture. This study furthers the understanding of the motor control requirements of a simple repositioning task.

## 213

### Quantitative sensory testing can identify a subgroup of unilateral lateral epicondylalgia with severe pain and disability

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Bill Vicenzino, University of Queensland

**Question:** Can sensory, motor and psychological factors distinguish those with severe pain and disability in unilateral lateral epicondylalgia?

**Design:** Cross-sectional, case-control cohort study, using cluster analysis to classify lateral epicondylalgia patients into mild, moderate or severe subgroups based on pain and disability (PRTEE).

**Participants:** 164 patients with unilateral lateral epicondylalgia and 62 age and gender matched healthy control participants.

**Outcome measures:** Quantitative sensory testing (pressure, thermal pain thresholds) at elbow, cervical and lower limb sites, pain-free grip, quality of life (EuroQol) and psychological factors (HADS, Tampa).

**Results:** Bilateral cold hyperalgesia ( $p < 0.004$ ) and unilateral heat hyperalgesia ( $p = 0.005$ ) were evident in severe lateral epicondylalgia compared to healthy controls. Bilateral and widespread mechanical hypersensitivity was present regardless of severity ( $p < 0.01$ ). Quality of life was significantly poorer in severe lateral epicondylalgia than those with lower pain and disability ( $p < 0.001$ ), while psychological factors did not differ between subgroups.

**Conclusion:** Lateral epicondylalgia patients with severe pain and disability could be distinguished by hypersensitivity to thermal stimuli. Findings may help identify reasons for delayed recovery in lateral epicondylalgia patients with severe symptoms, thereby leading to optimal treatments for this group with poorer quality of life.

## 214

### Can a multidisciplinary intervention of 6-weeks duration prove effective for chronic back and neck patients?

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Steven M McPhail, Centre for Functioning and Health Research, Brisbane

**Background:** Pain sensations amongst patients with chronic back and neck pain (CBNP) are believed to be influenced by non-mechanical factors such as psychological distress, depressive mood, hysteria, fear-avoidance and catastrophizing. Growing evidence supports a longer term multidisciplinary approach (MD) to management of chronic pain. No studies exist investigating interventions of shorter time frames in public hospital environments.

**Question:** Can an outpatient multidisciplinary intervention of 6-weeks duration prove effective for chronic back and neck patients?

**Design:** Non-randomized experimental study.

**Participants:** Forty-eight CBNP outpatients considered unsuitable for surgical management.

**Intervention:** The intervention consisted of education and exercise elements offered by physiotherapists and psychologists. This preliminary study investigated the effect of a 1-session/week for 6 weeks (18hrs total) offered in a Brisbane public tertiary hospital.

**Outcome Measures:** Responses to three instruments a) Assessment of Quality of Life (AQoL), b) Depression Anxiety Stress Scale (DASS) and c) Pain Self-Efficacy Questionnaire (PSEQ) were compared immediately pre and post intervention.

**Results:** Paired t-test during the interim analysis (first 35 participants) indicated a mean (SD) improvement in health utility (AQoL) of 0.058 (0.143),  $p = 0.023$  and PSEQ of 5.0 (13.8),  $p = 0.030$ . No significant change in DASS was observed. Regression analysis indicated a positive association between baseline DASS and change in AQoL health utility ( $p = 0.004$ ).

**Conclusion:** The MD intervention under investigation may represent a suitable approach to reduce health care costs associated with CBNP. Final results will be presented and discussed. Further investigation of this intervention using a randomised experimental design and comparator group is warranted.



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## 215

### A description of physiotherapy student orthopaedic clinical placements

Wendy Chesworth, University of Canberra

**Questions:** What do physiotherapy students see and do on a typical orthopaedic placement? How many and what type of clients do they see? How does this compare to other placements? What are the most common conditions seen?

**Design:** Prospective observational study.

**Participants:** 41 GEM students enrolled in a Master of Physiotherapy at the University of Canberra.

**Intervention:** Students completed a 36 criteria log required by the university for all clients seen during each placement.

**Outcome measures:** Client demographics, presentation, number and student role.

**Results:** Students saw 64 (95% CI 48.6 to 79.4) clients over a four week placement. 61% of clients were seen once. More clients were seen on this placement, compared with other placements (mean = 48.4, 95% CI 43.2 to 53.6, clients). 55.6% of clients were female. 39% were aged between 66 and 80 years. Six percent were below 17 years of age. Students tended to take an active role in managing clients (57.1% of all clients seen), compared with assisting (31.4%) or observing and discussing (11.5%). Knee replacement (25%), hip replacement (15%) and lower limb fractures (11%) comprised 51% of all clients seen. English as a second language accounted for 28.3% of all clients, rural or remote 4.4%, mental health 3% and Aboriginal or Torres Strait Islander people 0.8%.

**Conclusion:** This study quantifies a physiotherapy student's typical orthopaedic placement. Students have a high caseload and tend to manage clients, particularly joint replacement candidates. This information is useful for those training current and future physiotherapists.

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## 216

### A description of physiotherapy student musculo-skeletal clinical placements

Wendy Chesworth, University of Canberra

**Questions:** What do physiotherapy students see and do on a typical musculo-skeletal placement? How many and what type of clients do they see? How does this compare to other placements? What are the most common conditions seen?

**Design:** Prospective, observational study.

**Participants:** 49 GEM students enrolled in a Master of Physiotherapy at the University of Canberra. **Intervention:** Students completed a 36 criteria log required by the university for all clients seen during their musculo-skeletal clinical placement.

**Outcome measures:** Client demographics, presentation, number and student role.

**Results:** Students saw 58.3 (95% CI 45.2 to 71.4) clients over a four week placement. Students managed 52.4% of all clients, observed and discussed 27.5% and assisted with 20.1%. 57.9% of clients were seen once. Repeat sessions averaged 2.37 sessions. The clients had similar demographics. 50.6% of clients were male. 59% were aged between 18 and 40 years, and 28% between 41 and 65 years. 6.2% had English as a second language. The most common presentations were screening (16%), shoulder (11%), cervical spine (9%), lumbar spine (9%) and ankle/foot (8%).

**Conclusion:** This study quantifies a physiotherapy student's typical musculo-skeletal placement. Students saw fewer clients, observed or discussed a greater proportion of them and saw a larger variety of conditions than an orthopaedic placement. The proportion of clients being observed and discussed by students on placements needs to be monitored to ensure placements provide adequate and effective training opportunities. This information is useful for those involved in managing the training of physiotherapy students.

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## 217

### Joint manipulation curricula in Australian entry-level physiotherapy programs

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Robin Haskins, The University of Newcastle

**Background:** The practice of physiotherapy has long been associated with therapeutic manipulative techniques, with a growing body of evidence to support their inclusion. Physiotherapists are among a select group of health professionals that are lawfully permitted to perform cervical spine manipulation, however there is no specific accreditation requirement for Australian universities to teach these skills in entry-level programs. Despite much commentary concerning the minimum level of qualification needed to competently practise these techniques, very little is known about the current status of joint manipulation teaching in Australian physiotherapy entry-level programs.

**Method:** A descriptive cross-sectional survey of the musculoskeletal coordinators of all Australian entry-level physiotherapy programs identified by the Australian Physiotherapy Council was undertaken utilising Dillman's tailored design protocol.

**Results:** Fifteen musculoskeletal coordinators (60% male, mean age 43 years) representing 14 universities provided data on 18 (75%) of the 24 entry-level programs. Two-thirds of respondents considered joint manipulation to be an entry-level professional skill. Joint manipulation is included in the curricula of 78% (n=14) of the surveyed programs, of which thoracic and lumbar techniques are taught in all, with mid-lower cervical (38%), extremity (8%) and upper cervical (8%) manipulative techniques taught less commonly. Of programs not currently teaching joint manipulation, the most common reasons included manipulation not being considered an entry-level skill (75%), insufficient time within the curriculum (50%) and a perceived lack of evidence regarding its efficacy (25%).

**Conclusions:** The findings of this study are similar to those from the United States and provide direction to the teaching of manipulation.

### Learning lumbar spine mobilisation: the effects of frequency and self-control of real-time objective feedback

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Darren A Rivett, The University of Newcastle, Newcastle

**Background:** Spinal mobilisation is commonly taught in physiotherapy programs, however the optimal feedback for learning is unknown.

**Question:** What is the effect of frequency and self-control of feedback on physiotherapy students learning lumbar spine mobilisation?

**Design:** Pre-test, post-test and 5–7 day follow-up comparison of three randomised feedback groups: constant (100% of practice trials), intermittent (33%) and self-controlled (varied according to student choice) feedback.

**Intervention:** Sixty-two physiotherapy students performed 12 practice trials of grade II posterior-to-anterior mobilisation to the third lumbar vertebra while receiving real-time objective feedback on their applied forces via a computer screen.

**Outcome measures:** The difference between students' and a physiotherapist expert's force parameters (mean peak force [N], force amplitude [N], oscillation frequency [Hz]) were compared between groups at post-test and follow-up using ANCOVA. A smaller difference indicated better performance. Students were also surveyed regarding their perceptions of feedback.

**Results:** Students in the self-controlled group applied mean peak force (mean difference between student and expert 6.7N, 95% CI 4.4 to 9.0) and force amplitude (6.3N, 4.2 to 8.4) that more closely matched the expert's compared to those in the constant group (13.7, 8.7 to 18.6,  $p = .021$ ; 13.1, 8.9 to 17.4,  $p = .028$ ) at post-test, with similar results at follow-up for force amplitude only (self-controlled, 9.5, 5.8 to 18.1; constant, 21.0, 13.3 to 28.7,  $p = .018$ ). All students reported an improved understanding of force application, but feedback preferences varied.

**Conclusion:** Self-controlled feedback is more beneficial than constant feedback for students learning to apply forces during lumbar mobilisation.

### Experienced physiotherapists can detect differences in palpation findings between locations in the cervical spine without information on pain provocation

Kerrie Evans, Griffith University  
Neil Tuttle, School of Physiotherapy and Exercise Science, Griffith University

**Question:** Can experienced physiotherapists using only tactile information determine which of two locations in the cervical spine was previously deemed as a likely source of a patient's symptoms?

**Design:** Observational study embedded in a larger trial.

**Participants:** Two musculoskeletal physiotherapists with over 15 years experience and twenty individuals with neck pain for more than two weeks.

**Intervention:** One therapist took a history, performed a physical assessment including motion palpation, and selected a location considered hypomobile and likely to contribute to the patient's symptoms. A second location was selected at least one level above or below on the opposite side. The locations were indicated by a laser line. A second therapist palpated the patient's neck and, without questioning on pain, decided which location was more likely to contribute to the patients symptoms.

**Outcome measures:** Proportion of agreement

**Results:** The second therapist agreed with the first therapist's assessment for 18 out of 20 patients which corresponds to a confidence interval for the true agreement of 68 to 99%.

**Conclusions:** The higher level of agreement found in this study than some previous studies may be due to the task being detecting differences rather than classifying palpation findings or to the similar background and experience of the two therapists. The results however are consistent with previous research where differences in stiffness were found between tender and less tender locations on the cervical spine. This study demonstrate that therapists are capable of reliably detecting differences in cervical palpation without information on pain provocation.

### Manual therapy treatment of cervicogenic dizziness and pain: preliminary results of a randomised controlled trial

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Darren A Rivett, The University of Newcastle. Callaghan.  
Michael G Katekar, The University of Newcastle. Callaghan.  
Robin Callister, The University of Newcastle. Callaghan.

Cervicogenic dizziness and pain are common problems in the community. Previously we provided clear evidence for the short-term efficacy of Mulligan Sustained Natural Apophyseal Glides in the treatment of cervicogenic dizziness and pain (Reid, Rivett, Katekar & Callister, 2008). Currently we are conducting a randomised controlled trial investigating the relative effectiveness of Mulligan glides and Maitland passive joint mobilisation treatments with long-term follow up. To date, 27 participants with cervicogenic dizziness have been randomised to one of three groups: Mulligan glides with self-gliding home exercises ( $n=8$ ); Maitland mobilisation with range of motion exercises ( $n=9$ ); and a placebo group receiving detuned laser ( $n=10$ ). Treatment was for 4 weeks, with follow-ups immediately post-treatment and at 6 and 12 weeks. Further follow-up will occur at 6 and 12 months. The primary outcome measures were the Dizziness Handicap Inventory and Visual Analogue Scales for severity of pain and dizziness. A blinded assessor conducted measurements. The following preliminary trends have been observed at 12 weeks: larger mean reductions in the dizziness Visual Analogue Scale for Mulligan glides (34 to 20) and Maitland mobilisation (43 to 21) treatments compared to placebo (46 to 38); reductions in mean Dizziness Handicap Inventory in all groups (7, 16, 19 respectively); and reductions in mean pain Visual Analogue Scale (14, 20, 18 respectively) in all groups. The preliminary results of the dizziness Visual Analogue Scale post-treatment, demonstrate borderline significant decreases in dizziness in the Mulligan glides ( $p=0.05$ ) and Maitland mobilisation ( $p=0.07$ ) groups compared to the placebo. Recruitment is ongoing.

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### Does manual therapy change joint pathology, position and movement?: a cross-over case-study of bone scans for Cuboid Syndrome

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**Question:** Does manual therapy change dorsal pain with weight-bearing and tissue pathology at the cuboid?

**Design:** Single-case study, with bone scan and CT investigations for a patient with right cuboid pain in 2007, and left cuboid pain in 2010.

**Participants:** Single-case with right (2007) and then left (2010) dorsal foot pain, swelling, severe limitation of weight-bearing and increased signal at the symptomatic cuboid on bone scans.

**Intervention:** Postero-anterior manipulative thrust and mobilisations with movement for the right side (2007 after 1 year of symptoms) and the left side (2010 after 6 weeks of symptoms).

**Outcome measures:** Pain, swelling and tolerance of weight-bearing activities were primary outcome measures. The general practitioner and orthopaedic surgeon undertook independent examinations, along with ordering the diagnostic imaging. Scans demonstrated local tissue pathology and relative tarsal positions.

**Results:** Pain and swelling reduced in 48 hours. Standing and walking tolerance recovered over 6–8 weeks. The general practitioner and orthopaedic surgeon were interested in the diagnosis and manual therapy that achieved recovery without immobilisation or surgery. Normal scans at the right cuboid in 2010 support the possibility that increased signal in 2007 may have been associated with symptoms at the right cuboid.

**Conclusions:** Research has provided many insights into the neurosensory mechanisms for manual therapy, but this unique cross-over case-study with imaging poses further questions about the mechanisms of manual therapy interventions. The results of scans pre and post manual therapy suggest that the potential for local mechanical effects to alleviate tissue pathology should still be considered.

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### Using visual estimation, physiotherapy students can reliably detect small differences in neck and shoulder movement but cannot accurately estimate angles

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**Question:** What are the relative abilities of physiotherapy students to detect differences in range of cervical and shoulder movement compared to their ability to estimate angles in degrees?

**Design:** Observational study.

**Participants:** Two groups of 20 physiotherapy students: one group for cervical movements; the other shoulder movements. **Intervention:** Using an electromagnetic orientation sensor, a simulated patient adopted a reference position of the neck in rotation or lateral flexion; or the shoulder in flexion or abduction. Participants estimated the angle in degrees. A second position was adopted, different from the reference angle by between two and ten degrees. Participants indicated which angle was greater. Fifty trials were performed by each participant.

**Outcome measures:** 95% limits of agreement were used to indicate accuracy of angle estimation. A second order curve fit was used to determine the difference in degrees that was necessary for 70% accuracy for each axis of movement.

**Results:** Large errors were found for magnitude estimation with limits of agreement ranging from + 14° to + 22° and frequent errors of over 40%. Students could reliably detect differences in cervical rotation and lateral flexion of 2.0° and 3.8°; and in shoulder flexion and abduction of 2.0° and 2.2°.

**Conclusion:** Students are much better at visually detecting differences than at estimating magnitude of angles. The findings support the use of visual estimation to detect change or difference in range of movement when this is the clinical parameter of interest as might occur when reassessing impairments within or between treatment sessions.

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### Can MRI findings differentiate between patients with low back pain and controls?

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Jane Latimer, George Institute for International Health,  
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Walter Koss, Dalcross Adventist Hospital

Justin Pik, Neurospine Clinic

**Question:** Are MRI findings more common or more severe in patients with likely discogenic low back pain (LBP) than in matched controls.

**Design:** Case control study.

**Participants:** Cases were 30 patients presenting for care with likely discogenic LBP (demonstrated centralisation with repeated movement testing), of moderate intensity and with minimal or no past history of LBP. Controls were 30 volunteers with no current LBP, matched for age, gender and past history of back pain. Cases and controls underwent MRI scanning using an identical protocol.

**Outcomes:** All MRI scans were read by 2 blinded assessors. Reported outcomes included disc degeneration (1–5 scale), high intensity zone, Modic changes, annular tears and disc herniation.

**Results:** The presence of disc degeneration, Modic changes and disc herniation substantially altered the odds of a participant being a case or control. For example subjects were 5.21 (95% CI 1.28 to 21.24) times more likely to be a case than a control when disc degeneration grade > 3 was present and 6.00 (95% CI 1.17 to 30.73) times more likely with Modic changes. The presence of a high intensity zone or annular tear was found to significantly alter odds for one assessor but not the other assessor.

**Conclusions:** MRI findings including disc degeneration, modic changes and herniation are more common in people with current (likely discogenic) LBP than in matched controls. Further investigation of the value of MRI findings as prognostic factors and as treatment effect modifiers is required to assess the potential clinical importance of these findings.

## Back pain beliefs at 17 are related to the impact of low back pain

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**Background:** Higher disability levels in adults with non-specific chronic low back pain are associated with negative back pain beliefs. These beliefs can be positively influenced with education resulting in reduced disability. Adolescence is an important time in the development of low back pain, but the relationship between beliefs and impact has not been investigated in adolescents.

**Methods:** 1299 adolescents in the Raine Study provided information on specific impacts related to low back pain (care seeking behaviours, activity modification behaviours), back pain beliefs (back beliefs questionnaire) and a number of covariates.

**Results:** Subjects who reported never experiencing low back pain had more negative beliefs than those who reported low back pain (mean difference; 1.63, 95% CI; 1.01 to 2.26,  $p < 0.001$ ). There was no mean difference in beliefs among subjects who did/did not report care seeking behaviours. In contrast those who responded yes to activity modification behaviours had significantly poorer beliefs than those who did not (mean differences 1.3 to 2.6,  $p < 0.001$  to 0.005). A greater number of activity modification behaviours was associated with poorer beliefs in those subjects with experience of low back pain. More positive beliefs were associated with female gender, lower body mass index, higher family income, better SF-36 Mental Health scores and more positive primary carer beliefs.

**Conclusion:** Differences in back pain beliefs are associated with different levels of impact in late adolescence. This provides a potential target for early intervention. Addressing beliefs in adolescence may arrest a potential pathway to adult low back pain disability.

## The efficacy of directional preference management for low back pain: a systematic review

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**Background:** Providing specific treatment based on symptom response for people with low back pain and a directional preference is a widely used treatment approach, however the efficacy of treatment using the principles of directional preference management is unclear.

**Objective:** To determine the efficacy of treatment using the principles of directional preference management for people with low back pain and a directional preference.

**Methods:** Computer databases were searched for randomised controlled trials published in English up to January 2010. Only trials investigating directional preference management for people with low back pain and a directional preference were included. Outcomes for pain, back specific function and work participation were extracted.

**Results:** Six trials were included in this review. Five were considered high quality. Clinical heterogeneity of the included trials prevented meta-analysis. GRADE quality assessment revealed mixed results, however moderate evidence was identified that directional preference management was significantly more effective than a number of comparison treatments for pain, function and work participation at short, intermediate and long-term follow-up. No trials found that directional preference management was significantly less effective than comparison treatments.

**Conclusions:** Although this systematic review showed mixed results, some evidence was found supporting the effectiveness of directional preference management when applied to participants with a directional preference particularly at short and intermediate term follow-up. Further high quality randomised controlled trials are warranted to evaluate the effect of specific treatment applied to people with low back pain and a directional preference.

## Two year follow up of a spinal stabilisation exercise regime in subjects with non-specific low back pain

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**Aims:** To investigate the long-term outcomes of a specific spinal stabilisation exercise regime (Bounce back small group classes) in subjects with non-specific low back pain (LBP).

**Design:** Multi centre case series.

**Participants:** Five physiotherapy clinics throughout Australia that offered Bounce Back exercise classes, collected data prospectively from 72 participants with non-specific LBP.

**Intervention:** Small group exercise groups of maximum 8 participants with standardised progressed functional program. Intervention provided one hour per week for eight weeks, by specifically trained Physiotherapists. Participants were provided with detailed weekly exercise handouts and encouraged to repeat exercises three times for 30–40 minutes between sessions. Outcomes were collected at baseline, eight weeks and two years.

**Outcomes:** Objective assessments were pain intensity, 11-point Numerical Pain Rating Scale (NPRS) and function, Roland Morris Disability Questionnaire (RMDQ).

**Results:** A significant difference was found between the mean outcome scores at baseline and two year follow-up. Pain had reduced ( $t_{48} = 2.987$ ,  $p = 0.004$ ) and function had improved ( $t_{48} = 2.330$ ,  $p = 0.024$ ). The baseline mean outcome scores with Standard Deviation (SD) were pain = 4.0 (SD 2.4) and function = 86.3 (SD 53.7). At eight weeks mean outcome scores (with 95%CI) were pain = 1.5 (0.9–2.0,  $p < 0.001$ ) and function = 33.2 (24.7–41.9,  $p < 0.001$ ). At two years' post intervention, mean outcome scores (with 95%CI) were pain = 3.0 (0.28–1.8,  $p = 0.008$ ) and function = 45.6 (29.0 to 52.4,  $p < 0.001$ ).

**Conclusion:** We found preliminary evidence of the effectiveness of progressed functional small group classes for non-specific LBP patients, with a reduction in pain intensity and improvement in function in both the short-term and long-term. This evidence should be confirmed in a randomised controlled trial design.

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### The effectiveness of sub-group specific manual therapy for low back pain: a systematic review

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**Background:** Manual therapy is frequently used to treat low back pain, but evidence of its effectiveness is limited. One explanation may be sample heterogeneity and inadequate sub-grouping of participants in randomised controlled trials where manual therapy has not been targeted towards those likely to respond.

**Objectives:** To determine the effectiveness of specific manual therapy provided to sub-groups of participants who have been identified as likely to respond to manual therapy.

**Method:** A systematic search of electronic databases was conducted. Only randomised controlled trials of manual therapy for participants identified as belonging to a sub-group of low back pain likely to respond to manual therapy were included. Data from included trials were extracted by two authors independently. Methodological quality of each trial was graded using the PEDro scale and the overall quality of evidence rated according to the GRADE domains. Treatment effect sizes and 95% confidence intervals were calculated for pain and activity.

**Results:** Eight RCTs were included in the review, five of high methodological quality. Clinical and statistical heterogeneity precluded meta-analysis. Significant treatment effects were found favoring sub-group specific manual therapy over a number of comparison treatments for pain and activity at short and intermediate follow-up. However, the overall GRADE quality of evidence was low to very low.

**Conclusions:** This review found preliminary evidence supporting the effectiveness of sub-group specific manual therapy when applied to participants identified as likely to respond. Further high quality research on low back pain sub-groups is required.

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### Community-based education for spinal pain in regional Western Australia: Qualitative results from the WA Musculoskeletal Health Network's 'Rural Roadshow'

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**Background:** The WA Spinal Pain Model of Care recommends providing Western Australians with evidence-based self-management strategies for spinal pain. This is important for regional WA where health services may be limited and unique access issues exist.

**Methods:** An inter-disciplinary team delivered interactive educational sessions to consumers at three regional sites in WA during 2010–2011. The education sessions were evidence-based and focussed on upskilling consumers with active pain management strategies. Five weeks after attending the forum, a subset of 15 consumers participated in a semi-structured telephone interview regarding the knowledge they acquired, access to local health services and evaluation of the forum. Purposive sampling was used to ensure that a range of experiences were captured. An interviewer, blinded to baseline demographic and longitudinal quantitative data, conducted the interviews using a standardised schedule. Inductive

techniques were used to identify and refine response themes.

**Results:** Five themes were identified, including: 1) The central role of the GP as an information source, although the information provided was often limited and biomedically oriented; 2) The lack of community-based specialist and GP services; 3) The use of individual coping strategies to manage pain within the constraints of individual lifestyles and circumstances; 4) Empowerment, validation of self-acquired (or previously acquired) coping strategies, and acquisition of new self-management skills after receiving evidence-based information from interdisciplinary experts and; 5) Benefits and drawbacks of the group-based education format.

**Conclusion:** The regional education forums were useful for consumers and highlight the need for community-based health information and services in regional WA.

## 229

### Physiotherapists provide considerable services to children with ASD and indicate needs for professional development and clinical guidelines: an observational study

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**Questions:** Are Queensland physiotherapists providing services to children diagnosed with or suspected of having ASD? Are there differences in service provision between the physiotherapy providers? Are the professional development needs of physiotherapists being met? Is there a need for national physiotherapy clinical practice guidelines?

**Design:** Prospective survey study.

**Participants:** Physiotherapists (n=146) working with children in QLD, providing/not providing services to children diagnosed or suspected of having ASD, were invited to respond to our survey.

**Results:** Seventy-four physiotherapists returned the survey (51%). Physiotherapists provided services to 1202 children diagnosed with or suspected of having ASD in the past six months. Sixty-three physiotherapists (97%) provided services in a multidisciplinary team. Children aged 4–6 years (n=481) formed the largest age group of children receiving physiotherapy services, followed by those aged 7–10 years (n=362). Department of Education and Training (DET) provided significantly more physiotherapy services to children with ASD (96%) than other service providers (p = .002). Professional development in the specific area of ASD was described as “insufficient needs being met” by 35 respondents (47%). The need for clinical practice guidelines for physiotherapists was reported by 69 respondents (93%).

**Conclusions:** Physiotherapists working with children in QLD are providing considerable services to children diagnosed with or suspected of having ASD. DET is the largest service provider for children with ASD, consistent with the age groups of children receiving services. There is a perceived lack of physiotherapy specific ASD related professional development opportunities. Clinical practice guidelines are sought by the majority of physiotherapists surveyed.

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### Early anterior dynamic ultrasound compared with Graf ultrasound in the assessment of infant hips in the “at risk” population

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Adjunct lecturer University of South Australia

Adrian Schoo, Associate Professor of Physiotherapy,  
Rural Health School, Latrobe University.

Timothy Skinner, Director of Research,  
Flinders University Rural Clinical School, Mount Gambier.

**Background:** Despite routine clinical examination of all infant hips, followed by Graf ultrasound where indicated, some children are still being diagnosed with dysplasia of the hip after 3 months of age. Graf measures morphology in a developing neonatal hip. Recent studies found that being born in a rural or regional area is a risk factor for late diagnosis. **Aim:** To test the use of anterior dynamic ultrasound as a measure of stability in assessing the neonatal hip.

**Method:** Twenty babies in the “at risk” population, born in a regional hospital were referred by the delivering doctor and seen by the physiotherapist and a sonographer. Each had a dynamic ultrasound using the Andersson method and a Graf ultrasound.

**Results:** According to Andersson, 9 infants required follow up dynamic ultrasound at 4 weeks because they had > 3 mm movement on the first examination. Three of the 9 had a hip splint applied for 6 weeks. According to Graf, 15 babies were reported as having immature hips with inadequate acetabular cover. Over the same period 3 babies with no risk factors, who were not part of the study, had hip dysplasia diagnosed at 12 weeks and treated by splinting.

**Conclusion:** Anterior dynamic ultrasound can be utilized early to assess neonatal hip stability, and may be more accurate than focusing on morphology in a developing hip. A larger study is justified to evaluate the outcome of this method on the detection and management of developmental dysplasia of the hip.

## 231

### The motor ability of Kuwaiti children aged 5–9 years using standardized assessment tool

Suad Eid ALanzi, Curtin University, Perth. Ministry of Health,  
Kuwait, Kuwait

Jan Piek, Curtin

Lynn Jensen, Curtin University, Perth

**Question:** Is there any difference in the motor ability of Kuwaiti children aged 5–9 years compared to the Movement Assessment Battery for Children (MABC-2) norm sample?

**Design:** Cross-sectional study.

**Participants:** 297 Kuwaiti children aged 5–9 years old (147 boys and 150 girls); mean 92.88 months, SD14.24month) who were recruited from public and private primary mainstream schools in urban and rural areas.

**Method:** The MABC-2 was administered to Kuwait children and motor ability of Kuwaiti children was compared with the MABC-2 UK norm sample.

**Results:** Kuwaiti children were significantly less motor competent than their UK peers. Girls were significantly better than boys in the manual dexterity and balance components while boys were better in the ball skills.

**Conclusion:** Despite the literature showing no cultural influences on children’s motor ability, our study found differences in the motor ability of Kuwaiti children and the UK norm sample. The literature reports that there are no gender differences in motor ability, but our study found gender differences. These two results need further investigation to determine the reasons for these differences.

## 232

### Community walking in people with Parkinson Disease: Relationships between the amount of walking, mobility level and confidence

Robyn M Lamont, University of Queensland

Meg E Morris, University of Melbourne

Marjorie H Woollacott, University of Oregon, United States

Sandra G Brauer, University of Queensland

**Question:** Is the amount of walking in the community by people with Parkinson disease (PD) related to simple clinical measures of mobility level, walking and walking confidence?

**Design:** Cross-sectional, correlational.

**Participants:** 61 community-dwelling people with idiopathic PD who had no history of surgery for PD and were not cognitively impaired.

**Outcome Measures:** Mobility was assessed using the dual task Timed Up and Go (TUG) test Walking was measured using the Six Minute Walk Test (6MWT). Walking confidence was measured using the Ambulatory Self Confidence Questionnaire (ASCQ). Time spent walking in the community was measured over 3 consecutive days using an accelerometer (ActivPAL).

**Results:** People with PD spent approx 42.1 minutes (range 5.6–124.6 minutes) per day walking in the community. Time spent walking in the community was moderately and significantly correlated with performance on the TUG test ( $r = -0.384, p = 0.005$ ), TUG motor ( $r = -0.384, p = 0.007$ ) and 6MWT ( $r = 0.351, p = 0.013$ ). Walking confidence was also significantly associated with average time spent walking in the community ( $r = 0.322, p = 0.024$ ).

**Conclusion:** Maintaining the ability to walk in the community is a common goal of physiotherapy in people with PD because of its important contribution to ongoing community participation. Accurately measuring all components of community walking is difficult. Common and simple to perform clinical walking tests such as the TUG and 6MWT and ASCQ may reliably reflect the amount people with PD walk in the community.

### Muscle power, muscle strength and activity performance measures are more reproducible than postural sway measures in Parkinson's disease

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Catherine Sherrington, Musculoskeletal Division, The George Institute for Global Health, University of Sydney, Sydney

Victor S Fung, Movement Disorders Unit, Department of Neurology, Westmead Hospital, Sydney

**Question:** What is the reproducibility (test-retest reliability and measurement error) of impairment and activity performance measures in people with Parkinson's disease?

**Design:** Observational study with repeated measures.

**Participants:** Thirty-one community-dwelling people with Parkinson's disease.

**Outcome measures:** Measures of impairment: muscle strength, muscle power (speed x strength), postural sway; and measures of activity performance: maximal balance range, coordinated stability, choice stepping reaction time, repeated sit-to-stand, Timed Up & Go, Timed Up & Go with cognitive dual-task and Lateral Reach; were taken one week apart when participants were "on" their Parkinson's medications.

**Results:** Measures of muscle power and muscle strength showed good reproducibility (ICC3,1 0.85 to 0.97, measurement error 5% to 18% of the mean) but measures of postural sway showed poor reproducibility (ICC3,1 0.04 to 0.51, measurement error 42% to 106% of the mean). Measures of activity performance also showed good reproducibility (ICC3,1 0.62 to 0.97, measurement error 6% to 17% of the mean), except for coordinated stability and the Timed Up & Go with cognitive dual-task, which showed poor test-retest reliability (ICC3,1 0.50 and 0.55, respectively) and large measurement error (76% and 58% of the mean, respectively). Removal of six participants with disabling dyskinesia improved the reproducibility of measures of postural sway (ICC3,1 0.50 to 0.80, measurement error 17% to 31% of the mean).

**Conclusion:** The high reproducibility of measures of muscle power, muscle strength and activity performance suggests that they are appropriate measures for both differentiating between individuals and tracking performance over time within individuals.

### Health-related quality of life of people with Parkinson's disease living in rural Victoria

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Jennifer L McGinley, The University of Melbourne

Jennifer Watts, Monash University

Hylton Menz, La Trobe University

Anna T Murphy, Kingston Centre Southern Health

Robert Iansek, Kingston Centre Southern Health

Meg E Morris, The University of Melbourne

**Questions:** How does the health-related quality of life of people with Parkinson's disease living in rural Victoria compare with people living in metropolitan Melbourne? Does rural living contribute to health-related quality of life in people with Parkinson's disease?

**Design:** Analytic observational study.

**Participants:** Two samples of people with Parkinson's disease living in metropolitan Melbourne and rural Victoria were included. The metropolitan sample consisted of 210 individuals who had participated in the baseline assessment of an existing trial, while the rural sample included 24 participants who attended community-based rehabilitation programs and support groups in rural Victoria.

**Outcome measures:** The Parkinson's Disease Questionnaire-39 was used to quantify health-related quality of life.

**Results:** There was a statistically significant difference in the health-related quality of life of participants in rural Victoria as compared to individuals in metropolitan Melbourne ( $p = 0.025$ ). Participants in rural Victoria recorded a higher mean score for the Parkinson's Disease Questionnaire-39 even after adjusting for differences in disease duration. This indicated that they had a poorer overall health-related quality of life. Rural living was also found to be a significant predictor of health-related quality of life ( $\beta=0.14$ ; 95% CI -1.27 to -0.08;  $p = 0.027$ ).

**Conclusion:** The findings of this study suggest that some people with Parkinson's disease living in rural Victoria perceive their health-related quality of life to be relatively poor. Further studies examining the health care needs of individuals living in rural and remote areas are required in order to minimise the debilitating consequences of this disease.

### Community walking: The perception of people with Parkinson Disease

Robyn M Lamont, University of Queensland

Meg E Morris, University of Melbourne

Marjorie H Woollacott, University of Oregon, United States

Sandra G Brauer, University of Queensland

**Question:** What barriers or facilitators to walking in the community do people with Parkinson Disease (PD) perceive?

**Design:** This qualitative study involved five focus groups.

**Participants:** 18 people with PD and 14 partners of people with PD participated in the focus groups. Four metropolitan and one rural group were conducted. One metropolitan group included partners of people with PD alone.

**Outcome Measures:** Data analysis was performed by thematic content analysis of transcripts.

**Results:** People with PD predominantly reported use of internal personal strategies such as using attention to monitor and correct stepping and planning trips to coincide with medication effectiveness; as facilitators to community walking. External factors, particularly environmental factors such as crowds, attention demanding environments and difficult terrain were primarily described as barriers. Due to the adoption of strategies or facilitators the people with Parkinson Disease in these groups tended not to report any difficult or disability walking in the community.

**Conclusion:** People with PD identify particular barriers to walking in the community and are aware of a number of strategies they use to overcome barriers so they may continue walking in the community. While these strategies and facilitators are effective, people with PD may not perceive difficulty or disability walking in the community, but rather this period (preclinical disability) may signal disability in the near future. Physiotherapy may have a role in identifying this period and implementing therapy to delay disability in addition to supporting the use of effective strategies and facilitators through education and directed therapies.

## 236

### Reliability and discriminant validity of the Quality FM, a new measure of movement quality of ambulatory children with cerebral palsy

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Darcy Fehlings, Bloorview Research Institute, Canada

Lisa Shircore

Peter Rosenbaum, McMaster University, Canada

**Questions:** What are the intra-rater, inter-rater and test-retest reliability and minimum detectable change of the Quality FM? Can it discriminate among children with different ambulation abilities?

**Background:** Optimizing motor skills and movement quality are rehabilitation goals for children with cerebral palsy. We developed the Quality FM, a revision of the Gross Motor Performance Measure, to address a measurement gap in this area.

**Design:** Measurement study with baseline/retest sessions.

**Participants:** Thirty-three ambulatory children with cerebral palsy (mean 8.8 years) in Gross Motor Function Levels I (n=17), II (n=7), and III (n=9).

**Method:** Gross Motor Function Measure assessment (Stand and Walk/Run/Jump dimensions) was videotaped with each child at baseline and retest (1–2 weeks apart). Quality FM was scored from video by trained physiotherapist assessor pairs who scored it independently.

**Outcome measure:** Quality FM evaluates quality of movement of Stand and Walk/Run/Jump items of the Gross Motor Function Measure. It assesses five quality of movement attributes: Alignment, Co-ordination, Dissociated movement, Stability and Weight-shift.

**Results:** Attribute mean scores varied from 45.0% (SD=27.2) (stability) to 56.2% (SD=27.5) (alignment). Attribute ICCs achieved excellent reliability with the lowest being 0.89 (95%CI lower limit=0.79) for test-retest alignment. Minimal detectable change was <10% points across attributes. For all attributes, the Quality FM differentiated among children in Gross Motor Function Levels I, II & III (P<0.05).

**Conclusion:** Reliability was excellent for all attributes. The Quality FM differentiated among children with different walking abilities. Lack of ceiling effect and detectable change of 10.0% points suggest potential as an outcome measure.

## 237

### Objective differences in children with congenital talipes equinovarus who require tibialis anterior tendon transfer compared to those who don't

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Paul Gibbons, The Children's Hospital at Westmead

David Little, The Children's Hospital at Westmead

Joshua Burns, The Children's Hospital at Westmead

**Introduction:** Tibialis anterior tendon transfer (TATT) is commonly used to treat residual dynamic supination and recurrence in congenital talipes equinovarus (CTEV). Are physiotherapists able to objectively identify those children who may benefit from a TATT and ensure review by an orthopaedic surgeon?

**Methods:** From August 2009 to October 2010, 17 children (average age 51 months ± 10 months) with 22 CTEV feet were assessed prior to a TATT. All children had undergone prior treatment according to the Ponseti protocol. Assessment was undertaken using the Dimeglio Scale, Foot Posture Index, hand held dynamometry for strength, pedobarography and quality of life with the Clubfoot Disease Specific Index Questionnaire and the Child Health Questionnaire. These results were compared to 5 controls (average age 47 months ± 16 months) with 8 CTEV feet that did not require a TATT.

**Results:** Differences were noted in several key areas. The average Dimeglio score in the TATT group was 5 (±2.1) compared to 2.9 (±0.7) in the control group. Resting foot alignment in standing assessed with the Foot posture Index identified a more supinated posture with an average score of -0.2 (±3.5) compared to the control group average of +3.6 (±3.6). The ratio of eversion to inversion strength in the TATT group was 0.7 compared to 1.29 in the control group.

**Conclusions:** Children with CTEV assessed pre-TATT show differences in objective measurements compared to CTEV controls of the same age. Physiotherapists can use these assessments to guide referrals for orthopaedic review.

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### Inter- and intra-rater reliability of physiotherapists using the Argenta Visual Scale and calipers when measuring deformational plagiocephaly: pilot study

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Madeleine O'Brien, Royal North Shore Hospital, Sydney

Nancy Low Choy, Bond University, Robina, Gold Coast

Jayne Stanton, Royal North Shore Hospital, Sydney

Michael Steele, Bond University, Robina, Gold Coast

**Question?** Are physiotherapists working in a paediatric setting able to reliably use ball-point calipers or the Argenta Visual Scale to measure deformational plagiocephaly?

**Design:** Prospective observational pilot study.

**Methods:** Seven infants (5 male, 2 female, mean age 4.7 months) with a diagnosis of deformational plagiocephaly, and whose families consented to participate in the study were tested by three physiotherapists. Four dimensions of the head (anterior-posterior, lateral, right diagonal, left diagonal) were measured using calipers (mm) and deformational plagiocephaly severity was categorised using the Argenta Visual Scale (categories 1–5). The measures were undertaken twice in random order to determine inter and intra-rater reliability.

**Results:** The level of agreement between testers was high (lateral) to very high (other dimensions) for the caliper measures (Cronbach Alpha >0.75). A moderate level of disagreement was revealed when physiotherapists used the Argenta Visual Scale to categorise deformational plagiocephaly (Cronbach Alpha = -0.676; p = 0.728). Within tester reliability was confirmed with high to very high paired sample correlations (ICC > 0.7; p < 0.05) for all but the lateral head measure (ICC = .149-.572; p > 0.05). Paired t-tests showed no significant differences between measures by the same physiotherapist except for tester 1 (Right diagonal; t = 2.931, p = 0.026) and tester 2 (Left diagonal t = 2.521, p = 0.045).

**Conclusion:** Inter- and intra-tester reliability of physiotherapists was demonstrated using calipers to measure deformational plagiocephaly, but physiotherapists were less able to agree on the severity of deformational plagiocephaly when categorising children using the Argenta Visual Scale.



## Measuring motor function of children with mild/moderate intellectual impairment using the HiMAT/ Revised HiMAT compared to BOT2: a pilot validation study

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Nikki Milne, Bond University

Helen Keogh, Department of Family and Community Services – Aging, Disability and Home Care NSW

Joy Richmond, Department of Family and Community Services – Aging, Disability and Home Care NSW

Mike Steele, Bond University

**Question:** Does the High-level Mobility Assessment Tool (HiMAT) or the revised HiMAT provide valid measures of motor performance in children with mild to moderate intellectual impairment compared to the gold standard reference, Bruininks–Oseretsky Test of Motor Proficiency-Second Edition (BOT2).

**Design:** A prospective observational study.

**Participants:** Thirteen children (12 males; one female) with a mean age of 11.5 years, categorised with mild ( $n=7$ ; IQ = 55-75) to moderate ( $n=6$ ; IQ = 35-55) intellectual impairment participated in this study with parental consent.

**Outcome Measures:** Motor tasks included on the HiMAT tool (11 high-level walking tasks/stairs/run, skip, hop and bound; Score/54); revised HiMAT tool (8 items – no stairs or bound on affected limb; Score/32) and BOT2 (Fine manual control, manual coordination, bilateral coordination; balance; body coordination; running speed/agility; strength; strength/agility) were completed by the children.

**Results:** Pearson  $r$  correlations revealed that the HiMAT total score was moderately associated with three components of the BOT2: Bilateral coordination ( $r=.619$ ,  $p<0.05$ ); Running speed/agility ( $r=.685$ ,  $p<0.01$ ); and Strength ( $r=.681$ ,  $p<0.05$ ) but not Total Motor Composite score ( $r=.212$ ,  $p>0.05$ ). The revised HiMAT total score had moderate to very high associations with each gross motor total point and scale scores of the BOT2 ( $r=.591-.900$ ,  $p<0.05$ ) and moderate associations with the Total Motor Composite Score ( $r=.612$ ,  $p<0.05$ ).

**Conclusion:** This pilot data indicate that the Revised HiMAT may be more valid than the HiMAT to use with children who have an intellectual impairment. Ongoing research is required to consolidate the findings of this pilot validation study.

## Consequences of neck pain for female office workers

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Emma Ellison, Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane

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Matthew O'Rourke, Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane

Paula Wilson, Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane

Venerina Johnston, Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane

**Question:** How do female office workers manage their neck pain?

**Design:** Cross-sectional observational study.

**Participants:** 226 female office workers with neck pain who use a computer more than 20 hours per week. Fifty-one of these attended a university clinic for assessment of their neck complaint.

**Outcome measures:** Severity of neck pain was evaluated with the Neck Disability Index. Duration and consequences of neck pain were evaluated with questions from the Nordic Musculoskeletal Questionnaire including self-reported work absence, claims for worker's compensation, health care use, impact on work and leisure activity and medication use.

**Results:** Mean score on the Neck Disability Index was 21%. During the last 12 months, 24% had been absent from work; 27% had reduced their work activity; 46% had reduced their leisure activities and 63% had consulted a health professional due to neck trouble. Interestingly, only 8% had ever submitted a worker's compensation claim and 12% indicated changing jobs due to neck pain. Of those who underwent further assessment, 35.3% considered themselves to be 'self-managers' of their neck pain with conventional medical strategies the most common strategy utilised by this population: prescription or over-the-counter medications (82.5%), physiotherapy (64.7%) and visiting their general practitioner (54.9%).

**Conclusion:** Although the severity of neck pain experienced by female office workers is low, the impact on work and leisure is substantial. This study suggests the level of presenteeism in the workforce is significant with many self-managing by taking time off work, reducing work and/or leisure activity and utilizing passive coping strategies.

## Definition of Slips Trips and Falls: Similar, Yet Different

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Venerina Johnston, Division of Physiotherapy, School of Health and Rehabilitation Sciences, The University of Queensland, Brisbane

**Question:** How does the definition of slips, trips and falls vary among stakeholders in the community care setting?

**Design:** Narrative review from quantitative studies.

**Participants:** Community dwelling elderly, health care professionals and researchers from both the health and occupational health and safety speciality.

**Intervention:** The definition of slips, trips and falls employed in research by the varying stakeholders and the associated inclusion/exclusion criteria which stem from this.

**Outcome measures:** Impact of different interventions on reporting and incidence of slips, trips and falls and efficacy of interventions.

**Results:** The review found large variations in the definition of slips, trips and falls among researchers, community dwelling elderly and the occupational health and safety industry sector. The elderly and healthcare professionals relate the definition back to personal perceptions and experience, while the researchers tend to bias the definitions towards the aims of their research. The definition was found to impact on the incidence of slips, trips and falls and effectiveness of interventions.

**Conclusion:** There is currently no standardised slip, trip and falls definition. This means the reliability and validity of information being extracted from research findings is incomparable and limits the exploration of intervention strategies. The discrepancy in definition may not provide an accurate picture of the incidence and risk factors for injury and limits the generalizability of the results.

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### Accommodating the increased bariatric population in health care facilities: the importance of developing a standard practice within the design process to accommodate and allow for redevelopment

Helen (Hal) c Robertson, Workforce Health, SA Health

**Design:** This presentation reviews bariatric patient room design research over the last 10 years. It identifies facts, figures and forecasts on increased obesity in the Australian population to address this issue now and in the future. It also identifies characteristics of accommodation requirements for bariatric patients in an acute hospital setting and barriers experienced with current hospital design.

**Background:** The Royal Adelaide Hospital is a 650-bed acute care hospital set on a 5.8-hectare site in the centre of metropolitan Adelaide. The majority of wards are in buildings built in 1962 and 1969. Environmental challenges in nursing, assessing and mobilising obese and bariatric patients include restricted size of rooms, Out Patient Clinic corridors and hygiene areas, 760mm wide bathroom doors, inability to install ceiling hoists, small lifts and minimal storage space. Funding, equipment and staffing issues are ongoing challenges.

**Method:** This paper outlines workplace strategies, engineering developments and equipment implementations. Key areas of progress discussed include: weighing patients, data collection, equipment implementation and design limitations. With work due to begin on the new RAH, design features to accommodate for larger patients' needs to reflect the obesity trends in Australia:

**Conclusions:** Each health facility will manage the obese and bariatric patient according to its current resources and environmental issues. The lack of equipment, funding and storage are common barriers. Future proofing with appropriate design to manage larger patients is an essential component to reduce worker injury and provide dignified, quality patient care.

## 243

### Burnout and coping strategies among Saudi physiotherapists

dalia M Al-Imam, King saud university, Saudi Arabia

Hana I Al-Sobayel, King saud university, Saudi Arabia

**Background:** Physiotherapists have been found to suffer burnout to an increasing degree.

**Purpose:** explore the factors that are associated with burnout among Saudi physiotherapist, their coping strategies and how it affect their work performance.

**Design:** A non-experimental cross sectional survey.

**Participants:** 170 physiotherapists who working in Saudi Arabia.

**Instruments:** Maslach Burnout Inventory-General Scale, Areas of Worklife Survey, Brief COPE and self reported work performance survey.

**Results:** 118 completed the questionnaires (62.7% female). Mean of working years was (7.36) & 76.5% were ranged from 23 to 33 years old. The physiotherapists fell in the average range of burnout. The (mean & SD) for the subscales were: Exhaustion (14.16 ±7.36), Cynicism (10.6±6.54) and Professional efficacy (26.38±7.15). There was a statistically significant difference in Exhaustion & Cynicism for the subspecialty ( $p = .02$ ); Cynicism for absenteeism ( $p = 0.04$ ) and Efficacy for educational level ( $p < .001$ ). The strongest correlations were found between workload and Exhaustion ( $p < .001$ ) then reward and Cynicism ( $p < .001$ ). Emotional coping strategies reflect the highest mean (14.9) followed by problem coping strategies (11.27). Strong correlations were found between avoidance and Cynicism ( $p < .001$ ) then problem coping strategies and Efficacy ( $p < .001$ ). Avoidance is the only predictor for Cynicism and problem coping strategies is the only predictor for Efficacy. Work performance showed positive correlation with Efficacy ( $p < .001$ ) and negative correlation with Exhaustion ( $p = .21$ ) and Cynicism ( $p = .01$ ).

**Conclusion:** The Saudi physiotherapists had moderate level of burnout and adopt active coping strategies.

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### Injury Prevention in Agricultural Industries

Anne Taylor, Wise Work Pty Ltd

**Question:** Is agriculture is one of the most dangerous industries in Australia?

**Design:** A summary of data collected, reports published and surveys conducted from 2002 to April 2011. **Participants:** Australian farmers, their workers and service providers.

**Results:** Although the number of fatalities per annum has decreased since mid 1980s, Agriculture remains the most dangerous industry in Australia. Injury statistics are unreliable as many Agriculture businesses are small, family owned enterprises, covering a wide range of commodities, which are not required to report, having no employees.

This presentation will address: the many, varied as well as the common causes of fatalities, common injuries, injury prevention programs, case studies of injured farmers, current advocacy programs

**Conclusion:** Despite reduction in the number of fatalities and the severity of injuries there is a need for public and industry specific safety management awareness programs.

## 245

### The impact of side lying during inhalation of a nebulised aerosol on the pattern of deposition in healthy adults and in adults with minimal and advanced cystic fibrosis (CF) lung disease.

Ruth L Dentice, University of Sydney

Mark R Elkins, University of Sydney

Jordan Verschuer, Royal Prince Alfred Hospital

Stefan Eberl, Royal Prince Alfred Hospital

Peter T Bye, University of Sydney

**Question:** Does inhalation in side lying influence the deposition of nebulised medication in adults with cystic fibrosis?

**Design:** Randomised cross-over trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** Thirteen adults (mean±SD age 30±6years) with stable cystic fibrosis (CF) lung disease (FEV1 45±18 % pred, range 25–78).

**Intervention:** Inhalation of four mL of radioaerosol in two randomised positions (upright sitting, or alternating between left and right side lying at two minute intervals) while nebulising for 20 minutes.

**Outcome measures:** A transmission scan outlined the three-dimensional margin of the lung fields. A gamma camera scanned the pattern of deposition of the radioactivity. An index of the uniformity of the deposition was calculated as the standard deviation of counts/voxel throughout the lung fields.

**Results:** The proportion of the loaded dose delivered to the body was 22±6% in sitting and 19±5% in sidelying (mean difference -3%, 95% CI -6 to 1). The proportion of the delivered dose that deposited in the lungs was 57±11% in sitting and 59±8% in sidelying (mean difference 2%, 95% CI -2 to 6). The uniformity index was 1892±486 in sitting and 2229±774 in sidelying (mean difference 416, 95% CI -16 to 815). The concentration of the dose in the apical regions was 48±20% of that in the whole lung in sitting and 51±20% in sidelying (mean difference 3%, 95% CI -2 to 8).

**Conclusion:** Side lying did not significantly affect deposition in adults with CF. Further investigation is warranted in patients with milder CF lung disease.

### Safety and feasibility of an exercise intervention for patients following lung resection: pilot randomised controlled trial

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Caroline Chao, Department of Physiotherapy, Austin Health, Melbourne

Christine F McDonald, Department of Respiratory and Sleep Medicine, Austin Health, Melbourne & Institute for Breathing and Sleep, Melbourne

Sue Berney, Department of Physiotherapy, Austin Health, Melbourne

Linda Denehy, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, & Institute for Breathing and Sleep

**Questions:** Is exercise intervention for patients following lung resection safe and feasible in an Australian setting? Do patients improve their exercise capacity and health-related quality of life after exercise intervention?

**Design:** Pilot randomised controlled trial with concealed allocation and assessor blinding.

**Participants:** 15 people (53% male), mean age 65.5±16.1 years post lung resection for suspected cancer.

**Intervention:** Post-operatively, the control arm received inpatient respiratory physiotherapy according to a standardised clinical pathway. The intervention arm additionally received aerobic, resistance and stretching exercise provided twice daily from day one post-operative until discharge home and then twice weekly as an outpatient for eight weeks.

**Outcome measures:** Safety (number of adverse events), feasibility (recruitment rate, consent rate, session delivery rate, outpatient participant attendance rate), exercise capacity (6-minute walk test) and health-related quality of life (questionnaires). Measurement time-points: pre-operatively, two and 12 weeks post-operatively.

**Results:** 175 patients were screened at thoracic surgery clinic between March-November 2009, 18% were eligible and 82% consented. Fifteen participants (10 later confirmed cancer) were randomised day one post surgery to the control (n=8) and intervention (n=7) group. Inpatient exercise was delivered on 71% of occasions. Only 57% (n=4) of participants attended outpatient classes on 81% of occasions. No adverse events occurred. Intervention was associated with positive trends of improved quality of life. There were no clear trends in exercise capacity.

**Conclusion:** Exercise intervention following lung resection was safe. Inpatient exercise was feasible and well received by participants. Outpatient exercise was well received by a sub-group of participants who attended.

### Evaluation of Exercise Rehabilitation for Survivors of Intensive Care: An assessor blinded, randomised controlled trial

Linda Denehy, Department of Physiotherapy, The University of Melbourne

Sue Berney, Physiotherapy Department, Austin Health, Melbourne

Elizabeth Skinner, Physiotherapy Department, Austin Health, Melbourne

Lara Edbrooke, Department of Physiotherapy, The University of Melbourne

Karla Gough, Nursing and Supportive Care Research, Peter MacCallum Cancer Centre Melbourne

Kimberley Haines, Physiotherapy Department, Austin Health, Melbourne

Graeme Hawthorne, Department of Psychiatry, The University of Melbourne

Meg Morris, Department of Physiotherapy, The University of Melbourne

**Question:** Does intensive care (ICU), hospital and outpatient exercise intervention improve health related quality of life (HRQoL) and physical function in patients with an ICU stay ≥ 5 days compared to standard care.

**Design:** Parallel groups randomised controlled trial with assessor blinding performed in a single tertiary centre.

**Method:** Participants were stratified and randomised to receive standard care or intervention if they were in ICU > 5 days, were over 18 and had no established neurological insult. Participants were assessed at recruitment, ICU discharge, hospital discharge, 3, 6 and 12 months. Physical function was assessed using the Physical function in ICU test (PFIT); 6 minute walk test (6MWT); timed up and go test (TUG). Health related quality of life was measured using the SF36 V2 and the assessment of quality of life (AQoL). Muscle strength was measured using the medical research council scale (MRC). Differences between time points were analysed using Intention to treat and linear mixed modelling. No imputation of missing data was undertaken.

**Results:** One hundred and fifty participants Mean age 60; median APACHE II 19 were randomised. The intervention group improved 6MWT distance more rapidly in the first 3 months (Quadtme  $p < 0.005$ ) and across 12 months (Group x Time  $p = 0.039$ ). There was a trend toward significance for AQoL (Group x Time  $p = 0.056$ ) as the intervention group declined less in utility score across 12 months.

**Conclusion:** A continuum of exercise intervention, performed by physiotherapists hastens recovery of 6MWT distance and health related quality 12 months after ICU discharge.

### Mentoring of clinical educators results in improved learning experiences for physiotherapy students

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Melanie Nguyen, The University of Sydney

Kate Thomson, The University of Sydney

**Question:** Does participation of Physiotherapy Clinical Educators in a mentoring program improve educator skills, resulting in better learning environments for physiotherapy students?

**Design:** Quasi-experimental.

**Participants:** Nineteen physiotherapy clinical educators, 260 students.

**Intervention:** A 10-month mentoring program was developed in consultation with physiotherapy clinical educators via participation in an on-line survey. This program included formal and informal, in person and online case-based discussions and group workshop meetings. Ethics approval was obtained from The University of Sydney Human Research Ethics Committee.

**Outcome measures:** For educators: ability to facilitate and assess student learning, ability to liaise with the university, counselling skills and time and stress management skills. For students: feedback content, delivery of feedback and time spent with educator.

**Results:** Students of participating educators felt their educator spent more time with them ( $p = 0.01$ ) and they were more comfortable with delivery of feedback ( $p = 0.008$ ) than students of non-participating educators. A significantly greater number of students of participating

educators agreed that they had been provided: explanations for their performance on learning outcomes ( $p=0.02$ ), enough feedback ( $p=0.02$ ) and suggestions for improvement ( $p=0.03$ ). There were no significant differences between the groups of students in the perceived usefulness of feedback ( $p=0.06$ ). Clinical educators reported improvements in their ability to create effective learning environments, counselling skills, time and stress management and ability to liaise with the university.

**Conclusion:** Educators participating in a mentoring program reported improved teaching skills, resulting in a better learning environment for students. Acknowledgements: This project was funded by the Teaching Improvement and Equipment Scheme.

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### Changes in the evidence-based practice profile as physiotherapy graduates transition into the workforce

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Marie T Williams, University of South Australia

Tim S Olds, University of South Australia

Lucy K Lewis, University of South Australia

**Question:** What are the EBP profile changes in entry-level physiotherapy students transitioning into the workforce?

**Design:** Prospective, observational, longitudinal.

**Participants:** From 2008, 29 participants were tested in their final year in a physiotherapy program, and again after the first and second workforce years. From 2009, 76 participants were tested in their final and first workforce years.

**Outcome measures:** Participants completed a valid and reliable Evidence-Based Practice Profile questionnaire, which identified five self-report EBP domains (Relevance, Terminology, Confidence, Practice, Sympathy).

**Results:** Effect sizes (ES) of domain changes were small (ES 0.04 to 0.42). There was a consistent pattern of decline in scores for Relevance in the first workforce year (ES -0.29 to -0.42, 95% CI -0.23 to +0.81 for 2008, +0.09 to +0.74 for 2009), followed by an improvement in the second year (ES 0.25, 95% CI -0.23 to +0.76). Scores in Terminology (knowledge of EBP concepts) improved (ES 0.19 to 0.26, 95% CI -0.32 to +0.71 for 2008 occasion 1-2, -0.29 to +0.73 occasion 2-3, -0.06 to +0.58 for 2009). Scores for Practice (EBP implementation) declined in the 2008 cohort (ES -0.04 to -0.23, 95% CI -0.29 to +0.75 for occasion 1-2, -0.48 to +0.55 for occasion 2-3). Confidence scores improved during the second workforce year (ES 0.27, 95% CI -0.25 to +0.79). Scores for Sympathy (practitioner disposition towards EBP) did not change.

**Conclusion:** As students transitioned into the workforce, there was a transitory decline in the practice and sense of relevance of EBP, despite increases in confidence and knowledge.

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### The efficacy and acceptability of traditional and peer-assisted models of clinical education for paired entry-level physiotherapy students – phase one: designing a peer-assisted learning model

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Stephen Maloney, Monash University

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Terry Haines

This study is a randomised controlled trial to compare the quality and acceptability of two models of clinical education, a traditional approach and one where students undertake peer assisted learning (PAL) activities. The two models will be delivered to pairs of undergraduate physiotherapy students on placement within Southern Health (SH), the largest public health service in Victoria.

Phase one of the study involved the design of an evidence based, clinically applicable PAL model in consultation with clinical educators.

Phase two of the study involves the two models being implemented in a randomised, cross-over design. Participants will be 3rd year physiotherapy students ( $n = 24$ ) allocated in pairs, and clinical educators ( $n = 16$ ). Two interventions will be compared, traditional, where students will complete learning activities as individuals, and PAL, where students will be facilitated to complete learning activities in pairs and peer assessment and feedback will provide an adjunct to supervisor feedback. Each pair will undertake both models, acting as their own control.

In phase one, the PAL model was developed in collaboration with clinicians as part of a series of training and exploration workshops. Clinical educators have agreed on a schedule of activities that will be consistently applied across all student pairs.

Phase two is due for completion in October, 2011 and will compare the effects of the traditional and PAL models on learning and performance outcomes; workload of university staff, clinical educators, and health service resources; student experience, satisfaction and wellbeing; clinical educator experience, satisfaction, and service delivery.

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### An innovative approach for teaching clinical reasoning: making thinking visible

Clare Delany, The University of Melbourne

Clinton Golding, The University of Melbourne

**Aims:** This qualitative participatory action research involved a collaboration between academics from education and physiotherapy and experienced allied health clinical educators. The aims were to identify the core thinking steps and questions experienced clinicians pose to themselves when engaged in clinical reasoning, and to frame those thinking processes in a way that makes it easier for clinical educators to teach and assess, and for students to emulate and master.

**Methods:** Twenty three clinical educators from 5 allied health groups attended a series of 7 small group discussions, where they identified and developed questions and thinking routines to facilitate clinical reasoning for students in their discipline. Data consisted of educators' reflective diaries recording the questions and thinking steps they developed and evaluating the impact of the thinking routines on student learning and reasoning.

**Results:** Educators reported the thinking routines provided a useful prompt for students to learn clinical thinking and a teaching structure to frame and make visible the usually tacit thinking processes in clinical reasoning. For educators, the process of thinking about the 'fit' or relevance of the routine encouraged them to examine in concrete terms what they were aiming to teach students steps in clinical reasoning.

**Conclusions:** The thinking steps and routines identified and then trialed in this research provided participatory professional development for educators and a framework for students to develop both dispositions and strategies of thinking that are necessary for complex processes of clinical reasoning in physiotherapy and other allied health practices.

### Pains, sprains and automobiles – clinical placement for physiotherapy students in an emergency department

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Steve Doherty, Department of Rural Health and Rural Clinical School – Northern NSW

Julia Greaves, Department of Rural Health and Rural Clinical School – Northern NSW

Nick Ryan, Hunter New England Area Health

**Background:** To meet the challenge of providing sufficient high quality clinical placements for undergraduate physiotherapy students, university programs need to increase quality clinical education opportunities. In 2009 the University Department of Rural Health and Rural Clinical School – Northern NSW created a program for physiotherapy students to complete clinical placements in the Tamworth Emergency Department (ED). A position was created to provide a clinical service and supervise student's placements in the ED. This paper describes data taken from student evaluation forms.

**Method:** Student feedback in the form of written term evaluations and their experience on placement were thematically analysed, and service statistics were collected. Students were asked to hand in their evaluation after their final assessment so as not to bias responses.

**Results:** 34 undergraduate physiotherapy students have completed 4–5 week long ED clinical placements. Feedback has been overwhelmingly positive: 94% of students strongly felt the placement met their expectations. Students reported having opportunity to develop new skills in acute injury management including fractures, casting, taping and primary health care. They have also experienced extended scope activities such as wound management, pharmacological management and joint reduction.

**Conclusion:** The ED is an excellent environment for undergraduate physiotherapy students to undertake clinical education. It offers opportunities for clinical skills development which are unique to ED yet applicable in other clinical settings. It is an underutilised area for student placement and possibly an area for expansion to help alleviate demands for placement numbers.

**Outcomes:** Primary outcome measure was competency of practice measured by Assessment of Physiotherapy Practice (APP) in two clinical vivas, a new and a review patient at the conclusion of the clinical experience. Secondary outcomes included student perception of experience and clinical educator rating of student performance.

**Results:** There were no significant differences in competency between the SLE 25:75 and control groups ( $p=0.532$ ). The interspersed group achieved a significantly higher APP score than the control group ( $p=0.001$ ). The interspersed model was superior to the 25:75 model ( $p<0.001$ ) accounting for student GPA. Students rated the SLE experience positively. Clinical educators reported comparability between the groups.

**Conclusions:** A high fidelity SLE can replace clinical time, and an interspersed model can result in greater attainment of clinical competency in cardiorespiratory physiotherapy practice.

### Practical examination grading via iPads

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Paul Davey, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University

**Question:** Can a web-based interface designed for Apple™ iPads provide a viable alternative to standard paper grading of physiotherapy practical examinations?

**Design:** Quantitative survey design.

**Participants:** Thirty-two physiotherapy students each completed two 15-minute stations of practical examinations; twelve experienced examiners were recruited in the School of Physiotherapy at Curtin University each graded between 5 and 6 examinations. Components graded included communication, task performance, planning and organisation, risk management and clinical reasoning. After using the iPads to grade students' performance, examiners completed a questionnaire on usability.

**Outcome measures:** Standardised reliable and validated scales for measuring the perceived usefulness and ease of use of new technologies.

**Results:** Overall, examiners provided positive ratings for both perceived usefulness and perceived ease of use. Additional comments included the potential for improved efficiency (vs. paper grading) as well as suggestions for minor modifications for improvement.

**Conclusion:** The pilot-test provides evidence that using an electronic grading tool via an iPad is a viable alternative to paper grading for grading practical examinations. The current system of paper grading typically requires at least double-handling of paper and grade information: examiners' handwritten notes are collated and data is entered manually, often by another person and often requiring additional clarification. The new grading tool will reduce collation time and avoid paper wastage. Issues encountered include requirement for improvement in wireless connectivity, layout and touch pad familiarisation. Once refined, the tool has clear potential for use in grading practical examinations both in physiotherapy and the higher education setting in general.

### Simulated learning environments plus clinical immersion results in equivalent or higher achievement of competency compared to traditional clinical immersion in cardiorespiratory physiotherapy

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Anne Jones, James Cook University

Kate Watson, University of Queensland

Norman Morris, Griffith University

Joan McMeeken, University of Melbourne

Anthony Wright, Curtin University of Technology

Darren Rivett, The University of Newcastle

Gwen Jull, The University of Queensland

**Question:** Does an innovative model of physiotherapy clinical education that combines simulated learning environment (SLE) and clinical immersion result in comparable achievement of competency to a conventional clinical immersion model in cardiorespiratory physiotherapy practice?

**Design:** Two multi-institutional randomised controlled trials with allocation concealment and assessor blinded to group allocation.

**Participants:** Volunteer physiotherapy students entering clinical practice at seven participating universities, recruited 2008–2010.

**Intervention:** Two SLE models were investigated: Trial 1 a week in SLE before 3 weeks of clinical immersion (25:75 group), Trial 2 two weeks of a 50:50 SLE/real patient education within a 4 week cardiorespiratory clinical placement (interspersed group). In each trial, students were randomly allocated to either an SLE or traditional clinical immersion control group (4 weeks duration).

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### Change in dexterity with sensory awareness training: a randomised controlled trial

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The role of sensory awareness in motor control is receiving increasing interest in the rehabilitation literature, both as a feed forward and feedback mechanism.

**Question:** What is the feasibility and effect of training in sensory awareness on dexterity in healthy adults?

**Design:** Randomised placebo-controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** Twenty-nine healthy university students randomly allocated to one of three groups.

**Intervention:** The two experimental groups received either a single group sensory awareness training lesson on the dominant hand, or the same lesson on the non-dominant hand. The control group received a single relaxation (sham) session.

**Outcome measures:** The primary outcome was a dexterity measure: the Purdue pegboard. Secondary outcomes were: the grip-lift manipulandum, adverse events, compliance and self-perceived changes using a questionnaire. Measures were taken immediately before and after training.

**Results:** The awareness lesson on the dominant hand produced a significant improvement in dexterity compared to the control (Purdue pegboard, effect size=0.66, 95% confidence intervals 0.01–1.31,  $p=0.013$ ), but failed to reach significance for the non-dominant hand compared to the control group, or between the non-dominant hand versus dominant hand groups. All participants completed the training, and the subjective reports confirmed the objective outcomes. No adverse events or issues were reported.

**Conclusion:** The training was both feasible and effective in improving dexterity in the dominant hand of healthy adults. Training sensory awareness using a dynamic paradigm may be a useful technique in neurological rehabilitation and should be investigated.

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### Can clinical tests predict the response of stroke patients to transcranial direct current stimulation of primary motor cortex?

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**Question:** Is cathodal transcranial direct current stimulation effective for proximal paretic upper limb control after stroke?

**Design:** Randomised, within-participant experimental study.

**Participants:** Twelve stroke patients 6 weeks–3 years after stroke.

**Intervention:** Transcranial magnetic stimulation was used to assess excitability of corticomotor projections from ipsilesional hemisphere during flexion and pronation motor tasks with the paretic arm. In separate sessions, cathodal or sham transcranial direct current stimulation was applied to the contralesional motor cortex for 20 minutes.

**Outcome measures:** The selectivity ratio, a neurophysiological marker of upper limb motor control, was used to assess corticomotor excitability during the motor tasks. Upper limb impairment, function and spasticity were measured using Fugl-Meyer, ARAT and Ashworth spasticity scales.

**Results:** Higher selectivity ratios were associated with lower function and spasticity. After cathodal stimulation, the selectivity ratio improved in patients with low Ashworth score, and worsened in patients with Ashworth > 1 ( $R_2 = 0.80$ ,  $P = 0.0001$ ). There was a negative correlation after cathodal stimulation and ARAT ( $R_2 = 0.75$ ,  $P = 0.0001$ ) and Fugl-Meyer scores ( $R_2 = 0.59$ ,  $P = 0.003$ ).

**Conclusion:** Cathodal stimulation improved the selectivity ratio for mildly impaired patients and worsened the selectivity ratio for moderate to severely impaired patients. Transcranial direct current stimulation of contralesional primary motor cortex is not a 'one size fits all' solution for upper limb recovery in patients with stroke. While it may improve upper limb function in patients mild proximal weakness, it may be contraindicated in patients with moderate to severe weakness.

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### Mirror box therapy is a feasible therapy option for sensorimotor impairments in people with chronic upper limb hemiparesis

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Norm Morris, School of Physiotherapy and Exercise Science, Griffith University

**Question:** Is a mirror box exercise program feasible for sensorimotor impairments in people with chronic hemiparesis.

**Design:** A within-subject, repeated-measures study.

**Participants:** Twelve people with chronic hemiparesis.

**Intervention:** A thirty minute mirror box sensorimotor exercise program, conducted three times per week for six weeks.

**Outcome Measures:** Feasibility was determined by measuring compliance. Sensorimotor measures, including light touch threshold and proprioceptive error of the paretic hand; and participation restrictions were measured at baseline (Week 0), immediately after (Week 6) and six weeks (Week 12) following the intervention.

**Results:** Compliance was good (participants completed 66% of possible exercise sessions). The paretic hand performed worse on all measures compared to the non-paretic hand at baseline. By Week 6, the paretic hand tended to improve light touch threshold by  $2.9 \pm 7.66\%$  ( $p > 0.05$ ) and proprioceptive error tended to reduce by  $1.13 \pm 22.62\%$  ( $p > 0.05$ ). By Week 12, there tended to be further improvements however these remained non-significant ( $p > 0.05$ ). Both Patient Specific Functional Scale and Euroqol-5D VAS scores increased from Week 0 to Week 6 ( $p < 0.05$ ), and was maintained following the intervention (Week 12) ( $p < 0.05$ ).

**Conclusions:** The mirror box sensorimotor exercise program used in this study appears feasible, with improvements that appear to be functionally important for this group of people with chronic hemiparesis. The mirror box program may be a useful tool for clinicians particularly as it enables independent use by patients.

## The effect of neck torsion on postural stability in subjects with persistent whiplash

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**Questions:** Dysfunction of cervical receptors in neck disorders has been shown to lead to disturbances in postural stability. The neck torsion manoeuvre used in the smooth pursuit neck torsion (SPNT) test is thought to be a specific measure of neck afferent dysfunction on eye movement in those with neck pain. This study aimed to determine whether neck torsion could change balance responses in those with persistent whiplash associated disorders (WAD).

**Design:** Prospective observational study.

**Participants:** Twenty subjects with persistent WAD and 20 healthy controls aged between 18 and 50 years.

**Outcome measures:** Participants stood on a computerised force plate with eyes closed in comfortable stance under 5 conditions: neutral head, head turned to left and right and neck torsion to left and right. Root mean square (rms) amplitude of sway was measured in the anterior-posterior (AP) and medial-lateral (ML) directions.

**Results:** The whiplash group had significantly greater rms amplitude in the AP direction following neck torsion compared to the control group ( $p < 0.03$ ).

**Conclusion:** The results show that the neck torsion manoeuvre may lead to greater postural deficits in individuals with persistent WAD and provides further evidence of neck torsion to identify abnormal cervical afferent input, as an underlying cause of balance disturbances in WAD. Further research is warranted.

## Whiplash induced changes in size and shape of the oropharynx – a prospective study

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**Questions:** Do changes in oropharynx size/shape observed in patients with chronic whiplash occur in all patients irrespective of recovery rates? Are changes related to voice projection measures?

**Design:** Prospective study.

**Participants:** 41 subjects with acute whiplash were followed at 4 weeks, 3 and 6 months post-injury.

**Intervention:** Repeated measures T1-weighted MRI of the oropharynx (C1-2 level); Acoustic voice analysis.

**Outcomes:** Measures at each time point: Neck Disability Index (NDI), oropharynx cross-sectional area (CSA-mm<sup>2</sup>) and shape-ratios (SR), recordings of vowel prolongations (analysed acoustically using the Multi-Dimensional Voice Program). Subjects were classified at 6-months using scores on the NDI: recovered (<8%, n=16), mild pain and disability (10–28%, n=12), moderate/severe pain and disability (>30%, n=13).

**Results:** There was no difference in CSA or SR across all groups at 4-weeks. At 6-months, CSA was significantly different between recovered and moderate-to-severe groups ( $p=0.001$ ). The recovered group demonstrated a significant increase in CSA ( $p=0.04$ ) over time whereas the moderate-severe group significantly decreased ( $p=0.01$ ). At 6-months, the moderate-severe group had a reduced SR when compared to the mild group ( $p=0.03$ ). No differences in CSA or SR were found between the mild and recovered groups at any time point. Voice analysis overall indicated no major abnormalities although 6 subjects with reduced CSA demonstrated increased shimmer and/or jitter suggesting some change in neuromuscular function of the muscles controlling the vocal folds.

**Conclusion:** Temporal reductions in CSA of the oropharynx occur following whiplash but only in those with moderate/severe symptoms. Selected voice changes were measured in some patients.

## Measures of central hyperexcitability in chronic Whiplash Associated Disorder – a systematic review and meta-analysis

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**Objective:** To synthesise the evidence for central hyperexcitability in chronic whiplash associated disorders (WAD).

**Design:** Systematic review with meta-analysis.

**Participants:** Individuals with chronic WAD compared to healthy controls.

**Outcome Measures:** Studies were eligible if measures of quantitative sensory testing (QST) were used. were conducted.

**Results:** The search yielded 23 trials of good quality, 13 were suitable for meta-analyses (two or more studies of a QST). Compared with healthy controls, participants with WAD showed significantly heightened sensitivity to the following tests:

Pressure Pain Thresholds (PPT) at the Head/Neck/Upper Thoracic (H/N/UT) area (SMD -1.36, 95% CI -1.89 to -0.82),

PPT at the Upper Limb (UL) (SMD -1.33, 95% CI -2.50 to -0.16),

PPT at the Lower Limb (LL) (SMD -1.01, 95% CI -1.70 to -0.33),

Nociceptive Flexor Reflex (SMD -0.73, 95% CI -1.11 to -0.35),

Cold Pain Threshold (CPT) at H/N/UT (SMD 0.91, 95% CI 0.66 to 1.17),

CPT at UL (SMD 0.66, 95% CI 0.37 to 0.94),

Heat Pain Threshold (HPT) at H/N/UT (SMD -0.58, 95% CI -0.88 to -0.28),

Electrocutaneous Stimulation (ECS) at H/N/UT (SMD -1.04, 95% CI -1.63 to -0.45),

ECS at LL (SMD -0.85, 95% CI -1.67 to -0.03) and

elbow extension with the Brachial Plexus Provocation Test (SMD -0.55, 95% CI -0.76 to -0.35).

PPT showed high heterogeneity.

**Conclusion:** There is compelling evidence for the presence augmented central nociceptive processing in chronic WAD. This should be considered in the management of chronic WAD.

**Acknowledgements:** MS receives a Senior Research Fellowship from the NHMRC

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### Patients with chronic whiplash are not impaired on laterality tasks

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**Questions:** Are patients with chronic whiplash impaired on laterality tasks? Is performance on a neck laterality task related to characteristics of pain in patients with chronic whiplash?

**Design:** Prospective observational study.

**Participants:** Sixty-four (35 female) patients with chronic (>6months) whiplash and 24 (14 female) asymptomatic controls.

**Outcome measures:** Accuracy and reaction time of responses to foot and neck laterality judgement tasks. Pain characteristics including duration of symptoms, pain intensity, Neck Disability Index scores, Post-traumatic Stress Diagnostic Scale scores, pressure pain thresholds and cold pain thresholds were collected for whiplash participants.

**Results:** There was no effect of group on accuracy or reaction time. There was a significant effect of body part on both reaction time ( $p < 0.001$ ) and accuracy ( $p = 0.001$ ). There was no interaction between group and body part for either reaction time or accuracy. There was a significant correlation between cold pain thresholds and both accuracy ( $r = 0.33$ ) and reaction time ( $r = -0.33$ ) on the neck laterality task in patients with whiplash. Cervical spine pressure pain thresholds were significantly correlated with accuracy ( $r = 0.36$ ) and reaction time ( $r = 0.29$ ) in patients with whiplash.

**Conclusion:** Patients with chronic whiplash are not impaired on neck or foot laterality judgement tasks. Patients with chronic whiplash who have lower tolerance to pressure and cold stimuli perform better on a neck laterality task. Whilst rehabilitation strategies to address these changes have recently become popular, the findings suggest they may not be appropriate for the management of whiplash.

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### Implementation of clinical guidelines for whiplash: effect on physiotherapists and chiropractors knowledge and practice

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**Question:** Does a targeted implementation strategy for whiplash guidelines increase knowledge and professional practice of physiotherapists and chiropractors managing patients with whiplash? Can we identify predictors of learning for knowledge and change in health practice?

**Design:** Prospective prognostic study.

**Participants:** 94 health professionals (68 physiotherapists and 26 chiropractors) who manage whiplash participated in this study. Health professionals were classified at baseline as compliant ( $n = 52$ ) or non-compliant ( $n = 42$ ) with clinical guidelines for whiplash, according to a record of clinical practice.

**Intervention:** All participants completed a 2-day interactive educational workshop delivered by opinion leaders. The educational content focused on the pre-identified knowledge and practice gaps in relation to clinical guidelines for whiplash.

**Outcome measures:** Follow up data were collected at 3 months. Outcome measures were change in professional knowledge measured by questionnaire and change in clinical practice measured by clinical records. Identification of predictors of learning at 3 months were analysed using multiple linear regression.

**Results:** The mean (SD) change in knowledge was significant ( $p < .0001$ ) between baseline (18.9 (5.3)) and post intervention (24.4(5.3)) questionnaire scores. 58% of professionals were compliant with clinical guidelines at baseline and 79% compliant post intervention ( $p = .002$ ). Predictors of learning were baseline knowledge ( $p = .001$ ) and profession ( $p = .003$ ) (adj  $R^2 = 35\%$ ).

**Conclusion:** A targeted implementation strategy resulted in a large effect on changing health professional's knowledge and clinical practice to be compliant with clinical guidelines for whiplash. Greater learning was observed in those with low baseline knowledge, suggesting that future implementation strategies should be targeted at these individuals.

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### The temporal development of fatty infiltrates in the neck muscles following whiplash injury: an association with pain and posttraumatic stress

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**Questions:** How soon after whiplash injury do muscle fatty infiltrates develop and are they associated with poor recovery? Are muscle fatty infiltrates related to pain and psychological factors?

**Design:** Prospective longitudinal observational study.

**Participants:** Forty-four subjects with acute (<4 weeks) whiplash.

**Outcome measures:** An MRI measure for muscle fatty infiltrates and patient self-report of pain, cervical range of movement and Post-traumatic Stress Diagnostic Scale scores were recorded at baseline (<4 weeks), 3-months and 6-months post-injury. Participants were classified at 6-months follow-up as recovered, mild or moderate/severe based on Neck Disability Index scores.

**Results:** There was no difference in MFI across all groups at enrolment. MFI values increased in the moderate/severe group ( $p = 0.002$ ) and were significantly higher in comparison to the recovered ( $p = 0.001$ ) and mild groups ( $p = 0.021$ ) at 3 months post injury. These differences persisted at 6 months post injury. No differences in MFI values were found between the mild and recovered groups. Initial severity of PTSD symptoms mediated the relationship between pain intensity and MFI at 6-months ( $p = 0.04$ ). Initial ROM loss did not.

**Conclusions:** MFI in the cervical extensors occurs soon following whiplash injury and suggest the possibility for the occurrence of a more severe injury. PTSD symptoms have some relationship with the development of MFI indicating a link between the psychological and physical presentations of WAD.



## Understanding and Treating PTSD in the context of Chronic Pain due to Whiplash Injury: Pilot Data from a Randomised Control Trial

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**Background:** Whiplash Associated Disorders (WAD) are common and incur substantial personal and economic costs. Conventional treatments (exercise, manual therapy and pain-focused CBT) have offered only modest effects in reducing pain and disability. The presence of PTSD has been associated with more severe whiplash complaints and poor functional recovery. Trauma-focused CBT has shown moderate effectiveness in chronic pain samples, however there have been no clinical trials within WAD.

**Methods:** Results of a pilot study investing the effects of trauma-focused CBT on psychological factors, pain and disability in individuals with chronic WAD will be presented. Participants were randomly allocated to either CBT (n=13) or a waitlist control (n=13) and treatment effects were evaluated at 10 weeks and 6-month follow-up, using a diagnostic interview, self-report questionnaires and qualitative sensory pain threshold measures.

**Results:** Results indicated clinically significant reductions in PTSD symptoms in the CBT group compared to the waitlist. The treatment of PTSD was also associated with improvements in self-reported pain, disability and psychophysiological reactivity to trauma cues, however minimal changes in sensory pain thresholds were observed between the groups.

**Conclusions:** This study provides preliminary support for the use of trauma focused CBT within chronic WAD. The finding that treatment of PTSD symptoms resulted in improvements in self-reported pain and disability but not sensory pain thresholds highlights the complex and inter-relating mechanisms that underlie both WAD and PTSD. Implications and future research directions will be discussed.

**Conclusion:** For this sample of patients with isolated hand burns, recovery was rapid and good for those whose burn injuries were such that they were able to be managed conservatively or with Biobrane®.

## The importance of a self-selected painful activity as an outcome assessment tool for patellofemoral pain treatment

Marjon Mason

Susan L Keays, Bond University Gold Coast, University of the Sunshine Coast Sippy Downs

Peter A Newcombe, The University of Queensland Brisbane

**Question:** Which of four patellofemoral pain (PFP) causing activities is best suited to assess changes in improvement of PFP after physiotherapy treatment?

**Design:** Sub-study: part of a prospective longitudinal study with a 32 month follow-up.

**Participants:** Forty-one individuals with PFP, totalling 60 knees, age range 13–82 years (mean=45, SD=17).

**Intervention:** Standard program of quadriceps strengthening, quadriceps stretching and taping for two weeks, augmented with an individualised exercise program for another fortnight.

**Outcome measures:** Participants were assessed using the visual analogue scale (VAS) on four painful activities: going up and then down stairs, when stepping down an 18cm step and during a self-selected activity at five time-points: before treatment, at week one, two, four and at 32 months. Eta2, an effect size measure, was calculated over the five time points for each of the four pain measures to establish the strength of association between the variance of each pain measure and the intervention. Eta2 is zero for no association and one for full association.

**Results:** Thirty-seven subjects with 51 knees were available for assessment at each of the five time-points. Over time, pain improved over all four measures ( $p \leq 0.001$ ). Eta2 for the step-down test was 0.258, upstairs 0.407, downstairs 0.433 and 0.699 for the self-selected activity.

**Conclusion:** PFP during a self-selected activity shows a stronger association with the effect size of the intervention than PFP going up and downstairs or stepping down an 18cm step, it should therefore be included as an assessment tool when treating PFP.

## Physical and quality of life outcomes of patients with isolated hand burns: a prospective audit

Nicola Williams

Kathy Stiller, Burns SA

John Greenwood, Royal Adelaide Hospital

Philip Calvert, Burns SA

Tanja Healey, Royal Adelaide Hospital

Margot Masters, Royal Adelaide Hospital

Sheila Kavanagh, Royal Adelaide Hospital

**Question:** What are the physical and quality of life outcomes of adult patients with isolated hand burns?

**Design:** Prospective audit.

**Participants:** 52 patients with 57 burned hands.

**Intervention:** All participants received standard care, which included medical, nursing and allied health input. From a physiotherapy and occupational therapy perspective, standard practice included assessment within 24 hours of admission, positioning/splinting, daily range of motion exercises (commencing immediately [conservative], day 3 postoperatively [Biobrane®] or day five postoperatively [split skin graft]), oedema management, general mobility, functional retraining, education, scar management and out-patient follow-up as required.

**Outcome measures:** The following outcomes were measured up to 12 months post-burn injury: Total Active Motion, grip strength, Michigan Hand Outcomes Questionnaire, Burn Specific Health Scale–Brief, Matching Assessment with Photographs and Scars, and return to work/leisure.

**Results:** Participants whose burn injuries were such that they were able to be managed conservatively or with Biobrane® showed rapid recovery in all outcomes, with normal or near-normal values achieved within 2 weeks to 1 month post-burn. Only four participants required excision and split skin grafting, with their outcomes demonstrating more marked initial deterioration, a slower rate of improvement, but eventual good recovery.

## Development, validation and predictive capacity of a modified Örebro Musculoskeletal Screening Questionnaire in low back and general musculoskeletal working populations

Charles P Gabel, University of the Sunshine Coast

Markus Melloh, University of Otago, New Zealand

Brendan Burkett, University of the Sunshine Coast

**Question:** Can psychometric characteristics, predictive capacity and practicality of the Örebro Musculoskeletal Pain Questionnaire' (ÖMPQ) be improved by modifications to wording and item constructs to produce the 'Örebro Musculoskeletal Screening Questionnaire' (ÖMSQ)?

**Design:** Prospective, observational cohort.

**Participants:** Consecutive patients in two-stages, 1) development and calibration in a LBP population n=(n=106) and 2) validation in a general musculoskeletal (GM) population (n=143) from seven Australian physiotherapy outpatient clinics with spine, upper and lower limb symptoms. Age 38.9±10.5 years, 42.6% female and 80% with symptoms of 1.4±1.2 weeks.

**Intervention:** Nil.

**Outcome measures:** Predictive ability ÖMSQ cut-off scores were determined from baseline and repeated fortnightly to monthly measures of function, severity and absenteeism.

**Results:** The ÖMSQ demonstrated face and content validity, high reliability (ICC2.1=0.97), criterion validity with the original-ÖMPQ (r=0.99) and internal consistency range ( $\alpha=0.26-0.83$ ). Predictive ability was verified for function, severity and absenteeism (110

ÖMSQ-points cut-off for LBP and 114 points for GM) with positive likelihood ratios: 4.2-4.9). Mean ÖMSQ scores were determined for different cut-off levels ( $p < 0.001$ ). Strong correlation ( $r = 0.72$ ) was shown between baseline ÖMSQ scores and recovery time. Factor analysis revealed six constructs compliant with the WHO-ICF themes where consistency was higher than the ÖMPQ. Practicality improved with missing responses reduced up to 50% and completion time and readability unchanged.

**Conclusion:** The ÖMSQ changes improved constructs, practicality and predictive ability in both LBP and GM working populations, while essential psychometric properties were retained. The ÖMSQ enhances validity and practicality of the original-ÖMPQ and is applicable to the GM working population.

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### A clinimetric comparison of four low back pain outcomes: the Spine Functional Index, Oswestry, Roland Morris and Functional Rating Index

Charles P Gabel, University of the Sunshine Coast

Markus Melloh, University of Otago, New Zealand

Brendan Burkett, University of the Sunshine Coast

**Question:** Can a new full-spine patient reported outcome (PRO), be developed, validated and tested in a LBP population and demonstrate improved clinimetric properties of psychometrics and practicality compared to existing standardised criteria.

**Design:** Two-stage observational LBP cohort; 1) development over three phases of item identification, reduction and field-testing plus calibration, 2) validation and concurrent criteria completion with consecutive patients ( $n = 121$ ) from 10 physiotherapy outpatient clinics.

**Intervention:** Nil.

**Outcome measures:** New PRO, the Spine Functional Index (SFI); criterion, Functional Rating Index (FRI), Oswestry Disability Index (ODI) and Roland Morris Questionnaire (RMQ).

**Results:** The SFI demonstrated higher overall clinimetric performance on the 'measurement of outcome measures' and 'Bot' clinimetric property measurement scales (96%) than the FRI (84%), the ODI (72%) and RMQ (86%). Concurrent validity was high with each criterion ( $r = 0.87-0.98; 95\%CI$ ). The SFI had preferred or equivalent clinimetric properties for reliability (ICC2:1, SFI=0.97, criteria=0.95), responsiveness (standard response mean=1.44, criteria=1.23-1.45 and effect size=1.05, criteria 0.99-1.19) and 90%CI minimal detectable change (6.5%, criteria=9-10%). Internal consistency was comparable for all PROs (range  $\alpha = 0.93-0.94$ ). The SFI practicality was equivalent to the RMQ and preferred to the FRI and ODI with: readability SFI and RMQ=grade 7-6; FRI and ODI=grade 10, missing responses SFI-RMQ=1.5-2%; FRI-ODI=5.3-7%). Administration time (completion and scoring) was comparable for all PROs at 2-3 minutes.

**Conclusions:** The SFI demonstrated sound clinimetric properties for lumbar spine status and functional limitation. The SFI was recommended head of and preferable to the FRI, ODI and RMQ due to superior psychometric, practical and summary performance characteristics with lower error rates.

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### Evidence based questionnaires for profiling patients with chronic recurrent back pain who are commencing an education and exercise rehab program

Anna-Louise Bouvier, Physiociase

In order to establish clear baselines for assessing the physical, functional, and psychosocial progress of patients presenting for a group exercise rehab program, a multifactorial approach to assessment is necessary. This is a case study of how a combination of evidence based questionnaires can be used to profile patients and give indications as to prognosis. The Bothersome Scale, Pain VAS scale, Patient Specific, Functional Scale, Roland Morris Scale, Tampa Fear Avoidance Behaviour Questionnaire and Catastrophisation Scale are used to give the physiotherapist teaching a class a simple but accurate profile of clients in the class and highlight their main flags (e.g pathological, functional or psychosocial) These questionnaires form the basis of a 2 year longitudinal prognosis study of 100 patients that the Physiociase practice is currently undertaking with Sydney University.

## 270

### Suitability of the OMSPQ as a clinical screening tool for biopsychosocial risk factors in subjects with persistent whiplash

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Venerina Johnston, Division of Physiotherapy University of Qld

Julia Treleaven, Division of Physiotherapy University of Qld

**Questions:** A combination of biopsychosocial factors are important prognostic indicators of outcome after a whiplash injury. A quick, valid and reliable tool which could help screen for these risk factors would be ideal in the busy clinical setting. The Orebro Musculoskeletal Pain Questionnaire (OMSPQ) is a quick, 24 item, screening tool which contains components of a large majority of these biopsychosocial factors. The aim of this study was to determine any correlations between the OMSPQ and specific components of it and commonly used tools to measure pain and disability, anxiety and depression, fear avoidance and post-traumatic stress in whiplash patients.

**Participants:** Seventy subjects with persistent whiplash.

**Outcome measures:** OMSPQ, Neck disability Index (NDI), Patient Specific Functional Scale (PSFS), General Health Questionnaire (GHQ) total and anxiety and depression subscales, Tampa scale for kinesophobia, Impact of events scale revised (IES R).

**Results:** The OMSPQ was significantly correlated with the Tampa ( $r = 0.58$ ), NDI ( $r = 0.77$ ), GHQ ( $r = 0.63$ ), and GHQ subscales for anxiety ( $r = 0.54$ ) and depression ( $r = 0.56$ ). OMSPQ was weakly correlated with IES R ( $r = 0.35$ ). Despite poor agreement between the activities included in OMSPQ and activities selected by the patients in the PSFS, a mild correlation was present ( $r = 0.37$ ). There were no significant correlations between coping or work subscales of the OMSPQ and any relevant outcome measures.

**Conclusion:** The OMSPQ would appear to be useful as a quick screening tool for those with persistent whiplash. Some modifications could be of benefit and further research is required.

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### Troublesome driving tasks and development of a preliminary questionnaire for perceived driving difficulty in individuals with chronic whiplash associated disorders

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Venerina Johnson, Division of Physiotherapy, School of Health and Rehabilitation Science, The University of Queensland, Brisbane.

Julia Treleaven, Division of Physiotherapy, School of Health and Rehabilitation Science, The University of Queensland, Brisbane.

Gwendolen Jull, Division of Physiotherapy, School of Health and Rehabilitation Science, The University of Queensland, Brisbane.

**Question:** How to assess driving difficulty in people with chronic whiplash associated disorders (WAD)?

**Design:** Qualitative study and survey.

**Participants:** Study 1; Thirty-three individuals with chronic WAD. Study 2; Seven individuals with chronic WAD and 15 experts (14 physiotherapists and a chiropractor).

**Intervention:** Study 1 investigated which driving tasks were nominated as troublesome by individuals with chronic WAD. Study 2 developed a preliminary questionnaire to assess driving difficulty.

**Outcome measures:** Study 1; self-rated perceived driving ability, semi-structured interview about troublesome driving tasks. Study 2; content validity index (CVI) using the 15 experts.

**Results:** Study 1, 73% of the whiplash subjects reported reduced driving ability. The most frequently nominated troublesome driving tasks were checking blind spots, prolonged driving and reversing/reverse-parking, which are not included in current questionnaires on driving ability. In Study 2, a new questionnaire was developed inclusive of 33 driving tasks derived from the patient interview and literature. Seven individuals with chronic WAD assessed clarity of expression and the format of questionnaire. To calculate the CVI, the 15 experts rated the relevance of the 33 driving tasks to WAD. Thirty driving tasks remained after exclusion of driving tasks which did not reach 70% in the CVI (driving an unfamiliar car, holding conversations while driving, and operating CDs/radio while driving).

**Conclusion:** Current questionnaires for aged or disabled persons do not have appropriate psychometric properties to assess driving difficulty in individuals with chronic WAD. A preliminary questionnaire with 30 driving tasks was developed for further research in a WAD population.

**Results:** Generally, the self-reported severity of symptoms increased over time with the exception of pain and joint stiffness which improved. The concern attributed to these symptoms showed a similar pattern of progression with the concern attributed to pain showing a statistically significant decline ( $p < 0.05$ ).

**Conclusion:** The results from this study can assist health care professionals in implementing a similar screening tool within the clinical setting to effectively identify individuals who require allied health intervention to improve their functioning and quality of life during and after chemotherapy. Additionally, this screening tool informs health care professionals of the areas they should routinely target and give appropriate advice and education on to patients commencing chemotherapy.

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### Predictors of outcome in patients with musculoskeletal pain: specific or generic?

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**Objective:** To identify which "generic" prognostic factors, such as pain intensity, levels of disability, and psychological factors, are most strongly associated with musculoskeletal pain persistence, regardless of the location of pain. We tested the hypothesis that pain location does not add predictive value to these generic prognostic models, and that such prognostic factors are equally important across different pain locations.

**Methods:** Data from a prospective observational cohort of acute ( $n = 413$ ) and chronic ( $n = 414$ ) primary care patients with musculoskeletal pain was used to develop predictive models. The analysis was carried out in three steps: derivation of predictive models including generic factors only; investigation of the added predictive value of pain location; and investigation of effect modification by pain location.

**Results:** Generic factors predicted outcome over different time periods (3 months and 12 months) and for both acute and chronic musculoskeletal pain (AUC 0.72 to 0.74). The most consistent predictors of poor outcome were having had the same complaint in the previous year (OR = 2.03 to 3.46), a lower level of education, lower scores on the SF-36 "vitality" subscale, using pain medication at baseline, and being bothered by the complaint more often in the past three months. Pain location variables only slightly improved the predictive ability of the models over generic factors and were inconsistent across the models.

**Conclusion:** Generic factors appear to play an important role in the prognosis of acute and chronic musculoskeletal pain, regardless of the location of pain.

## 272

### An Allied Health Screening Tool Questionnaire Effectively Identifies Changes in Cancer Patients' Perceived Chemotherapy-induced Side Effects following Six Weeks of Treatment: A Prospective Clinical Trial

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Leah McIntyre

Micheal Steele

**Questions:** What are the self reported deleterious physical side effects of chemotherapy? Does the self reported severity and concern attributed to side effects change over a six week period?

**Design:** Prospective clinical trial.

**Participants:** Forty five participants who were undergoing chemotherapy at the Mater Adult Hospital completed the initial questionnaire (0 weeks) while twenty three of these participants completed both 0 and 6 week questionnaires.

**Outcome Measure:** The AHST questionnaire was completed by patients undergoing chemotherapy prior to commencing chemotherapy (0 weeks) and again at six weeks into treatment. The questionnaire asked participants to rate the severity and concern attributed to physical symptoms including balance impairments, walking problems, muscle weakness, joint stiffness, fatigue, pain and pins and needles.

## 274

### Greater trochanteric pain syndrome is as painful and functionally debilitating as severe osteoarthritis of the hip

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Jill L Cook, Monash University

Terry Neeman, The Australian National University, Canberra, ACT, Australia

Paul N Smith, The Trauma and Orthopaedic Research Unit at the Canberra Hospital, Canberra, ACT, Australia. The Australian National University

**Questions:** Which condition is worse? Greater trochanteric pain syndrome or hip osteoarthritis?

**Design:** Prospective case controlled study.

**Participants:** Forty two people with Greater trochanteric pain syndrome, 20 with severe hip osteoarthritis, and 23 age and sex matched asymptomatic participants were recruited from hospital waiting lists and the community; individuals were interviewed. Exclusion criteria included inflammatory and metabolic disorders.

**Outcome measures:** The Harris hip score; Oswestry disability index; Australian quality of life instrument; Functional co-morbidity index; and fulltime work assessment.

**Results:** No difference was found between the two symptomatic groups on the Harris hip score; Oswestry disability index; Australian quality of life instrument; or the Functional co-morbidity index measures. Both symptomatic groups were significantly more disabled than the control group on the Harris hip score and Oswestry disability index ( $p < 0.001$ ); had lower Australian quality of life instrument scores ( $p < 0.001$ ); and higher Functional co-morbidity index scores (Greater trochanteric pain syndrome vs control,  $p = 0.005$ ; Hip osteoarthritis vs control,  $p = 0.019$ ). Participants with Greater trochanteric pain syndrome were least likely to be in full time work; full time work participation probability (95% C.I.): Greater trochanteric pain syndrome: Prob = 0.288 (0.160 to 0.463), Hip osteoarthritis Prob = 0.518 (0.273 to 0.753); control group of Prob = 0.676 (0.439 to 0.847).

**Conclusion:** People with Greater trochanteric pain syndrome have similar levels of pain, disability and quality of life, but are less likely to be in full time employment than people with severe hip osteoarthritis.

## 275

### The burden of chronic musculoskeletal ankle problems in the community

Claire E Hiller, University of Sydney

Elizabeth J Nightingale, University of Sydney

Amy Sman, University of Sydney

Joshua Burns, University of Sydney

Kathryn M Refshauge, University of Sydney

**Question:** What is the impact and healthcare use of people in the community with chronic ankle problems?

**Design:** Observational, interview.

**Participants:** Sixty-seven participants ( $48 \pm 11.9$  yrs) with a history of ankle sprain ( $n = 41$ ) fracture ( $n = 15$ ) or arthritis ( $n = 11$ ) who agreed to in-depth interview, from a randomised telephone survey of NSW community-dwelling people ( $n = 751$ ).

**Outcome measures:** Impact was measured by: symptoms (VAS scale 0–10), Foot and Ankle Outcome Survey (FAOS, maximum 100, Age normalised score (AN) = 92), Cumberland Ankle Instability Tool (CAIT, maximum stability 30, AN 29), and Australian Quality of Life (AQoL-4D, maximum 1.00 AN 0.85). Between-group differences were analysed by one way ANOVA. Healthcare use was number of healthcare practitioner visits in the past year and self-management strategies.

**Results:** There were no differences between groups for any outcome. All questionnaire results were below age-related norms: FAOS  $70.5 \pm 29$ , CAIT  $15.4 \pm 8.6$ , AQoL  $0.74 \pm 0.27$ . Pain intensity most days was (mean  $\pm$  SD)  $2.6 \pm 2.3$ , weakness  $3.2 \pm 2.9$ , instability  $3.0 \pm 2.5$ .

Most people (75%) decreased and changed their physical activity although some (10%) continued and suffered the consequences. Twenty-five (37%) people sought healthcare for their ankle problem, most commonly from GPs. Most did not seek help because they had learnt to manage themselves. Self-management commonly included an ankle support, exercises and ice.

**Conclusion:** Chronic musculoskeletal ankle problems are an under-recognised problem in the community and have a significant impact long-term on people's lives.

## 276

### What is the impact of adult hallux valgus on foot pain and disability?

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Bill T Vicenzino, The University of Queensland

Michelle D Smith, The University of Queensland

**Questions:** Do adults with a structural hallux valgus deformity experience more foot pain and functional limitation than matched controls? Do they report significant concerns about appearance and difficulty with footwear?

**Design:** Cross-sectional case-control study.

**Participants:** Thirty volunteers with hallux valgus (radiographic hallux valgus angle  $> 15$  degrees) and 30 matched controls were recruited (50 women, 10 men; mean age 44.4 years, range 20 to 76 years).

**Outcome measures:** Differences between groups were examined for self-reported foot pain and disability, concerns about appearance and footwear, balance and functional performance, hallux plantarflexion and abduction strength, pressure-pain threshold and passive dorsiflexion range of motion at the first metatarsophalangeal joint.

**Results:** All self-report measures showed that hallux valgus was associated with greater foot pain and disability, and significant concerns about appearance and footwear ( $p < 0.001$ ). Hallux valgus subjects showed reduced hallux plantarflexion (mean difference =  $37.1$  N; 95% CI 18.8 to 55.4) and abduction strength (mean difference =  $9.8$  N; 95% CI: 4.0 to 15.6), and increased mediolateral sway while standing with both feet eyes closed (mean difference =  $-0.34$  cm; 95% CI:  $-0.63$  to  $-0.04$ ). Lower pressure-pain threshold was measured at the medial first metatarsophalangeal joint in hallux valgus subjects (mean difference =  $133.3$  kPa; 95% CI 15.1 to 251.5).

**Conclusion:** Adults with hallux valgus experience greater foot pain and disability, decreased hallux muscle strength and increased postural sway compared to controls. This is also the first study reporting the significance of concerns regarding appearance and footwear related to hallux valgus.

## Is Physiotherapy effective for a mid body Achilles tendinopathy?: A review of non-surgical and non-pharmacological interventions

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Paul Williams, Morriston Hospital ABM University Trust, Wales, United Kingdom

Clare Topliss, Moorrsiton Hospital, ABM University Trust, Wales, United Kingdom

**Question:** Is physiotherapy for a chronic mid body Achilles tendinopathy effective? **Design:** Systematic review of the literature.

**Method:** A search of published and grey literature databases was undertaken (1999–December 2010). Two reviewers independently assessed the studies for eligibility using a strict inclusion and exclusion criteria. Eligible articles were assessed critically using the Pedro score. Data on cohort characteristics, diagnostic criteria, treatment intervention, outcome measures and results was extracted and synthesized by a narrative research method.

**Results:** 209 studies were identified. Nine publications met the review inclusion criteria. Methodological quality was adequate for all nine studies; however, blinding was a limitation for most. Interventions investigated were; Exercises (n=2), Low level laser therapy (n=1), Low energy shockwave treatment (SWT) (n=3), Air cast brace (n=2) and Insoles (n=1). Some evidence exists for eccentric exercises in combination with SWT or Laser. However, contrary to other reviews, eccentric exercises were not found to be superior to other physiotherapy treatments.

**Conclusions:** There is insufficient evidence to determine which method of physiotherapy is most appropriate for a chronic mid body Achilles tendinopathy. Further well designed randomised controlled trials assessing physiotherapy interventions with specific diagnostic criteria and appropriate outcome tools are required.

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## Knee kinematics: A new world of 2D to 3D motion imaging

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Abdullah A Muhit, University of New South Wales at the Australian Defence Force Academy

Mark R Pickering, University of New South Wales at the Australian Defence Force Academy

Paul N Smith, Trauma & Orthopaedic Research Unit, Canberra Hospital and ANU Medical School

The past gold standard for kinematic analysis was RSA which requires beads inserted into the bone. Recently 2D images from fluoroscopy and 3D imaging from MRI or CT have been registered to produce synthetic models of dynamic 3D motion. This is faster, non-invasive and enables pre and post op studies, but a past barrier was accuracy for out-of-plane translation. This presentation aims to describe the application of these new algorithms to knee kinematics, enabling the first ever prospective, controlled RCT of total knee replacement motion.

Initial experiments used cadaveric specimens implanted with tantalum beads to act as fiducial markers. The specimens were imaged with CT for a 3D model, then moved through flexion and extension to capture fluoroscopy films at 25 frames per second. A series of studies has tested the accuracy of this technique against RSA and the algorithms written for registration. The finished product is a 3-dimensional kinematic model with an accuracy of less than 0.5mm and 0.5° in five degrees of freedom and 0.65mm in out-of-plane translation. Internationally 3mm for out-of-plane translation is reported.

A CAD model of the implant was substituted for CT for post knee replacement images (RBK, Global Orthopaedic Technology). The mean standard deviation of error in-plane was 0.23° and for out-of-plane translation was 0.59mm. Improved accuracy is due to crisp implant outlines.

Our experiments show that our 3D to 2D registration method is approaching the accuracy of RSA. It is sufficiently accurate to produce confident interpretation of prospective kinematics studies.

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## The effect of ACL rupture on gastrocnemius muscle activation: a study of alterations in EMG measures & their relationship to knee joint stability

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Joanne E Bullock-Saxton, Faculty of Health Sciences, Bond University

Peter A Newcombe, Department of Psychology, The University of Queensland.

**Question:** Do anterior cruciate ligament deficient (ACL) individuals use different gastrocnemius muscle activation strategies during a dynamic task compared to healthy controls? Are these activation characteristics related to knee joint laxity?

**Design:** A cohort cross-sectional study.

**Participants:** 15 ACLD patients and 11 healthy control subjects.

**Measures:** Surface EMG of left and right medial gastrocnemius (MG) was recorded during a controlled single leg hop on each limb. Onset and offset of MG activation relative to take-off, during flight and landing were calculated as well as the amplitude (RMS) of activation. Passive knee laxity was measured with the KT1000.

**Results:** MG activity on the injured side of ACLD participants demonstrated significant prolonged activation in preparation to hop, minimal muscle inactivity prior to take-off, and increased duration of overall muscle activity when compared to the uninjured side and control subjects ( $p < 0.05$ ). Significant positive correlations were found between passive knee joint laxity and the three significant temporal **measures:** Pre-take-off activity ( $p = 0.036$ ), pre-take-off % activity ( $p = 0.036$ ), and total activity duration ( $p = 0.043$ ). RMS of the muscle signal was not significant.

**Conclusion:** Overall, the MG on the ACLD side demonstrated longer activation, with minimal rest during the hop test, which may be an attempt to maintain knee stability. Furthermore, the strong relationship between knee laxity and prolonged muscle activation suggest that individuals with a loss of knee stability are more reliant on active control of the gastrocnemius muscle.

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## The long term outcome of a 2-staged physiotherapy approach to the treatment of patellofemoral pain

Susan L Keays, Bond University Gold Coast; University of the Sunshine Coast Sippy Downs

Marjon Mason

Peter A Newcombe, The University of Queensland Brisbane

**Question:** Can one month of physiotherapy comprising standard and individualised treatment for patellofemoral pain (PFP), lead to long-term (nearly three years) improvement?

**Design:** Longitudinal prospective four week study with 32 months follow-up.

**Participants:** Forty-one individuals with PFP, totalling 60 knees, age range 13–82 years (mean = 45, SD = 17).

**Intervention:** Participants were treated using a standard program of quadriceps strengthening, quadriceps stretching and taping for two weeks, augmented with individualised exercises for another fortnight.

**Outcome measures:** Quadriceps isokinetic strength, quadriceps muscle length and eccentric control as well as pain during four activities namely, up and then down stairs, stepping down an 18 cm step and during a self-selected activity were recorded at four time-points: Before treatment; at week two; four and after 32 months. Anova's and t-tests were conducted to assess: Firstly the effects of standard treatment over two weeks, secondly the supplementation of individualised treatments for two weeks and thirdly the outcome after 32 weeks.

**Results:** All participants were tested in the short term, 37 participants with 55 knees were tested at 32 months. Firstly, standard treatment significantly improved all seven measures ( $p < .001$ ). Secondly, standard plus individualised treatment significantly further improved all seven measures ( $p < 0.01$ ). Thirdly, follow-up at 32 months showed that six out of seven measures were maintained. Quadriceps strength was reduced but two of the four pain measures improved significantly ( $p < 0.01$ ).

**Conclusion:** A 2-staged approach comprising standard and individualised physiotherapy administered over four weeks is effective in the treatment of PFP and leads to long term benefits at 32 months.

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## 281

### Development and validation of the Participation-Based Environment Accessibility Assessment Tool in the Zambian context

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Jennifer C Nitz, The University of Queensland, St Lucia Campus, Queensland

Desleigh de Jonge, The University of Queensland, St Lucia Campus, Queensland

**Purpose:** Describe the development and validation of a new measure for assessing the accessibility of the built environment in Zambia. **Questions:** What is the content of the Performance-Based Environment Accessibility Assessment Tool in comparison to other assessment tools and the International Classification of Functioning, Disability and Health?

**Design:** A qualitative design.

**Participants:** Eighty eight persons with mobility impairment who use wheelchairs and crutches for mobility purposefully recruited in 5 provinces of Zambia.

**Method:** Focus group discussions and personal interviews regarding the accessibility experiences of the built environment. The construction of the Performance-Based Environment Accessibility Assessment Tool was guided by the identified environmental features which impede access for persons with mobility impairment who rely on wheelchairs or crutches for mobility pertinent to developing countries.

**Results:** In comparison with the Community Health Environment Checklist, the Performance-Based Environment Accessibility Assessment Tool has similarities on entrances, ramps and elevators but differences on toilets, amenities, usability and rescue assistance. The Performance-Based Environment Accessibility Assessment Tool relates with the International Classification of Functioning, Disability and Health in mobility outdoor, products and technology, natural environment and man-made changes to the environment.

**Conclusion:** The Performance-Based Environment Accessibility Assessment Tool was constructed grounded in the reality of people's experiences in Zambia. Suggest that clinometric properties testing of the tool be conducted to establish its reliability.

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## 282

### A comparative study of positioning on premature infants respiratory function

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Nancy Low Choy, Bond university, Gold Coast

Andreas Schibler, Mater Children's Hospital, Brisbane

Michael Steele, Bond University, Gold Coast

**Question:** Is quarter turn from prone more effective than supine and prone positioning in improving lung function and ventilation efficiency, in preterm infants in neonatal intensive care unit (NICU)?

**Design:** Retrospective data analysis.

**Participants:** Fifty-four infants less than or equal to 32 weeks gestation with a birth weight of greater than 750 g formed three ventilatory groups: 6 spontaneously ventilating; 24 breathing with endotracheal tube (ETT) support, 24 breathing with continuous positive airway pressure (CPAP) via nasal prongs.

**Main outcome measures:** Ventilation distribution and regional lung filling characteristics were measured using electrical impedance tomography (EIT). Physiological measures – respiratory rate (RR), heart rate (HR), oxygen saturation (SpO<sub>2</sub>) and fraction of inspired air (FiO<sub>2</sub>) – were collected.

**Results:** Respiratory rate (RR) was significantly lower in the quarter turn from prone position compared to the baseline supine (mean difference  $> 8.76$  breaths/min;  $p < 0.01$ ), was trending lower compared to 30 minutes supine (mean difference 5.81 breaths/min;  $p = 0.054$ ) but was not different to prone. There was no other significant effect related to position. The spontaneously ventilating infants had a greater magnitude of tidal volume in quarter turn from prone in specific lung regions compared to ventilated infants. In all positions the spontaneously ventilating infants had better ventilation homogeneity.

**Conclusion:** This study demonstrated that quarter turn from prone had a positive positional effect on premature infants RR. Whilst no other significant findings between positions were evident, only the immediate effects were investigated, thus further research into the longer term effects of quarter turn from prone is warranted.

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### Further development of the Challenge Module – a new observational tool to measure advanced motor skills in children with cerebral palsy

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**Questions:** What is the inter-rater reliability of the Challenge Module? Do any further revisions need to be made to its item-specific time-based response options before psychometric properties are tested in an international study?

**Background:** The Challenge Module was created as an adjunct to the Gross Motor Function Measure to give physiotherapists a tool to evaluate change in advanced motor skills in high-functioning children with cerebral palsy.

**Design:** Measurement development/validation pilot study.

**Participants:** Twelve children (7 males, 5 females) with cerebral palsy (mean age 9.9 years, SD 2.9) in Gross Motor Function Classification Level 1.

**Method:** Participants attended a single testing session and two physiotherapists (assessor, observer) scored.

**Outcome measures:** The Challenge Module consists of 25 items scored on a 0 to 4 point scale. A score of '2' demonstrates ability to complete the item and a '3' or '4' reflects full performance within item-specific targeted speed.

**Results:** Inter-rater reliability ICC was 0.99 (95% CI 0.98 to 1.00), and minimal detectable change was 4.75% points. Total mean score was 52.68% (SD 18.52%). Three items had a mean score  $< 1.0$ , indicating extreme difficulty and need for revision. Six items had a mean score of  $1.0 < 2.0$ . These were generally able to be completed, but only slowly, suggesting time-based response options need to be more generous to improve the measure's sensitivity.

**Conclusion:** Preliminary results demonstrate the Challenge Module's excellent reliability and potential for change evaluation, and also identify response options that need re-evaluation prior to conducting an international study.

### Physiotherapy and occupational therapy assessment results of children with primary language disorder: supporting co-morbidities

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**Question:** This paper explores the physiotherapy (PT) and occupational therapy (OT) assessment findings of children with primary language disorder (PLD) attending a school which caters to children with this deficit.

**Design:** Audit study.

**Measures:** Performance on all PT and OT assessments used between 2000 and 2008 were included.

**Analysis:** Percentage of children performing abnormal or below normal are reported. Correlations between subtests were explored.

**Participants:** Files of all children diagnosed with PLD ( $n=119$ , males=90) attending the school between 2000 and 2008 were included.

**Results:** On the PT specific and OT/PT combined assessments, 58% to >80% presented with sensory motor and posture/balance abnormalities, and performed below average in gross and fine motor areas. On OT specific assessments, 41.18% to 50% of children scored below normal in visual motor perceptual, visual closure, visual-motor integration, and visual-motor speed. Strong and significant correlations were found between many subtests, for example: posture balance test on NSMDA and NDPA (0.841,  $p=0.00$ ); posture balance test on NDPA and BOTMP (0.775,  $p=0.00$ ); and fine motor test on BOTMP and PDMS (0.745,  $p=0.034$ ).

**Conclusions:** On all tests used, children with PLD demonstrated high frequencies of sensory and motor deficits, supporting co-morbid motor deficits in PLD, and thus the need for an interprofessional team to provide optimal management. High correlations between measures suggest that the tests agree on which children have deficits, therefore all the assessment measures may not be necessary. Overall, this study supports the need for physiotherapists in the management of children with PLD.

### The prevalence of Developmental Coordination Disorder in Kuwaiti children aged 5–9 years old

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**Question:** Is the prevalence of developmental coordination disorder in Kuwaiti children within the range reported in the DSM-IV?

**Design:** Cross-sectional study.

**Participants:** 297 Kuwaiti 5–9 year old children (147 boys and 150 girls) who were recruited from public and private primary mainstream schools in urban and rural areas.

**Methods:** The prevalence of DCD was measured based on the DSM-IV criteria. The MABC-2 was administered to The DCDQ was completed by parents who had provided consent for their children to be included in the study. PASW statistics-18 was used to analyze the total score of the MABC-2 and the DCDQ at the 15th percentile as a cut-off which was then cross-tabulated to detect children who performed below the 15th percentile in both tools.

**Results:** The results showed that 14.14% (42 children) of the total sample performed below the 15th percentile in both the MABC-2 and the DCDQ. Using the 5th percentile as a cut-off on the MABC-2, 5.7% have DCD; the ratio of boys to girls was 1.8:1. At the 15th percentile of the MABC-2, 8.4% were at risk of DCD; the ratio between boys and girls was equal.

**Conclusion:** The conclusion drawn is that the prevalence of DCD in Kuwait is similar to what is reported in the American Psychiatric Association. The clinical implication of this study is that a diagnosis of DCD that adheres to the DSM-IV criteria requires that two different instruments may be needed to accurately calculate the prevalence of DCD and precisely diagnose children with DCD.

### Functional performance in young Australian children with Achondroplasia

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Leanne Johnston, School of Health and Rehabilitation Sciences, The University of Queensland

**Question:** Are children with achondroplasia delayed in development of functional independence skills when compared to typically developing children?

**Design:** A multi-centre, population-based, cross-sectional study was developed. The study was lead by the Royal Children's Hospital, Brisbane and involved The Royal Children's Hospital, Melbourne; The Children's Hospital at Westmead, Sydney; Princess Margaret Hospital, Perth and the Women's and Children's Hospital, Adelaide.

**Participants:** Parents of all known Australian children with achondroplasia turning three, five or seven years between October 2008 and October 2010.

**Outcome measures:** Parents were interviewed using the Functional Independence Measure for Children (WeeFIMTM) to gather information about their child's performance on 18 common daily functional activities across three domains of self-care, mobility and social cognition. This data was compared to WeeFIMTM norms.

**Results:** Thirty-five families participated with 14 children aged 3 years, 12 children aged 5 years and 9 children aged 7 years. Children with achondroplasia showed delayed development of independence in functional tasks across all domains and in all age groups compared to normative data.

**Conclusion:** The need for additional support to complete self care, mobility and social cognition tasks suggests an increased burden of care extending later into childhood for families, teachers and carers of children with achondroplasia. Access to physical, occupational and speech therapists skilled in assessment and management of achondroplasia may assist families to identify strategies and environmental devices to support their children to become more independent, particularly at time of school commencement.

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### The McGuire Score for Clinical Assessment of Clubfoot: Inter-Rater Reliability of Clinicians

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**Background:** The McGuire Clubfoot scoring system has been used at this institution for many years to monitor clubfoot as children grow and develop. It is a rapidly administered manual test of passive abduction, active eversion, passive dorsiflexion with the knee flexed and extended and of plantar flexion. Up until this time it has not been subjected to reliability or validity studies.

The aim of this study was to establish inter-rater reliability of the McGuire Clubfoot scoring system.

**Methods:** 4 clinicians assessed a cohort of 30 children (12–60 months). 24 children had unilateral or bi-lateral clubfoot, and 6 children had typically developing feet. A total category score of normal or mild, moderate or severe deformity was calculated by summing the 5 sub-component scores. Single measure intraclass coefficients with a 95% confidence interval and chronbach alphas were used to determine inter-rater agreement of the assessors.

**Results:** The absolute agreement between the assessors was acceptable for the total score category of each foot (Chronbach alpha L = 0.767; R = 0.678.) Intra-class correlations showed fair to moderate reliability between testers when the overall category score for each foot was considered (L: rho = 0.451; R: rho = 0.345) Of interest, the agreement results were much higher on the left foot compared to the right, and the more experienced clinicians had higher levels of agreement compared to the less experienced clinicians.

**Conclusion:** The McGuire Clubfoot scoring system is a reliable tool for ongoing assessment for children treated for clubfoot.

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### Chart audit of children with cerebral palsy in Thailand

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**Purpose:** A chart audit of management of children with cerebral palsy (CP) in Thailand was conducted to describe assessment and management for these children.

**Participants:** Using stratified randomised selection, charts of children with CP (N=269) were audited in 4 Thai hospitals (N= 23, 85, 37, 32) and 2 schools (N=10, 82).

**Methods:** Data was audited regarding demographic factors, assessments and managements.

**Analysis:** Descriptive data was analysed using the Statistical Packages for the Social Sciences (version 18).

**Results:** Type of CP was recorded for 71% of cases. Mainly children were classified as having diplegia (N= 92) or quadriplegia (N=36). Gross Motor Function Classification System was reported in only 3 charts, but could be ascribed from chart entries. Birth weight was recorded for 81.41% of cases while Gestational age was mainly recorded as preterm/term.

For assessment under body structures and function, few charts (N= 30) reported aspects such as deep tendon reflexes, with more reporting manual muscle (N=118), muscle tone (N=179) and muscle length (N=81) tests. Activity domain measures were reported in 96.28% of charts.

Management was mainly reported in the above 2 domains, including oral medication for spasticity and/or epilepsy (N=69/81). Physiotherapy intervention was reported in 235, orthoses were provided for 127 children and orthopaedic surgery for 71.

**Conclusion:** This audit provides a description of some elements of paediatric CP presentation in Thailand. It is clear that more structured, detailed and standardized reporting of client information and physiotherapy measures and practices need to be established within Thai venues.

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### Plagiocephaly measured by cranial vault asymmetry index using a flexible curve: a reliability study

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**Background:** There have been increasing referrals of infants presenting with Positional Plagiocephaly (PP) for physiotherapy intervention. A practical, economical and reliable plagiocephaly measure is essential to assess intervention outcomes. The Cranial Vault Asymmetry Index (CVAI) is reported, but little psychometric data is available.

**Measurement:** A flexible curve was moulded to the infant's head and then placed on the paper to trace the head shape. Two diagonals at 30 degrees from the vertical were drawn from the mid-point of the central line, to their intersection with the head outline. As indicated in the literature, the difference in length of the two diagonals was divided by the short diameter, and multiplied by 100%, yielding a CVAI.

**Method:** Thirty-four infants aged 3 to 8 months, were measured twice (T1 and T1') at the beginning of their physiotherapy sessions. Twenty infants were randomly selected to repeat the measurement twice (T2 and T2') at the end of the session. A total of 54 sets of repeated measures were tested for intra-rater reliability testing. Twenty sets of T1 and T2 measures were tested for test-re-test reliability testing.

**Results:** Intraclass correlation coefficient for intra-rater reliability was 0.87 (95% CI 0.78–0.92) and for test-re-test reliability was 0.9 (95% CI 0.77–0.96).

**Conclusion:** Using a flexible curve to measure skull asymmetry is a reliable and practical tool to be applied in clinical settings. CVAI is a dependable measurement for physiotherapists to evaluate intervention outcomes and progression of the condition.



### The Lillilwan project: The first Australian study of the prevalence of fetal alcohol spectrum disorders in a remote Indigenous community

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Elizabeth Elliott, Discipline of Paediatrics and Child Health, University of Sydney

**Background:** In mid-2009 the remote Aboriginal communities of the Fitzroy Valley, North Western Australia invited The George Institute and The University of Sydney to work with them on the first population-based, FASD prevalence project to be conducted in Australia.

**Aim:** To estimate the prevalence of FASD and other health and developmental problems in all children born in 2002 and 2003 and living in the Fitzroy Valley.

**Design:** An active case-ascertainment design has been used.

**Methods:** This study involves 2 stages. In Stage 1, just completed, a questionnaire was used to collect demographic, cultural, social and biomedical data from the parents/carers of all children, and in particular, the early life exposure of these children to alcohol. Stage 2, commencing May 2011, involves the physical examination of these children including detailed physiotherapy assessment. Following collection of all data, FASD prevalence will be determined by applying internationally recognised diagnostic criteria.

**Results:** 122 out of a possible 128 parents/carers (95%) agreed to participate in Stage 1. Self-reported data on the type of alcohol consumed during pregnancy, and the timing, frequency, pattern and duration of drinking will be presented.

**Conclusion:** Alcohol misuse is a particular problem in remote communities where anecdotal reports suggest that rates of Fetal Alcohol Spectrum Disorders are high. Aboriginal women identify many reasons for alcohol misuse during pregnancy including unemployment, domestic violence, lack of knowledge of the adverse effects of alcohol on the fetus, and the legacy of loss of traditional land and culture.

### Fitness, mild motor impairment and competency in able extremely low birthweight children

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Kristen Gibbons

**Question:** What is the relationship of fitness or mild motor impairment with competency in able ELBW (<1000g) 11–13yo children?

**Design:** A case control study.

**Participants:** 54 able ELBW 11–13 year old children (31 male) and 55 term-born peers (28 male) participated.

**Outcome Measures:** Fitness (VO<sub>2</sub> max calculated from a 20m Shuttle Run), motor impairment (rated by The Motor Assessment Battery for Children) and parent report of competence (rated by The Child Behavior Checklist) were examined.

**Results:** The ELBW group was less competent:  $p < 0.001$  CBCL Total T Mean (95% CI) ELBW 41.51 (38.78 to 44.29), Term 52.16 (48.9 to 55.42) and had poorer cardiorespiratory endurance:  $p < 0.001$  difference between the VO<sub>2</sub> max means (95% CI) = 4.05 (2.01 to 6.1) and motor scores:  $p < 0.001$  MABC Total median (IQR) ELBW 17.75 (16), Term 7.5 (9). The difference between the groups on total competence score was no longer significant when adjusted for both fitness and motor scores. Social competence was associated with fitness and motor, and school competence with motor in both groups, but the association of fitness with activity competence was only in the ELBW group. Fitness and motor score were independently related to overall competence only for the ELBW group.

**Conclusions:** Fitness and mild motor impairment have stronger relationship with competence for ELBW 11–13yos than for their term born peers. In the ELBW group, fitness was associated with successful engagement in activities and was associated with overall competence independent of its association with motor impairment.

### Is physiotherapy effective for improving palliative patients' ability to cope with breathlessness? A randomised controlled trial

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**Question:** What is the effect of physiotherapy intervention on palliative patients' ability to cope with breathlessness?

**Design:** Randomised controlled trial with assessor blinding and intention-to-treat analysis.

**Participants:** 23 individuals admitted to an inpatient palliative unit who were experiencing breathlessness.

**Intervention:** The experimental group (n=13) completed a 1-week training protocol that involved instruction in pursed lips breathing, pacing of activities and energy conservation, in addition to their normal physiotherapy. The control group (n=10) received normal physiotherapy, but with no instructions to help cope with breathlessness.

**Outcome measures:** Chronic Respiratory Disease Questionnaire (CRQ), Borg Scale of Perceived Breathlessness and VAS of patients' perceptions of the effectiveness of physiotherapy for breathlessness management. Measures were taken at baseline and after 1 week.

**Results:** Eligible patients were near the end of life, with median time from recruitment to death of 48 days for the 23 participants and 12 days for an additional 40 patients who were eligible but did not participate. There were no significant differences in the change scores on the CRQ or the Borg scale. Participants in the intervention group rated the beneficial effect of physiotherapy for breathlessness 8.6cm (95% CI 4.3 to 12.8) higher on the VAS than the control group.

**Conclusion:** Conducting research close to the end of life presented challenges for recruitment, as potential participants had severe fatigue and important personal issues which required attention. Although standardised outcome measurement tools did not detect significant changes, palliative clients' perception that physiotherapy for breathlessness was beneficial deserves further investigation.

### Self reported physical activity levels, fitness and muscle strength of people with non-small cell lung cancer: Preliminary analyses

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**Questions:** How physically active are people with lung cancer? How does this compare with recommended physical activity guidelines for Australians? Is there a change in physical activity, fitness or strength over a 10 week period following diagnosis?

**Design:** Prospective longitudinal cohort study.

**Participants:** To date, 15 people (11 male), mean  $\pm$  SD age 68.1 $\pm$ 10.5 years, lung capacity (FEV1) 79.0 $\pm$ 19.7% predicted, BMI 25.8 $\pm$ 6.4 kg/m<sup>2</sup> with stage I-III non-small cell lung cancer, recruited from three tertiary hospitals.

**Outcome measures:** Time points: baseline (pre-treatment), 10-weeks post diagnosis. Self reported physical activity measured using Physical Activity Scale for the Elderly. Fitness measured using cardio-pulmonary exercise testing (VO<sub>2</sub>peak) and 6-minute walk distance (6MWD). Upper and lower limb muscle strength.

**Results:** Preliminary analyses of the first 15 participants demonstrated at baseline 46.7%, 20.0% and 33.3% of participants were engaged in 'sufficient', 'insufficient' and 'sedentary' levels of physical activity respectively. Fewer participants were engaged at baseline in 'sufficient' levels of activity (compared with 54.1% Australian data) and more participants were classified as 'sedentary' (compared with 17.9% Australian data). In participants at baseline, mean  $\pm$  SD VO<sub>2</sub>peak was 16.1 $\pm$ 4.3 ml/kg/min and 6MWD was 449.0 $\pm$ 98.9 m. At follow-up (n=10, 30% during chemotherapy, 70% post-treatment) only 6.7% of participants were engaged in 'sufficient' levels of activity. 6MWD had declined by mean  $\pm$  SD of 29.0 $\pm$ 47.1 m and muscle strength had declined in the lower limb muscle groups.

**Conclusion:** At diagnosis most participants did not meet physical activity guidelines. Physical activity, fitness and strength had declined at 10 week follow-up.

### Potential utility of transcutaneous electrical nerve stimulation (TENS) for pain of metastatic bone disease

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**Question:** What parameters of TENS are required for effective analgesia in patients with metastatic bone cancer pain?

**Design:** Randomised, assessor-blinded, within-participant experimental pilot study (N=1 trial methodology).

**Participants:** One medically diagnosed patient with intractable pain from metastatic bone cancer of the lower spine. **Intervention:** After random assignment to one of three pre-identified TENS parameters (conventional; acupuncture-like; modulated frequency), participant underwent one hour of modulated frequency, 'strong but comfortable' TENS on Day 1 and two hours on Day 2.

**Outcome measures:** Repeated measures of pain scores, heart rate (HR), blood pressure (BP), activities of daily living, sleepiness (ESS), cognition (MoCA), pain and medication diary, and global assessment of pain. The Two Standard Deviation Band method and celeration lines were used to analyse data.

**Results:** The participant reported improvement in daytime fatigue and analgesia after TENS, and improved pain between Day 1 and 2. A trend towards reduced pain was evident at the onset of TENS on both days but pain increased during the second hour on Day 2 (p<0.05). There was no change in physical function scores following treatment but executive function elements of cognition improved after TENS. Systolic BP increased (p<0.05) at onset of TENS on both days, with decreased diastolic BP (p<0.05) on Day 1 and increased HR during second hour of TENS on Day 2 (p<0.05).

**Conclusion:** One hour of modulated frequency TENS provides immediate and temporary analgesia for metastatic bone pain. Cardiovascular measures suggest modulated frequency TENS affects sympathetic outflow. Further research is warranted.

**Ethics:** GCHSD HREC/09/QGC/69 and PES/25/09/HREC

### Passive limb movements for patients in an intensive care unit: a survey of physiotherapy practice in Australia

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Kathy Stiller, Royal Adelaide Hospital

**Question:** What is the current practice of physiotherapists with respect to passive limb movements for adult patients in Australian intensive care units?

**Design:** Cross sectional study.

**Participants:** 51 senior physiotherapists working in Australian level 3 (tertiary) adult intensive care units.

**Outcome measures:** A purpose-designed questionnaire.

**Results:** Of 65 questionnaires mailed out, 51 (78%) were returned. Routine assessment of the passive limb range of motion of all intensive care patients was performed by a minority of respondents (35%). Instead, most respondents based the need for assessment on criteria such as the patient's length of stay, reason for admission and medical history. Routine passive limb range of motion exercises for all intensive care patients were performed by a minority of respondents (14%), with most respondents instead doing these only for high-risk patients or those with loss of range. The interventions most frequently used by respondents were manually applied passive limb range of motion exercises, positioning, and mobilisation, although the actual exercise prescription was quite variable. Respondents reported that contracture was an uncommon problem in intensive care patients, and when it did occur was multifactorial in origin and caused moderate problems. The factors that most frequently influenced respondents' clinical practice were personal experience and colleagues' advice.

**Conclusion:** This is the first study to document the use of passive limb movements by physiotherapists working in adult intensive care units in Australia. Assessment of, and interventions for, passive limb range of motion were used selectively rather than routinely, with considerable variability between respondents.

## Ventilator hyperinflation: a survey of current physiotherapy practice in Australia and New Zealand

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Carol Hodgson, Alfred Health, and Monash University, Melbourne

Anne E Holland, Alfred Health, and La Trobe University, Melbourne

**Question:** What is the current physiotherapy practice of ventilator hyperinflation throughout Australian and New Zealand intensive care units?

**Design:** Prospective survey.

**Participants:** The senior physiotherapist of all identified intensive care units throughout Australia and New Zealand (n=189).

**Outcome measures:** A purpose-designed postal questionnaire.

**Results:** A response rate of 87% was obtained (n=165). A minority of respondents (21%) performed ventilator hyperinflation. Those that did not perform the technique indicated this was due to a lack of training in the technique (44%) and lack of medical approval (38%). Ventilator hyperinflation was most commonly performed by a senior physiotherapist in a tertiary intensive care unit. Ventilator hyperinflation was used as an alternative to manual hyperinflation, to allow improved monitoring and control of ventilator parameters (74%) and maintain positive end expiratory pressure (59%), and had similar indications for use to manual hyperinflation. There was wide variation in technique and dosage reported. Most respondents (69%) reported that they were taught the technique at the bedside by a senior physiotherapist, while only a minority learnt how to perform the technique at an undergraduate level (17%) or at a postgraduate course (23%).

**Conclusion:** Ventilator hyperinflation is not commonly used by physiotherapists in intensive care units throughout Australia and New Zealand and considerable variability was found in its application between respondents. Further studies are required to define optimal parameters for ventilator hyperinflation and promote standardised delivery of this technique. There is also a need for increased availability of both undergraduate and postgraduate education on this technique.

## Semi-recumbent positioning increases end expiratory lung volumes: A within participant experimental study using electrical impedance tomography

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**Question:** Does being semi-recumbent alter end expiratory lung volumes compared with supine lying? Does 30 degrees semi-recumbent alter end expiratory lung volumes compared with 20 degrees semi-recumbent? Does the time in semi-recumbent effect end expiratory lung volumes?

**Design:** Within-participant experimental study.

**Participants:** Twenty participants (5 Female) adults post open heart surgery who were being mechanically ventilated.

**Intervention:** Baseline end expiratory lung impedances were recorded after 20 minutes of supine lying and then at 1, 5, 10 and 20 minutes post elevation to both 20 degrees and then 30 degrees semi-recumbent.

**Outcome measures:** Alterations in end expiratory lung impedance (no units) as a surrogate measure of changes in end expiratory lung volume.

**Results:** A regression model demonstrated that end expiratory lung impedance was greater at both 20 degrees semi-recumbent (891, 95% CI 715 to 1067) and at 30 degrees semi-recumbent (1090 95% CI 915 to 1265) when compared with baseline supine lying. There was a significant difference between 20 and 30 degrees semi-recumbent positioning with 30 degrees being greater (199 95% CI 86 to 331). For every minute spent in 20 degrees semi-recumbent an increase of 7.7 occurred up until 20 minutes (95% CI 2.1 to 13.4). Time had no effect at 30 degrees semi-recumbent (-3.0 95% CI -10.3 to 4.4).

**Conclusion:** Semi-recumbent positioning at both 20 and 30 degrees semi-recumbent increases end expiratory lung volume with 30 degrees having a greater effect than 20 degrees. Time was significant factor at 20 degrees but not at 30 degrees semi-recumbent.

## Threshold inspiratory muscle training is safe in selected ventilated patients: a case series

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**Questions:** Is specific inspiratory muscle training with a threshold device safe in selected ventilated patients? Does inspiratory muscle strength increase from baseline to weaning from the ventilator with a strength-based inspiratory muscle training protocol?

**Design:** Prospective observational study.

**Participants:** Ten medically stable ventilator-dependent adult patients who were alert and able to cooperate with training.

**Intervention:** Patients completed inspiratory muscle training 5 to 6 days per week with a threshold device attached directly to the tracheostomy without supplemental oxygen. Each session comprised 3 to 6 sets of 6 breaths at an intensity of between 6 and 8 out of 10 (rate of perceived exertion, modified Borg scale), increased by 2 to 4 cmH<sub>2</sub>O incrementally to maintain rate of perceived exertion  $\geq$  6.

**Outcome measures:** The primary outcome measure was the physiological response to training (heart rate, mean arterial pressure, oxygen saturation and respiratory rate). The secondary outcome measures were incidence of adverse events and inspiratory muscle strength.

**Results:** No significant changes in heart rate (MD 1.3 bpm, 95% CI -2.7 to 5.3), mean arterial pressure (MD -0.9 mmHg, 95% CI -6.4 to 4.6), respiratory rate (MD 1.2 bpm, 95% CI -1.1 to 3.5 bpm) or oxygen saturation (MD 1.2%, 95% CI -0.6 to 3.0) were detected. Of the 195 sessions studied, no adverse events were recorded. Training pressures increased significantly (MD 18.6 cmH<sub>2</sub>O, 95% CI 11.8 to 25.3).

**Conclusion:** Threshold-based inspiratory muscle training can be delivered safely in selected ventilated patients and is associated with increased inspiratory muscle strength.

### Inspiratory muscle training to facilitate weaning from mechanical ventilation in intensive care patients: a systematic review

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Mark R Elkins, University of Sydney, Sydney

**Question:** Does inspiratory muscle training facilitate weaning in adults receiving mechanical ventilation?

**Design:** Systematic review with meta-analysis of randomised trials, identified with electronic searches of the Cochrane Central Register of Clinical Trials (CENTRAL), the Physiotherapy Evidence Database (PEDro), PubMed, EMBASE and CINAHL.

**Participants:** People aged at least 16 years who were intubated or tracheostomised and were receiving full or partial mechanical ventilation.

**Intervention:** Inspiratory muscle training versus no/sham training.

**Outcome Measures:** Inspiratory muscle strength and endurance, weaning success, weaning duration, survival, rate of reintubation and rate of tracheostomy.

**Results:** Three trials involving 150 participants met the inclusion criteria. Pooled data from the three trials showed that inspiratory muscle training significantly increased inspiratory muscle strength (mean difference 8 cmH<sub>2</sub>O, 95% CI 6 to 9). Data from two trials showed favourable but statistically non-significant effects: weaning tended to be more successful (relative risk 1.20, 95% CI 0.76 to 1.91) and of shorter duration (mean difference 21 hours, 95% CI -10 to 53). Inspiratory muscle training also had non-significant effects on survival (relative risk 1.22, 95% CI 0.54 to 2.77), reintubation (relative risk 0.65, 95% CI 0.10 to 2.98) and tracheostomy (relative risk 1.41, 95% CI 0.27 to 7.38).

**Conclusion:** Inspiratory muscle training improves the strength of the inspiratory muscles in patients receiving mechanical ventilation, but it is unclear whether this results in improvements in the duration or success of weaning or any of the other outcomes. Additional research should be performed to further determine the effects of inspiratory muscle training.

### Impact of physiotherapy intervention for a young amputee—a clinical case study

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Hayley Fitcher, Royal Brisbane & Women's Hospital

**Question:** How far can intensive Physiotherapeutic input, prosthetic science & patient determination take a patient with complete hemipelvectomy?

**Design:** Evaluation of physiotherapeutic clinical input over a period of eighteen months with a single client presenting following a workplace accident that resulted in surgeons performing a complete hemipelvectomy in order to save the young man's life.

**Participant:** A 23 year old male construction worker involved in a workplace accident involving heavy machinery, whose Left leg & pelvis was amputated after the accident in order to save his life.

**Intervention:** Physiotherapeutic input, with the use of videotaping, photography & clinical documentation track the patients' functional physical gains & demonstrate the effectiveness of regular input, in consultation with prosthetics, medical and specialised amputee professionals.

**Outcome Measures:** Functional outcomes such as the ability to mobilise independently in public with & without his prosthesis are tracked, along with gains in strength, range of motion, confidence & community functioning.

**Results:** Despite an horrific and extremely disabling injury, this young, highly motivated patient has defied all odds and is now living independently in the community, albeit with significant adaptations to his former lifestyle.

**Conclusion:** Working with a young, motivated & pragmatic client with a severe injury has proven to be a rewarding therapeutic challenge. Physiotherapy has much to offer and can make a significant difference to the quality of life of such patients. There is much to share and learn from within this single case scenario.

### Impact on health outcomes by the provision of training and resources to a network of providers in a compensable scheme

Tania Pizzari, La Trobe University, Melbourne

Megan Davidson, La Trobe University, Melbourne

Paul Coburn

**Question:** Does the provision of increased training and resources to a network of physiotherapists result in improved health and return to work outcomes of clients in a compensable scheme?

**Design:** Prospective case control study.

**Participants:** Twenty-one Transport Accident Commission clients of network physiotherapists matched with 21 Transport Accident Commission clients of non-network physiotherapists.

**Intervention:** Training and resources were provided to a group of physiotherapists by a compensable scheme with the aim of improving health and return to work outcomes.

**Outcome measures:** Self-reported return to work, Return to Usual Activities, Global Perceived Effect and mental and physical health (SF-12) were measured at three and six months after the commencement of physiotherapy treatment.

**Results:** The network physiotherapists within-group results improved significantly in Return to Usual Activities ( $p = 0.01$ ) and physical health ( $p = 0.006$ ) while the control group deteriorated in mental health status ( $p = 0.016$ ) and was unchanged on all other outcomes. There was a significant difference in change between follow up favouring the network physiotherapist on Return to Usual Activities ( $p = 0.027$ ) and the physical component of the SF-12 ( $p = 0.009$ ) compared to the control group. At the six month follow-up, five participants (two network and three controls) who had recorded a successful return to work at three months recorded failed attempts and there was no significant difference between the groups ( $p = 1.0$ ).

**Conclusion:** Increased training and resources provided to a network of physiotherapists may achieve better outcomes for clients in a compensable scheme.

### e-Recruitment: the future for clinical trials in a digital world?

Helena C Frawley, The University of Melbourne

Laura Y Whitburn, The University of Melbourne

Mary P Galea, The University of Melbourne

**Questions:** How do traditional and novel methods of recruitment to a randomised controlled trial (RCT) of physiotherapy for pelvic organ prolapse (POP) differ?

**Design:** This study analysed the sources, methods of recruitment, rates of retention and key demographic and condition measures in women enrolled in an RCT. Recruitment to this trial consisted of two recruitment methods: 'indirect' via gynaecology outpatients, and 'direct' via response to Facebook™, radio and newsprint advertisements.

**Participants:** One hundred and sixty-eight women with POP were enrolled.

**Outcome measures:** The POP symptom score (POP-SS), and POP Quantification (POP-Q).

**Results:** The indirect method recruited 54.6% of participants over 27.5 months, versus 45.4% recruited using direct methods, over 16 months. To date, retention to the trial has been higher in the direct group, with 3/74 (4.1%) of this group withdrawn by 6 months, compared to 21/94 (22.3%) withdrawn from the indirect group. There was no difference in POP-SS between the two groups (indirect method: mean = 9.6, 95% CI 8.5-10.7 versus direct method: mean = 10.9, 95% CI 9.6-12.3,  $p = 0.12$ ), however POP-Q stage (2.1, 95% CI 2.0-2.2 versus 2.0, 95% CI 1.8-2.1,  $p = 0.02$ ) and age in years (57.9, 95% CI 55.9-59.9 versus 52.4, 95% CI 50.2-54.7,  $p < 0.001$ ) differed between the groups.

**Conclusion:** In this study, direct methods resulted in a faster rate of recruitment, and retention to the trial appears substantially higher. While age and POP-Q differed between the groups, POP-SS did not, therefore maintaining the desired homogeneity of participants on this key outcome measure.

## 303

### Enthusiasm to sign up for pelvic floor physiotherapy research may not match with enthusiasm to participate in research

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Clare M Delany, The University of Melbourne

Helena C Frawley, The University of Melbourne

Jean Hay-Smith, University of Otago, New Zealand, New Zealand

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**Introduction:** People often sign up to clinical research with enthusiasm and hope that the experience of being a research participant will be personally beneficial. However, little is known about how this initial enthusiasm and motivation to adhere to research protocols changes during the research experience.

**Aim/Method:** This qualitative study, nested within a randomised trial, examined the experiences of women with pelvic organ prolapse who received lifestyle advice and pelvic floor muscle exercises. The research explored reasons for and experiences of participation via in-depth interviews with 15 women.

**Findings:** Reasons for 'signing in' to the research were conceptualized as different forms of hope: 1) 'self-interest', 2) 'altruistic', and 3) 'passive'. In the first two categories, women described their hopes and aspirations for joining the trial, in terms of either self-interest of gaining, or altruism of giving. In contrast, in the 'passive hope' category, women portrayed a sense of conformity to their doctor's advice or indifference towards participation. Once 'inside' the research, each participant's interpretation of the research agenda and its impact on their health beliefs, along with their initial hopes, gave rise to considerable variation in the way women adhered to the trial protocol.

**Conclusion:** This research provides insight into the preferences, anxieties, expectations and hopes that these women brought to clinical research, and how pre- and post-research hopes and experiences might impact on adherence and research outcomes. This information is particularly important when poor adherence means an insufficient exercise dose for treatment effect.

## 304

### Pelvic floor muscle strength, prolapse symptoms and prolapse stage: what is the relationship between these variables?

Helena C Frawley, The University of Melbourne

Suzanne Hagen, Glasgow Caledonian University, United Kingdom

Margaret Sherburn, The University of Melbourne

Patricia Neumann, University of South Australia

Peter Herbison, Dunedin School of Medicine, New Zealand

Jean Hay-Smith, University of Otago, New Zealand

Mary Galea, The University of Melbourne

**Questions:** What is the relationship between pelvic floor muscle (PFM) strength, pelvic organ prolapse (POP) symptom severity and POP stage?

**Design:** Analysis of key prognostic variables at baseline in a randomised controlled trial (RCT) of physiotherapy for POP.

**Participants:** 170 women with POP-Q stage I, II or III who attended for baseline assessment.

**Outcome measures:** PFM strength measures (digital muscle testing and pressure manometry) tested in lying and standing positions, a POP symptom score (POP-SS) and POP stage quantification (POP-Q).

**Results:** A weak inverse relationship was found between the POP-SS and POP-Q measures ( $p = 0.11$ ). Medium to large associations ( $r = 0.35-0.89$ ) were found between all PFM strength variables tested in both positions, with significance  $p < 0.001$  for all correlation values. Correlations between the POP-SS and PFM strength measures were inverse and values ranged from  $-0.08$  to  $-0.04$ . ANOVA revealed no statistically significant relationships between PFM strength variables and POP-Q stage ( $p = 0.78$  with lying digital strength testing,  $p = 0.10$  with lying peak manometry value).

**Conclusion:** These findings support previous literature which has demonstrated a lack of correlation between POP symptoms and POP-Q. PFM strength measures in this POP cohort demonstrated moderate to strong correlations with each other, congruent with findings in asymptomatic and incontinent populations. The lack of association between PFM strength variables and POP symptoms or staging was unexpected, and suggests further explorations are required to understand the nature of the relationship between POP and PFM function.

## 305

### An audit of pessary use in physiotherapy practice

Clare E Fitzmaurice, Pelvic Floor Rehabilitation and Continence Clinic

Sonia J Scharfbillig, Pelvic Floor Rehabilitation and Continence Clinic

Patricia B Neumann, Pelvic Floor Rehabilitation and Continence Clinic

**Question:** Can physiotherapists prescribe and fit pessaries for pelvic organ prolapse?

**Design:** A prospective audit was conducted between the first of July 2009 and 30th of June 2010. Consecutive patients with prolapse who were fitted with a pessary were recorded in a database. Descriptive statistics were applied.

**Outcome measures:** Prolapse was staged using the Pelvic Organ Prolapse Quantification system. The Pelvic Organ Prolapse Symptom Score was administered before and after treatment. Characteristics of pelvic floor muscle function were recorded. A specifically designed satisfaction questionnaire was administered at the end of treatment with satisfaction rated on a Visual Analogue Scale (0–10).

**Results:** Of 161 patients presenting with prolapse, 18 were fitted with a pessary by one of three clinicians. The average age of patients was 52 (range 29–73), prolapse stages were I (29%), II (59%) and III (12%). Avulsion injuries were identified in 88% of women. Median pelvic floor muscle strength was 1 (range 0–2) (International Continence Society scale). Of the six who were still using a pessary 12 months later, mean satisfaction with the pessary was 9. Nine (50%) discontinued use within eight weeks. Two of these (11%) went on to surgery. A range of adverse events/complications were reported.

**Conclusion:** Results of the first year of pessary fitting suggest that physiotherapists can prescribe and fit pessaries for prolapse in a clinical setting. However, the low number of women successfully fitted compared with reports in the literature suggests that there is a learning curve before proficiency is attained.

## 306

### Pregnancy-related low back and/or pelvic girdle pain: Listening to Australian women

Heather M Pierce

Caroline Homer, University of Technology, Sydney

Hannah Dahlen, University of Western Sydney

Jenny King, NSW Health, Westmead Hospital

**Questions:** What is the prevalence of pregnancy-related lumbo-pelvic (low back and/or pelvic girdle) pain, and the associated levels of pain and disability experienced by Australian women? What are the experiences of these women?

**Design:** Cross-sectional survey with closed response and open ended questions.

**Participants:** Ninety-six pregnant women in their third trimester consecutively attending an Antenatal Clinic.

**Outcome measures:** Pain diagram, Visual Analogue Scale, the Oswestry Disability Index.

**Results:** The period prevalence of self reported lumbo-pelvic pain during the pregnancy was 71%, and on the day of survey was 34%. There was an association between pain and multiparity ( $p=0.05$ ), a previous history of lumbo-pelvic pain unrelated to pregnancy ( $p=0.005$ ), and the regular use of stairs ( $p=0.04$ ). The average pain score was 6.5 for 'usual pain', and 3.8 on the day of the survey. A majority of women (67%) scored 11–40% disability and had reported their pain to their maternity carer (71%) but only 25% had received treatment. Seventy-five percent of women who received treatment reported benefit. The impact of pain on the woman's lifestyle and psychological health can be described as a balance between perceived pain level, disability and her capacity to elicit help and employ coping strategies.

**Conclusion:** Lumbo-pelvic pain is highly prevalent during pregnancy. Only a small proportion of women receive treatment, despite levels of pain and disability. This is the first known Australian study to report both the period and point prevalence of pregnancy-related 'low back' and/or 'pelvic girdle pain' from a cross sectional cohort.

## 307

### Relationship of post partum diastasis of rectus abdominis with a common abdominal strength measure and other post partum abdominal wall characteristics

Emma Maumann, Faculty of Health Sciences and Medicine, Bond University.

Joanne E Bullock-Saxton, Faculty of Health Sciences and Medicine, Bond University.

Linda Hickey, Mater Mothers Hospital, Brisbane

Kate Revie, Mater Mothers Hospital, Brisbane

Belinda Long, Mater Mothers Hospital, Brisbane

Lisa Reynolds, Mater Mothers Hospital, Brisbane

Michael Steele, Faculty of Health Sciences and Medicine, Bond University.

**Question:** Is the width of diastasis of rectus abdominis (DRA) related to the early post-partum abdominal strength or a number of other abdominal characteristics?

**Design:** Non-randomised experimental study.

**Participants:** Inclusion criteria: women who had normally delivered a live, full term baby and were due to receive standard physiotherapy care within 24–48 hours of delivery. Exclusion criteria: women who delivered by caesarean section, experienced a neonatal or intra-uterine death, had sustained a 3rd or 4th degree perineal tear, were medically unsuitable for physiotherapy assessment within 48 hours of delivery or were experiencing significant perineal pain. Sixty-eight women participated in the study.

**Outcome Measures:** The dependent variable was width of DRA (at, below and above the umbilicus). Independent variables were: a) abdominal characteristics of the presence and severity of abdominal wall bulging; coning; striae and tone and b) abdominal strength as measured by the capacity to maintain posterior pelvic tilt during different phases of a single leg slide.

**Results:** DRA was significantly wider at umbilicus level ( $p<.038$ ) and above umbilicus level ( $p<.023$ ) in subjects that displayed abdominal characteristic of bulging. Abdominal strength measures were not significantly related to DRA.

**Conclusion:** DRA and abdominal wall bulging may reflect connective tissue changes more than muscular tissue change or abdominal strength deficits. The findings suggest a need for further research

## 308

### An exploratory study of factors associated with diastasis of rectus abdominis in the early post-natal period

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Lizelle Miller, Mater Misericordiae Hospital, Brisbane.

Linda Hickey, Mater Misericordiae Hospital, Brisbane.

Michael Steele, Faculty of Health Sciences & Medicine, Bond University, Gold Coast

**Question:** What, if any, ante-natal and post-natal variables are associated with the degree of diastasis of rectus abdominis (DRA) in post partum women?

**Design:** Retrospective audit.

**Participants:** 277 post natal women at a major public maternity hospital.

**Outcome measures:** Twenty-nine independent variables in the categories of a) demographics, b) medical conditions c) activity levels, d) abdominal wall stress, e) pelvic floor stress, f) muscular and g) connective tissue characteristics were collated for each participant. In addition, the width of the DRA was measured (cm) by a physiotherapist. Some variables were recorded by the treating physiotherapist at the time of standard post natal patient care and others obtained from the hospital database.

**Results:** Data were analysed with either a univariate analysis of variance or a Pearsons correlation coefficient depending on its nature. Results demonstrated a mean DRA of 3.19cm (SD 1.747) and that DRA was significantly greater with the connective tissue variables of abdominal coning ( $p<0.001$ ), bulging ( $p<0.001$ ), striae severity ( $p<0.05$ ), striae surface area ( $p<0.001$ ) and joint hypermobility ( $p<0.05$ ). In addition, the muscular variable of abdominal tone was also significantly less in subjects with larger DRA ( $p<0.001$ ). No other variables in other categories were found to be associated with the size of the DRA.

**Conclusion:** This retrospective study has highlighted a possible relationship between the size of the DRA and connective tissue characteristics that has not been described in the literature before now. The findings are relevant to clinical practice as well as fundamental to further research.

## 309

### Inter-rater and intra-rater reliability of abdominal muscle function outcome measures commonly used in early postpartum physiotherapy management?

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Belinda Long, Mater Mothers Hospital, Brisbane

Linda Hickey, Mater Mothers Hospital, Brisbane

Michael Steele, Faculty of Health Sciences and Medicine, Bond University

**Question:** What is the inter-rater and intra-rater reliability of commonly used physiotherapy outcome measures in the early postpartum period?

**Design:** Test retest design of standard post natal physiotherapy assessment measures taken by two experienced physiotherapists.

**Participants:** 68 participants in the post natal wards of a Brisbane maternity hospital who delivered a live, full term baby and who were receiving standard physiotherapy care were admitted to the study.

**Outcome Measures:** A number of abdominal muscle function measurements were made by each therapist on two separate occasions: the width of diastasis of rectus abdominis, the presence and severity of abdominal wall bulging; coning; striae and tone and the capacity to maintain neutral lumbar spine during single leg slide.

**Results:** A good level of agreement was found to exist both between and within physiotherapists for commonly used postpartum outcome measures including striae amount, striae severity, DRA measurements, coning and bulging ( $r > .8$ ,  $p < .00$ ). The capacity to maintain neutral spine ( $r = .736$ ,  $p < .00$ ) and judgment of abdominal tone ( $r = .679$ ,  $p < .00$ ) revealed an adequate level of agreement.

**Conclusion:** Commonly used postpartum outcome measures have a good or adequate level of agreement both between and within physiotherapists.

## 310

### A musculoskeletal approach for patients with pudendal neuralgia: a cohort study

Peter R Dornan, University of Queensland

Michel Coppieters, University of Queensland

**Objective:** To investigate the effect of musculoskeletal management of the lumbopelvic region in patients with pudendal neuralgia and musculoskeletal dysfunctions in the lumbopelvic region.

**Patients:** Twenty-five male patients with pudendal neuralgia without a urological cause for the symptoms and with lumbopelvic musculoskeletal disorders participated.

**Methods:** The intervention consisted of explanation and postural advice, specific manual mobilisation techniques and motor control exercises for the lumbopelvic region. A modified Pelvic Pain Symptom Survey was used to evaluate changes in pain and sexual dysfunction at the end of treatment and at three months follow-up. A repeated measure analysis of variance was used to analyse the data.

**Results:** At the end of the treatment period and at follow-up, pain and sexual dysfunction had improved significantly. Although 39% of patients had experienced limited recurrence of symptoms during the follow-up period, patients stated that a home exercise program was effective at reducing the symptoms and no additional treatment was sought.

**Conclusion:** This cohort study provides Level 2b evidence that a musculoskeletal treatment approach has a positive influence on pain and sexual dysfunction in a specific subgroup of patients presenting with pudendal neuralgia.

**Keywords:** Pudendal nerve entrapment, Neuropathy, Pelvic pain.

## 311

### Do balance circuit classes provided in addition to usual therapy lead to greater improvements in balance among rehabilitation inpatients: a protocol for a randomised controlled trial

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Bradley Lloyd, Bankstown-Lidcombe Hospital, NSW

Karl Schurr, Bankstown-Lidcombe Hospital, NSW

Angela Vratisistas, Bankstown-Lidcombe Hospital, NSW

Catherine Sherrington, The George Institute for Global Health, NSW

**Question:** Does the addition of balance circuit classes to usual therapy lead to greater improvements in balance among rehabilitation inpatients than usual therapy?

**Design:** Randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** One hundred and sixty two patients admitted to the general rehabilitation ward at Bankstown-Lidcombe Hospital will be recruited. Participants will have no medical contraindications to exercise, will be able to fully weight bear as ordered by a medical officer, will be able to stand unaided independently for at least 30 seconds, and will be able to participate in group therapy sessions with minimal supervision.

**Intervention:** Participants will be randomly allocated to an intervention group or usual-care control group. The control group will receive standard physiotherapy intervention. The intervention group will receive 6x1-hour circuit classes of supervised balance exercises designed to maximise postural adjustments in standing in addition to standard physiotherapy intervention.

**Outcome measures:** The primary outcome is balance. Balance will be assessed by 5 balance tests; feet apart, feet together, semi-tandem, tandem, and single leg stance. Secondary outcomes include functioning, mobility, falls, and hospital readmissions. Participants will be assessed before randomisation, at 2 weeks and 3 months by blinded assessors.

**Conclusion:** This study will determine the impact of additional balance circuit classes on balance among rehabilitation inpatients. The results will provide essential information to guide evidence-based physiotherapy at the study site as well as across other rehabilitation inpatient settings.

**Trial registration:** ACTRN12611000412932.

## 312

### Promoting aged independence in the aged care environment

Henry M Rischbieth, Henry Rischbieth Physiotherapy

**Question:** Can regular home exercise without any special equipment improve balance and walking in octogenarians?

**Design:** Within-participant experimental pilot study.

**Participants:** Ten healthy, independent subjects (2 M), aged 84–89 years.

**Intervention:** Participants undertook 12 weeks of self-directed home exercises, performed 2–4 times each day, according on participants other activities. The exercises targeted anti-gravity muscles at the hip and knee. Participants were instructed in the exercise technique at the outset and then monitored by several phone calls during the study period. There was no other interaction with the researcher.

**Outcome measures:** Berg Balance Scale and Timed Up and Go were assessed at time of enrolment and at the end of the study period.

**Results:** Subjects showed significant improvement in Berg Balance Scale ( $p < 0.02$ ) but no change in Timed Up and Go ( $p > 0.1$ ).

**Conclusion:** Simple self-directed home exercises can improve balance in elderly people, suggesting improved independent function.

## 313

### What is the relationship between balance and balance self-efficacy at discharge home from a sub-acute rehabilitation unit and at one month follow-up?

Jacquelin A Mitchell, Princess Alexandra Hospital

Suzanne S Kuys, School of Physiotherapy and Exercise Science, Griffith University & Allied Health Research Collaborative

Nancy Low Choy, Bond University

Sarah T White, Bond University

**Question:** Is there a relationship between balance and balance self-efficacy at discharge from sub-acute rehabilitation. Does this continue following discharge?

**Design:** Prospective cohort study.

**Participants:** People who were admitted for sub-acute inpatient rehabilitation and discharged to community dwellings.

**Procedure:** Measures were recorded on discharge and one month following inpatient rehabilitation.

**Outcome measures:** The Balance Outcome Measure of Elder Rehabilitation (BOOMER) was used to determine balance; the 10 Metre Walk test (10MWT) measured gait speed (s) and balance self-efficacy was determined by the Activities-specific Balance Confidence Scale (ABC).

**Results:** Thirty people, aged 67 (SD 19) years, males 50%, were recruited to the study. The group was comprised of people with general debility, ortho-geriatric and neurological disorders. Average length of stay was 47 (34) days. On discharge, BOOMER scores (/16) ranged from 0 to 16, average (SD) 9 (4); average (SD) balance self efficacy score was 63% (22) and participants took on average 16.8 (9) secs to walk 10 m. A moderate significant relationship existed between balance performance and self-efficacy at discharge ( $r = 0.59$ ,  $p = 0.002$ ) and between balance performance at discharge and self efficacy at one month ( $r = 0.62$ ,  $p = 0.04$ ) post inpatient rehabilitation. There was no significant correlation between balance self-efficacy before and at one month following discharge from rehabilitation ( $r = 0.41$ ,  $p = 0.15$ ).

**Conclusion:** In this group of people discharged to the community following sub-acute rehabilitation, balance performance was related to balance self-efficacy. This relationship requires further exploration in a larger sample.

## 314

### Establishment of a clinical prioritisation pathway to surgical assessment regarding hip and knee arthroplasty

Anton Harms, Northern Health, Epping

Raphael Hau, Northern Health

Robyn Coyne, Northern Health

Talya McDonald, Northern Health

**Question:** What are the clinical pathways of patients referred to the Osteoarthritis Hip and Knee Service (OAHKS) at Northern Health, Melbourne?

**Design:** Description of an innovative clinical service.

**Intervention:** Since September 2008, 806 patients on the Orthopaedic waitlist with OA of the hip or knee were triaged to the Physiotherapist lead OAHKS. The clinical pathways include: referral for orthopaedic assessment following initial or review assessment, referral for conservative management (Dietitian, Physiotherapy); Dietetics is uniquely co-located with the physiotherapy service; discharge back to GP following initial assessment if OA not the cause of presenting symptoms; discharge following conservative management.

**Outcome measures:** Collation of pathway data. Waiting time from GP to OAHKS; waiting time from OAHKS to surgical assessment; weight change.

**Results:** Pre-OAHKS conservative management utilisation approximately 10%; General Practitioner referral to OAHKS mean 50 days (sd 36). Failed to attend 11%; referred for orthopaedic surgical assessment 53%, OAHKS to surgical assessment mean 99 days (sd 83); physio referral 63%; discharged following initial assessment as not OA 6.5%; discharge following conservative management 5%; on going review in OAHKS 38% (in clinic 80%; mailed questionnaire 20%). Total discharged without a surgical assessment 22%. Patients accepting Dietetic advice (253 referred; 173 accepted) successfully reduce weight by an average of 2.6% with a range of 0.8 – 15.1kg.

**Conclusion:** Through the introduction of the OAHKS, conservative management of patients presenting with OA of the hip or knee has been optimised; surgeons time has been more effectively utilised and a clinical prioritisation pathway to surgical assessment established.

## 315

### From rhetoric to reality – has our Medical Assessment and Planning Unit delivered as planned?

Kathy Grudzinskas, Princess Alexandra Hospital

Jeremy Lindsay, Princess Alexandra Hospital

Urszula Dolecka, Princess Alexandra Hospital

A 30 bed Medical Assessment and Planning Unit (MAPU) was opened at Princess Alexandra Hospital in February 2011. Planning for this unit aimed for 70% patient discharge from the hospital at 72 hours post admission. Other units in Australia have used the MAPU for assessment of all medical ward admissions to the hospital, meaning that discharge within a set time period is not the prime intent of the ward. Selection criteria for admission were developed, along with a model of care involving medical, nursing and allied health professional staff. Staffing is under review for the first twelve months. Physiotherapists and therapy assistants work across seven days to facilitate discharge. The model of care includes daily multi disciplinary discharge meetings. Allied health professional staff work as a team, with no local team leader. They have trialed a screening tool. This presentation will discuss how closely the patient mix has met that which was anticipated, how well the governance model has assisted in the running of the unit, discuss the effectiveness of the screening tool in predicting the need for allied health professional interventions, and review the input of physiotherapy and therapy assistant staff.



## Incidence and prognosis of contracture after spinal cord injury

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Lisa Harvey, Rehabilitation Studies Unit, The University of Sydney

Li Khim Kwah, The George Institute for Global Health, The University of Sydney

Jillian Eyles, Royal North Shore Hospital

Monica Ling, Prince of Wales Hospital

Marsha Ben, Royal Rehabilitation Centre Sydney

Rob Herbert, The George Institute for Global Health, The University of Sydney

**Question:** What is the incidence of contracture after spinal cord injury and who is most susceptible to contracture?

**Design:** Prospective cohort study assessing passive range of motion within one month and at one year after injury.

**Participants:** Ninety-two consecutive patients who sustained an acute spinal cord injury admitted to two spinal units.

**Outcome measures:** Range of motion of most appendicular joints was measured with a categorical (0–4 points) contracture scale. Torque-controlled quantitative measures of range were also obtained for ankle dorsiflexion, hip flexion with knee extension, elbow extension and wrist extension. Information on potential predictors (age, spasticity, pain, neurological status, limb fracture) was collected. Multivariate prediction models were developed.

**Results:** At one year, incidence of contracture by the contracture scale (shift of  $\geq$  one point on the four-point scale) was: shoulder 22%, elbow and forearm 17%, wrist and hand 21%, hip 33%, knee 11% and ankle 40%. Incidence of contracture by quantitative measures of range (loss of  $\geq$  10 degrees) was: elbow 13%, wrist 26%, hip 23%, and ankle 25%. Prediction models for contracture at the wrist and elbow included age and motor score predictors, and prediction models for contracture at the hip and ankle included only age. However these predictions were not clinically useful (adjusted  $R^2$  ranged from 0.083 to 0.25).

**Conclusions:** The incidence of contracture in major joints after spinal cord injury ranges from 11–40%. The ankle, hip and wrist are most commonly affected. We were unable to predict, with acceptable accuracy, those most susceptible to contracture.

## Passive mechanical properties of gastrocnemius muscles in people with spinal cord injury who have ankle contracture

Joanna Diong, The George Institute for Global Health, The University of Sydney

Li Khim Kwah, The George Institute for Global Health, The University of Sydney

Jillian Clarke, Faculty of Health Sciences, The University of Sydney

Lisa Harvey, Rehabilitation Studies Unit, The University of Sydney

Phu Hoang, Neuroscience Research Australia

Josh Martin, Neuroscience Research Australia

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Rob Herbert, The George Institute for Global Health, The University of Sydney

**Question:** How do the passive mechanical properties of gastrocnemius muscle-tendon units in people with spinal cord injury (SCI) who have ankle contracture differ from those of able-bodied controls?

**Design:** Cross-sectional study.

**Participants:** Twenty participants with spinal cord injury and ankle plantarflexion contracture and thirty able-bodied participants.

**Intervention:** Passive ankle torque and angle data were obtained as the ankle was rotated through range at six knee positions. Real time ultrasound imaging of gastrocnemius muscle fascicles was recorded simultaneously.

**Outcome measures:** Gastrocnemius length-tension curves were calculated from torque-angle data. Fascicle lengths were measured from ultrasound images and used to determine the contributions of fascicles to gastrocnemius length-tension properties.

**Results:** Participants with SCI had 25° (95% CI 19° to 31°) less passive ankle dorsiflexion range of motion than able-bodied controls. Means and differences are adjusted for shank length. There was no difference in gastrocnemius slack length between SCI and controls, but participants with SCI had stiffer muscle-tendon units (mean stiffness coefficient 70.5  $m^{-1}$ ) than controls (mean 51.8  $m^{-1}$ , 95% CI of difference 5.98 to 31.7  $m^{-1}$ ), and shorter muscle-tendon units at 100 N (mean 44.9 cm) than controls (mean 43.9 cm, 95% CI of difference -1.69 to -0.29 cm). Fascicle and tendon slack lengths and stiffness were similar in SCI and controls.

**Conclusions:** Gastrocnemius muscle-tendon units of participants with spinal cord injury and ankle contracture are stiffer than those of controls. The increased stiffness is most apparent at very low tensions below which the observed muscle fascicles fall slack.

## What is the most effective treatment for idiopathic toe-walkers?

Verity Pacey, The Children's Hospital at Westmead, Sydney

Rachal Turley, The Children's Hospital at Westmead, Sydney

Sarah Donaldson, The Children's Hospital at Westmead, Sydney

Suzie Taylor, The Children's Hospital at Westmead, Sydney

Kelly Gray, The Children's Hospital at Westmead, Sydney

**Question:** Idiopathic toe-walkers present a clinical conundrum for the treating therapist. Current literature presents many different treatment options, however the quality of evidence is poor. What is the most effective treatment for idiopathic toe walkers?

**Design:** A retrospective chart review was undertaken on patients referred to the physiotherapy department at The Children's Hospital at Westmead between October 2006 and Jan 2009.

**Participants:** Any child referred with idiopathic toe-walking. All patients with associated co-morbidities were excluded.

**Outcome measures:** Resolution of toe-walking, presentation with recurrence, need for surgery.

**Results:** Fifty-one patients were identified. Thirty-eight did not meet inclusion criteria, leaving 13 patients with a mean age 89 months (range 19–158 months). Orthopaedic surgeons referred 85% of included patients compared to 11% of the excluded cases. At initial assessment all patients were noted to get their heels to the ground. Initial physiotherapy treatment was stretching (9/13) followed by casting (4/13). However, all patients eventually required casting treatment. One patient in this cohort required surgical intervention. Evidence based guidelines have since been established.

**Conclusions:** Although prospective randomised studies are required to establish best evidence based practice, the clinical implications from this retrospective cohort have suggested that serial casting is required to correct idiopathic toe walking. Children not referred by orthopaedic surgeons are more likely to have non-idiopathic toe walking. Surgery should be considered a treatment option after six months of unsuccessful physiotherapy intervention.

## 319

### The use of lower limb orthotics in paediatric oncology throughout Australia

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Dot Ryan, Royal Brisbane and Women's Hospital, Brisbane

Meg Moller, Royal Children's Hospital, Brisbane

**Background:** Prescription of orthotics has been used as an adjunct therapy to assist in management of gait anomalies, secondary to neuropathic side effects of chemotherapeutic agents used in the treatment of children with cancer. Referrals for provision of orthotics have increased at the Queensland Children's Cancer Centre (QCCC) with 7 patients referred in 2005 compared with 27 in 2010. There is a paucity of literature which may guide clinical decision making concerning use of orthotics in this patient group.

**Aim:** To identify episodic and clinical indicators for prescription of orthotics and outcome measures used in paediatric centres Australia-wide.

**Method:** Descriptive questionnaire survey distributed to physiotherapists of 5 major paediatric cancer centres. Data will be collected regarding each centre's use of orthotics, including service models, indicators for prescription or intervention, evaluation and reasoning paradigms and outcome measures used by physiotherapists.

**Results:** Variance in episodes and use of orthotics in management of altered gait patterns as a result of chemotherapy in the paediatric population will be analysed to determine potential clinical reasoning methodologies.

**Conclusion:** The results of this study will establish areas for further development and research which may lead to provision of evidence-based use of orthotics in paediatric oncology.

## 320

### Does group continence education service to children on a waitlist for continence issues improve understanding and outcome for bladder control?

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Naomi Andrew, Department of Physiotherapy, Princess Margaret Hospital for Children, Perth

Naola Gibson, School of Sport, Exercise and Health, University of Western Australia, Perth

**Design:** Quasi-experimental, one-group pretest-posttest.

**Participants:** Thirty six children (mixed gender, age 6–15 years, organised by gender and age) who were on a waitlist to receive physiotherapy for continence issues.

**Intervention:** Continence information and self management groups were conducted for parents/children who are on a waitlist for physiotherapy. Participants received specific and generic information regarding continence, anatomy, physiology, medication, fluid ratio charts, bladder and bowel diaries and instructions how to use correct bladder and bowel dynamics. Continence symptoms and patient compliance were assessed pre group and reassessed by telephone interview one month post group attendance.

**Outcome measures:** Parent/child perceived understanding of continence problem; perceived ability to manage continence problems; self evaluation of continence symptoms.

**Results:** Parent's perception of understanding of their child's continence problem and information to manage the problem improved strongly following the group session (mean=1.69, standard deviation =0.52] vs. mean=2.33, standard deviation=0.62,  $p < 0.001$ ), whereas frequency of continence symptoms were unaffected (mean=3.6, standard deviation =5.39, vs mean =2.73, standard deviation =4.83,  $p=0.671$ ). Twenty two participants were followed up by telephone post group attendance. Nineteen out of 22 respondents continued to report continence issues at post group interview. There was poor compliance completing bladder charts and adequate daily fluid intake (with only three of the 22 completed) suggesting no positive behavioral change.

**Conclusion:** A group approach is an effective way of improving patient understanding and their perception of their ability to manage continence issues however, linking implementation of appropriate management behaviour clearly demands ongoing (individual) assessment, educational input and follow up.

## 321

### Physiotherapy treatment of children with dysfunctional voiding: An audit study of an innovative computer games-based biofeedback system

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David Winkle, The Mars Clinic for Children's Continence, South Brisbane.

John P Fitzgerald, The Mars Clinic for Children's Continence, South Brisbane.

**Purpose:** We conducted an audit to assess the outcomes of physiotherapy-directed use of the Urostym™ biofeedback system in the treatment of dysfunctional voiding.

**Methods:** A prospective study of 24 children between January 2009 and May 2010. Medical practitioner referrals for all patients presenting with symptoms of dysfunctional voiding were examined. Weekly intervention of 'standard therapy', Urostym™ biofeedback and Urostym Uroflow™ was performed. Urostym™ biofeedback uses surface electromyography to facilitate visualisation and control of pelvic floor muscle activity through a computer game. Urostym Uroflow™ Bluetooth technology enables simultaneous recording of surface electromyography and urine flow, with visual display of electromyography activity, flow rate and volume. Quantitative data comparisons are made between initial and final treatment voiding pattern flow rates and pelvic floor activity. Qualitative data comparisons are made to assess perceived severity of incontinence and impact of incontinence on quality of life, measured via visual analogue scales.

**Results:** Mean patient age was 8.4 years (range 5–14). The average number of 30 minute treatment sessions was 8.5 (range 5–17). Twenty subjects (83%) demonstrated improvement in voiding pattern. Statistically significant ( $p < 0.001$ ) improvements were observed in pelvic floor activity and visual analogue scale scores.

**Conclusions:** Physiotherapy-directed use of the Urostym™ biofeedback system is demonstrated to be a useful adjunct to standard therapy in the management of dysfunctional voiding. The Mars Clinic for Children's Continence, a strategic partnership between paediatric urology and physiotherapy, produces outcomes which improve patient compliance, quality of life and understanding of pelvic floor control.

## 322

### Gender differences in spinal kinematics during prolonged ergometer rowing in adolescence

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Angus Burnett, Department of Sports Science and Physical Education, Chinese University of Hong Kong, Hong Kong

Amity Campbell, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University

Peter O'Sullivan, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University

**Question:** Are there differences in spinal kinematics between adolescent males and females during prolonged ergometer rowing?

**Design:** Within-participant (time) and between-subjects (gender) experimental study.

**Participants:** Ten healthy adolescent males and 10 adolescent female rowers aged between 14 to 19 years.

**Protocol:** Participants performed a 20-minute rowing ergometer trial at a rate of 22 strokes per minute at a 'very hard' intensity level.

**Outcome measures:** Sacral angle (SA), Lower Lumbar Curvature (LLC), Upper Lumbar Curvature (ULC) and Thoracic Curvature (TC) were measured using an electromagnetic device. Stroke lengths and cycle durations were determined using a rotary encoder attached to the flywheel of a modified rowing ergometer.

**Results:** Males had a faster drive phase than females; spending only 37.3% of their stroke in the drive phase compared to 41.9% for females ( $p < 0.001$ ). The male's SA was postured more posteriorly than females ( $p = 0.04$ ) and displayed a more flexed TC ( $p = 0.04$ ). No differences were detected in the LLC ( $p = 0.330$ ) or ULC ( $p = 0.429$ ). Furthermore, males and females tilted their SA more posteriorly ( $p < 0.001$ ), and more flexed in the ULC and TC ( $p = 0.03$  and  $p = 0.04$  respectively) from 1<sup>st</sup> to 20<sup>th</sup> minute.

**Conclusion:** The results of this study identified that adolescent males typically sit in a more 'slouched' position than females during ergometer rowing. The more 'slouched' posture in spinal kinematics over the 20-minute ergometer trial is most likely the result of fatigue and supports previous research in adults. These findings may have implications for increased risk of LBP in male rowers and with prolonged rowing.

## 323

### Differences in spino-pelvic kinematics in sweep and scull ergometer rowing

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Joao-Paulo Caneiro, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University, Perth

Matthew M Doyle, Western Australian Institute of Sport, Perth

Peter O'Sullivan, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University, Perth

Carmel Goodman, Western Australian Institute of Sport, Perth

**Question:** The spino-pelvic kinematics of sweep and scull has yet to be investigated, despite evidence suggesting sweep rowing may be provocative for low back pain (LBP). The aim of this study was to determine whether differences existed in spino-pelvic kinematics in high-level rowers without LBP in sweep and scull ergometer rowing?

**Design:** Repeated measures study. **Setting:** Western Australian Institute of Sport laboratory.

**Participants:** Ten pain-free high-level rowers. **Interventions:** Kinematics of the pelvis, lower lumbar, upper lumbar and lower thoracic regions during the drive phase of the rowing stroke were measured whilst rowing on an interchangeable sweep/scull ergometer.

**Main Outcome Measures:** Total and segmental spino-pelvic kinematics.

**Results:** Sweep rowing showed greater lateral bend ( $p < 0.05$ ) throughout the stroke which was predominately due to movement of the upper lumbar and lower thoracic regions. Further, sweep rowing displayed a greater magnitude ( $p < 0.05$ ) of axial rotation at the catch (created at the pelvis). Both sweep and scull rowing showed values close to end range flexion for the lower lumbar spine at the catch and early drive phase. No difference ( $p > 0.05$ ) was evident in lateral bend or axial rotation values for the lower lumbar region.

**Conclusion:** Some differences exist in spino-pelvic kinematics between sweep and scull ergometer rowing. However, it may be speculated that the lack of differences in lateral bend and axial rotation at the lower lumbar spine in sweep rowing may represent an adaptive and protective approach of experienced rowers. This may be the focus of future research studies.

## 324

### Classification-based cognitive functional therapy intervention to alter spinal kinematics and reduce low back pain in an adolescent rower: case report

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Peter O'Sullivan, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University, Perth

**Question:** Previous research has reported that deficits in lumbar spine motor control resulting in increased end of range flexion strain is associated with LBP in rowers. However, to date there is no evidence that movement training interventions can alter the spinal kinematics of ergometer rowing and reduce pain. Therefore, the aim of this study was to investigate whether a cognitive functional intervention in an adolescent male rower with LBP, could alter the spinal kinematics and reduce LBP while ergometer rowing?

**Design:** single case study report with an 8 week intervention and 12 week follow-up period.

**Participant:** one male adolescent rower (17yo) classified with a flexion control disorder of the lumbar spine.

**Intervention:** spino-pelvic kinematics assessment pre and post-treatment (12weeks follow up). Classification-based cognitive functional therapy (5 sessions over 8 weeks) aimed to enhance lumbar spine flexion control during rowing.

**Outcome measures:** Visual Analogue Scale questionnaire, Roland Morris Disability Questionnaire (RMDQ) and spino-pelvic kinematics during ergometer rowing.

**Results:** Following the intervention there was an: increased anterior pelvic tilt, reduced lower lumbar flexion, increased upper lumbar flexion during ergometer rowing compared to pre-intervention. These changes were associated with reductions in LBP reported during ergometer rowing (VAS score initial= 6/10; follow up= 1/10) as well as reduced disability (RMDQ score: initial= 52.2%; follow up= 4.3%).

**Conclusion:** Although this data lends support that a cognitive functional approach may have the potential of changing spinal kinematics and reducing LBP during ergometer rowing, controlled research in a larger group is required to confirm these findings.

## 325

### The immediate effect of unilateral lumbar Z-joint mobilisation on posterior thigh flexibility

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Michael C Steele, Faculty of Health Sciences, Bond University

Adam M Szlezak, Faculty of Health Sciences, Bond University

Matthew Rebgetz, Faculty of Health Sciences, Bond University

**Background:** Posterior thigh flexibility is considered desirable for sportsmen and performing artists as impairment is implicated as a risk factor for muscle strain.

**Question:** What is the immediate effect of two dose rates on the flexibility of posterior thigh structures of sustained stretch or lumbar zygoapophyseal mobilisation?

**Design:** single blind randomised placebo control study.

**Participants:** Seventy two (72) healthy male and female subjects demonstrating a limited SLR were recruited. Two equal groups of 36 were formed to compare dose rate (3min or 6 min) and subjects within each group were randomly allocated into one of the three intervention sub groups.

**Intervention:** Three intervention conditions were compared, each intervention had two dose rates (3 min or 6 min); a) static hamstring stretching b) unilateral zygoapophyseal joint posteroanterior mobilisation of T12-L5 inclusive (2Hz) and c) non intervention control.

**Outcome measures:** Range (deg) of passive straight leg raise (SLR) with controlled dorsiflexion was measured with an inclinometer fixed to a specifically designed leg brace. Measures were collected pre and post intervention by an examiner blind to the intervention sub group. A multivariate analysis of variance was applied to the data to determine the effect of dose rate and intervention for increase in SLR range.

**Results:** A significant group difference was determined ( $p < .001$ ). Post hoc tests revealed significant gains in the mobilisation subgroups for 3 and 6 minute doses. No significant gains were found for 3min stretch whereas 6 minute stretching demonstrated significant gains but these were less than those achieved for the mobilisation group.

## 326

### Clinometric properties of patient reported outcomes measures for hip arthroscopy

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Kay M Crossley, University of Melbourne

**Question:** What are the clinometric properties of commonly used patient reported outcomes (PRO)s in people undergoing hip arthroscopy?

**Design:** Evaluation of the reliability, validity and acceptability of five PROs (Modified Harris Hip score (MHHS), Hip Osteoarthritis Outcome score (HOOS), Hip Outcome Score (HOS), Copenhagen Hip and Groin Outcome score (HAGOS) and MAHORN hip outcome score) in a hip arthroscopy population.

**Participants:** Adults undergoing hip arthroscopy, and age-matched controls.

**Methods:** Questionnaires were completed on one occasion by both groups and on a second occasion by the hip arthroscopy group. Those in the reliability study were blinded to the results of the original questionnaires.

**Outcome measures:** The test-retest reliability (ICC) and standard error of measurement (SEM) of each PRO was evaluated. The minimal detectable change (MDC) and ability to detect a difference between groups was determined. Furthermore the acceptability (floor and ceiling effects) of each measure was calculated.

**Results:** The test re-test reliability of PROs is excellent (ICC 0.79 to 0.99), with the SEM for all measures less than 10% and the MDC less than 20%. All PRO demonstrated a high ability to detect a difference between the hip arthroscopy and control groups. No measures demonstrated a floor effect; however the MHHS and several subscales of the HAGOS demonstrated a ceiling effect.

**Conclusion:** PROs for hip pain and function demonstrate clinometric properties that may enable researchers and clinicians to use them with confidence in a hip arthroscopy population.

## 327

### Hip Arthroscopy for intra-articular pathology: A Systematic Review of Outcomes

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Michael Makdissi, University of Melbourne

Anthony G Schache, University of Melbourne

Zuzana Machotka, University of South Australia

Kay M Crossley, University of Melbourne

**Question:** What are the outcomes (pain and function) following hip arthroscopy for intra-articular hip pathologies?

**Design:** Systematic review adhering to PRISMA guidelines for conducting and reporting systematic reviews with quality appraisal of included studies and effect size calculations where possible.

**Participants:** Adults with primary intra-articular pathology, excluding extra-articular pathology or osteoarthritis as the primary pathology.

**Intervention:** Hip arthroscopy, where pain and function were assessed using a patient reported outcome measure were included.

**Outcome measures:** Study quality was measured using the Downs and Black scale. Effect sizes were calculated where sufficient data was available.

**Results:** Twenty-nine studies were included. Fifteen studies investigated hip arthroscopy without osteoplasty. Effect sizes could be calculated for two studies, with large effects (3.12 to 5.46) noted at one to two year follow-up. For the remaining studies, post-operative improvements in pain and function were consistently reported over follow-up periods up to 10 years. Fifteen studies investigated hip arthroscopy with osteoplasty. Effect sizes calculated for nine of these studies showed mostly large effects (0.78 to 2.93) up to 28 months. Adverse events were minimal.

**Conclusion:** The best available evidence indicates that hip arthroscopy results in significant improvements in pain and function in patients with intra-articular hip pathology. While this improvement can be obtained up to 10 years post-surgery for hip arthroscopy without osteoplasty, the long-term follow-up (i.e. beyond three years) for hip arthroscopy with osteoplasty is yet to be evaluated. Further high-quality comparative studies are required, particularly investigating the role of rehabilitation in this patient population.

## 328

### Accessing High Quality, Evidence-based Clinical Practice Guidelines – The Australian Clinical Practice Guidelines Portal

Andrew Hirschhorn

The 10 highest impact physiotherapy/rehabilitation journals publish more than 1,000 articles between them annually; Medline citations grow at a rate of 60,000 per month. How can clinicians be expected to take in this information, let alone implement pertinent findings into clinical practice? Moreover, how relevant are most primary research findings to Australian clinical practice? Australia's Clinical Practice Guidelines Portal, an initiative of the National Institute of Clinical Studies, was developed 'to help Australian clinicians and policy-makers access high quality, evidence-based clinical practice guidelines via a single entry point'. This presentation will provide a review of the Clinical Practice Guidelines Portal and other web-based international and physiotherapy guideline repositories.

### Physiotherapist referral to heart failure rehabilitation program

Liz Buckman, Physiotherapy Department, The Prince Charles Hospital, Brisbane, Australia

Maria Podger, Clinical Nurse Consultant, Heart Failure Support Service, The Prince Charles Hospital, Brisbane, Australia

**Question:** Does physiotherapist referral of people admitted with acute heart failure result in successful enrolment in and completion of a heart failure rehabilitation program?

**Design:** Prospective observational study.

**Participants:** Three hundred and thirty-eight consecutive people admitted with a primary diagnosis of acute heart failure, under the general cardiologists, and consulted by the heart failure physiotherapist, between May 2006 and October 2007.

**Procedure:** Heart failure physiotherapist requested consent from in-patients to be referred to the heart failure rehabilitation program.

**Outcome Measures:** Participants successfully enrolled onto heart failure rehabilitation waiting list, completed pre-program assessment, commenced and completed heart failure rehabilitation program. Reasons for non-referral to heart failure rehabilitation waiting list and drop out prior to program completion.

**Results:** Two hundred and sixty-two in-patients (78%) were not referred to the heart failure rehabilitation program. Of these, 105 (40%) lived out of the district, 42 (16%) declined without reason, 16 (6%) declined due to transport/work commitments, 51 (19%) were deemed to be too frail to enter the program, 21 (8%) had precluding co-morbidities and 24 (9%) had no identifiable reason documented. Only 76 patients (22%) consented to be referred to the heart failure rehabilitation program. Thirty-three patients (9.7%) completed the pre-program assessment, 26 (7.7%) commenced and 15 (4.4%) successfully completed the program.

**Conclusion:** In this service, physiotherapist referral of people admitted with acute heart failure did not result in successful enrolment in, or completion of a heart failure rehabilitation program. Further high quality research is needed to explore more effective recruitment methods and referral pathways into heart failure rehabilitation program.

## 330

### Physiotherapy for patients following coronary artery bypass graft surgery: limited uptake of evidence into practice

Stephanie R Filbay, La Trobe University, Melbourne

Kate Hayes, Alfred Health, Melbourne

Anne E Holland, La Trobe University, Melbourne  
Alfred Health, Melbourne

**Questions:** Which physiotherapy interventions are used in the management of routine postoperative coronary artery bypass graft patients in Australian and New Zealand hospitals? Are these interventions based on current evidence?

**Design:** Prospective survey.

**Participants:** Senior cardiothoracic physiotherapists from Australian and New Zealand hospitals which perform coronary artery bypass surgery.

**Outcome measures:** A purpose-designed postal questionnaire was sent to participants to establish perceived influences on practice, participant experience, hospital protocols and current physiotherapy interventions in use for patients following uncomplicated coronary artery bypass graft surgery. Results were compared to a similar survey conducted in 1996.

**Results:** Fifty-four surveys were returned (response rate 88%). The most common treatments utilised were mobilisation (94% of hospitals), range of motion exercises (79%), deep breathing and/or cough (77%), cardiovascular exercise (42%) and incentive spirometry (40%). Respondents with a bachelor or diploma in physiotherapy were more likely to implement deep breathing exercises or coughing compared to those who obtained a postgraduate degree ( $p = 0.045$ ). There was a small reduction in utilisation of deep breathing exercises and cough compared to the 1996 survey (97% vs 77%). Clinical pathway use did not affect the likelihood of undertaking

deep breathing exercises ( $p = 0.21$ ). Respondents perceived personal experience as the most influential factor on postoperative treatment choices.

**Conclusion:** Physiotherapists treating patients following uncomplicated coronary artery bypass graft surgery continue to utilise interventions such as deep breathing exercises that are not supported by best available evidence. Standardised guidelines may be required to better match clinical practice with current literature.

## 331

### Physiotherapy for cystic fibrosis in Australia: knowledge and acceptance of the consensus statement recommendations

Anne E Holland, Alfred Health and La Trobe University, Melbourne

Brenda B Button, Alfred Health and Monash University, Melbourne

**Questions:** Are physiotherapists aware of the recommendations for physiotherapy management of people with cystic fibrosis (CF) in Australia? Are these recommendations implemented and do physiotherapists agree with the recommendations?

**Design:** Prospective survey.

**Participants:** All physiotherapists providing treatment to people with CF in Australia.

**Outcome measures:** A purpose-designed online survey assessed knowledge and uptake of key recommendations made in 'Physiotherapy for CF in Australia: A Consensus Statement'.

**Results:** Sixty-eight physiotherapists took part (response rate 49%). Knowledge of treatment recommendations was high for airway clearance (94%) and exercise assessment (76%). Most participants agreed with these recommendations (airway clearance 97% agreement, exercise 68% agreement). Only a small number of participants (18%) correctly identified the current recommendation to segregate patients with different organisms during airway clearance, with most participants (73%) implementing stricter infection control policies. Low levels of knowledge and agreement were evident for recommendations regarding measurement of blood sugar levels (BSLs) during exercise (36% knowledge and 28% agreement) and delivery of dornase alfa (53% and 65%). Physiotherapists from specialist CF centres were more likely to know the recommendations for BSL measurement ( $p=0.014$ ), dornase alfa ( $p=0.001$ ) and non-invasive ventilation ( $p=0.07$ ) compared to physiotherapists in other settings.

**Conclusion:** Physiotherapists are aware of treatment recommendations for CF in common areas of practice such as airway clearance and exercise. However, knowledge of recommendations is lower for specialised areas of practice and outside of specialist CF centres. Strategies to improve awareness and uptake of the consensus statement amongst physiotherapists outside of specialist CF centres are required.

## 332

### The Pulmonary Rehabilitation Toolkit: access, user profile and impact

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Sue C Jenkins, School of Physiotherapy, Curtin University and Sir Charles Gairdner Hospital, Perth

Anne E Holland, School of Physiotherapy, La Trobe University and The Alfred Hospital, Melbourne

Lissa M Spencer, Department of Physiotherapy, Royal Prince Alfred Hospital, Sydney

Catherine J Hill, 5 Department of Physiotherapy, The Austin Hospital, Melbourne;

Paul Cafarella, Repatriation General Hospital, Adelaide

Zoe J McKeough, Discipline of Physiotherapy, The University of Sydney, Sydney

Heather Allan, The Australian Lung Foundation, Brisbane; on behalf of the Pulmonary Rehabilitation Toolkit Committee

**Questions:** How widely used is the web-based Pulmonary Rehabilitation Toolkit? What is the profile of the users and what is the impact on clinical practice?

**Design:** Prospective observational study.

**Participants:** People who accessed the web-based Pulmonary Rehabilitation Toolkit between September 2008 and August 2010 and people who completed the on-line survey between July and August 2010.

**Outcome measures:** Numbers of unique visitors and number of hits from 2008 to 2010; survey responses.

**Results:** In the 12 months from September 2008 to August 2009 there were 15,898 unique visitors and 781,427 hits. This increased in the following 12 month period (September 2009 to August 2010) to 22,275 unique visitors and 990,004 hits. Two hundred and seventeen people completed the survey over a two month period. The majority of respondents were from Australia (82%), with 12% from USA, 5% from UK. Physiotherapists (33%) and nurses (30%) most commonly accessed the Toolkit. Twenty-eight percent of the respondents were currently providing a pulmonary rehabilitation program and 24% were planning to start a program. Forty-two percent of respondents accessed the Toolkit to find clinical information. Respondents rated the most useful sections of the Toolkit as Patient Education, Patient Assessment and Getting Started. Thirty-six percent of respondents changed their programs based on information in the Toolkit. Eighty percent of respondents were either 'satisfied' or 'very satisfied' with their experience of the website.

**Conclusion:** The evidence-based Pulmonary Rehabilitation Toolkit is widely accessed and has changed the clinical practice of more than a third of respondents.

## 333

### Patient perspectives on implementation of evidence-based care recommendations for chronic obstructive pulmonary disease

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Mary Young, Transitional and Community Service, Royal Adelaide Hospital, Adelaide

Karen Grimmer-Somers, International Centre for Allied Health Evidence, University of SA, Adelaide

Ral Antic, Department of Thoracic Medicine, Royal Adelaide Hospital, Adelaide

Peter A Frith, Respiratory, Allergy & Sleep Services, Adelaide Health Service & Dept of Respiratory Medicine, Flinders University

**Questions:** What are patient's perspectives on the care they receive for management of chronic obstructive pulmonary disease (COPD)? What are their perspectives on barriers and enablers to key evidence-based components of care?

**Design:** Qualitative study using semi-structured individual interviews and subsequent content analysis.

**Participants:** Patients admitted to a tertiary hospital with an acute exacerbation of COPD.

**Outcome measures:** Demographic and disease characteristics were obtained from medical records. Interview questions sought patients' experience of smoking cessation, pulmonary rehabilitation, medication use, influenza vaccination, long term oxygen use if hypoxaemic, and plan for future exacerbations. Perspectives on barriers to, and facilitators of, the implementation of these care recommendations were also sought.

**Results:** 15 people (five women) aged 75.8[9] years (mean [SD]) with moderate to severe COPD (FEV1% predicted 58[15]) participated in this study. Barriers and enablers operated at environmental, organisational, health care team, friend and family and individual levels. Adopting a medical procedure (influenza vaccination) was supported by community awareness and organisational structures. Changing lifestyle behaviour (smoking) was facilitated by perceived self-capability, perceived health benefit, and social influence; however these operated on a platform of high community awareness. In contrast, participants expressed low awareness of pulmonary rehabilitation, and were unaware that the benefits of exercise and the challenges of panic and anxiety could potentially be addressed by this intervention.

**Conclusion:** To improve implementation of evidence-based care recommendations in COPD, environmental awareness and organisational support lay a foundation for health care practitioners to then address patient-specific social and individual factors.

## 334

### The addition of education to exercise in pulmonary rehabilitation for patients with COPD does not result in greater improvements in outcomes

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Catherine J Hill, Department of Physiotherapy, Austin Health, Melbourne; Institute for Breathing and Sleep, Melbourne

Kate E Webster, School of Physiotherapy, La Trobe University, Melbourne

Christine F McDonald, Department of Respiratory and Sleep Medicine, Austin Health, Melbourne; Institute for Breathing and Sleep, Melbourne

**Question:** Does comprehensive pulmonary rehabilitation result in greater improvements in health outcomes in patients with COPD when compared to exercise training alone?

**Design:** A randomised controlled trial with allocation concealment, assessor blinded to group allocation, and intention to treat analysis.

**Participants:** Suitable patients with COPD referred to pulmonary rehabilitation at one tertiary site.

**Intervention:** Eight weeks of twice-weekly supervised comprehensive pulmonary rehabilitation (Comp PR) comprising exercise training plus disease specific group education and self-management strategies or exercise training (ET), according to national guidelines.

**Outcomes:** Primary outcome measures included 6-minute walk test (6MWT) and chronic respiratory questionnaire (CRQ). Measurements were taken within 2 weeks of program completion, and at 6 and 12 months following.

**Results:** Of 267 participants, mean (SD) age 72 (9) years, FEV1 59 (23)% predicted, 75% attended follow up assessment. There were no significant differences between the groups on any measure. Both groups demonstrated significant within-group improvements in 6MWT; mean improvement of 41m (CI 31-50 m) in the Comp PR group and 40m (CI 29-51 m) in the ET group ( $p < 0.05$ ) and in all domains of the CRQ immediately following the program. Both groups had small declines in all measures in the 12 months following, but the differences between groups were not significant.

**Conclusions:** The addition of disease-specific group education and self-management strategies to exercise training does not result in greater improvements in health outcomes and can be considered an effective option in the management of patients with COPD if comprehensive pulmonary rehabilitation cannot be offered.

## 335

### Does community based pulmonary rehabilitation provide health care utilization and cost saving benefits?

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Linda Denehy, School of Physiotherapy, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Melbourne

Annemarie L Lee, School of Physiotherapy, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne, Melbourne

**Question:** Does a community based pulmonary rehabilitation program in patients with chronic obstructive pulmonary disease decrease health care utilization?

**Design:** Prospective, randomised controlled trial with intention to treat analysis and assessor blinding.

**Participants:** Forty-four patients mean(SD) FEV<sub>1</sub>40(18) percentage predicted; age 70.57 (7.34) years were recruited at one tertiary centre.

**Intervention:** The experimental group attended a six week, twice weekly pulmonary rehabilitation program in addition to usual medical care. The control group received usual medical care only.

**Outcome measures:** Health care utilization data encompassing hospital and general practitioner attendance, medication usage and community costs were collected for 12 months post intervention.

**Results:** The experimental group demonstrated a reduction in the number of hospital separations ( $p = 0.01$ ) and a decreased total hospital length of stay ( $p = 0.01$ ). The average length of stay per admission for the experimental and control groups was 4.5 and 6.9 days respectively. The experimental group required less general practitioner home visits ( $p = 0.04$ ). Each pulmonary program was provided at a cost of \$AU 1073.00 per person. A comparison of the mean costs of providing 12 months of hospital and community care to each patient group demonstrated an overall net mean cost saving of \$AU 11,311.23 per person after attending pulmonary rehabilitation.

**Conclusion:** The results indicate a significant reduction in health care utilization, both in the hospital and community settings can be obtained after undertaking a pulmonary rehabilitation program which results in substantial cost benefits in patients with chronic obstructive pulmonary disease.

## 336

### Acute effect of Acu-TENS on blood beta-endorphin levels in patients with chronic obstructive pulmonary disease

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Christina WY Hui-Chan, University of Illinois at Chicago, United States

Homer PM Yu, Sichuan University, China

CQ He, Sichuan University, China

**Questions:** One session of Acu-TENS reduced breathlessness in patients with chronic obstructive pulmonary disease (COPD) but is there any concurrent effect on blood beta-endorphin levels?

**Design:** Prospective, double blinded, randomized controlled trial.

**Participants:** Forty-four patients diagnosed COPD were recruited.

**Intervention:** Patients were randomly assigned to either Acu-TENS, i.e. application of Transcutaneous Electrical Nerve Stimulation on acupoint (EX-B1, Dingchuan) or Placebo-TENS (identical to Acu-TENS without electrical output) for 45 minutes.

**Outcome measures:** Blood  $\beta$  endorphin levels, forced expiratory flow volume in one second (FEV<sub>1</sub>), dyspnoea visual analogue scale (DVAS) and respiratory rate (RR) were measured prior to, and after the intervention.

**Results:** Percentage change in  $\beta$  endorphin levels in the Acu-TENS group was 18.3% (95%CI 2.23 to 34.39,  $p=0.027$ ) more than the Placebo-TENS group. The percentage change in FEV<sub>1</sub> was 24.2% (95%CI 13.8 to 34.7,  $p<0.001$ ) higher in the Acu-TENS group when compared to the Placebo-TENS group. RR and DVAS were 14.2% and 20.7% lower in the Acu-TENS group compared with Placebo-TENS (95%CI: -20 to -8.3,  $p<0.001$ ) and (95% CI -35.1 to -6.1,  $p=0.006$ ) respectively. RR correlated negatively with  $\beta$  endorphin level ( $R=-0.477$ ,  $p=0.033$ ).

**Conclusion:** Acu-TENS is associated with an immediate increase in blood  $\beta$ -endorphin level, with concomitant improvement in FEV<sub>1</sub> and dypnoea level in patients with COPD.

**Trial registration:** NCT00922051

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### Advance care planning and pulmonary rehabilitation: participation and patient perspectives

Angela T Burge, Physiotherapy Dept, The Alfred

Annemarie Lee, Physiotherapy Dept, The Alfred, Institute for Breathing and Sleep, Austin Health

Amanda Nicholes, Advance Care Planning Service, Alfred Health

Stephanie Purcell, Advance Care Planning Service, Alfred Health

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Naomi Norris, Inner South Community Health Service, Hospital Admission Risk Program, Alfred Health

Sean Sandilands, Bentleigh Bayside Community Health, Melbourne

Anne E Holland, Physiotherapy Dept, The Alfred, Institute for Breathing and Sleep, Austin Health, School of Physiotherapy, La Trobe University

**Question:** Is the inclusion of an advance care planning information session as part of pulmonary rehabilitation and maintenance programs acceptable to participants?

**Design:** Qualitative study.

**Participants:** Participants in pulmonary rehabilitation and maintenance programs at hospital and community centres, who were invited to attend a group advance care planning information session.

**Intervention:** Semi-structured interviews, recorded and transcribed verbatim.

**Outcome measures:** Iterative thematic analysis of transcripts.

**Results:** Sixty-seven people (mean (SD) age 71 (11) years, mean FEV<sub>1</sub> 56 (24) % predicted, 12 (18%) on long term oxygen therapy.) were invited to attend session. There were no differences in age or disease severity between those who attended the session ( $n=44$ ) and those who did not. Of those who attended the session, 16 participants (24%) had previously heard of advance care planning, 38 participants believed that information about advance care planning was valuable, and 34 participants expressed strong support for the information to be presented in a group session. There was no consensus on which health professional should present advance care planning information. Major themes included: the appropriateness of the setting; the key role of the educator; and that the session prompted discussion and action. Other important themes included the preference for culturally specific services; the role of family in end-of-life decision-making; and requests for information about euthanasia. No differences in themes between hospital and community settings were evident.

**Conclusion:** An advance care planning information session was well accepted as part of a group education program within pulmonary rehabilitation and maintenance programs.

### Investigation of criteria used in participant selection of pulmonary rehabilitation programs in Australia

James R Walsh, Physiotherapy Department, The Prince Charles Hospital, Brisbane; Division of Medicine, The University of Queensland, Brisbane

Jenny Paratz, Division of Medicine, The University of Queensland, Brisbane

Zoe J McKeough, Discipline of Physiotherapy, The University of Sydney, Sydney

Norman R Morris, Griffith Health Institute, Griffith University, Gold Coast

**Question:** What criteria do pulmonary rehabilitation coordinators use to select participants for their program?

**Design:** Prospective observational study.

**Participants:** All pulmonary rehabilitation programs registered on the Australian Lung Foundation database were invited to participate in this study.

**Outcome measures:** A questionnaire was developed to investigate how pulmonary rehabilitation coordinators screen and prioritise referrals to their program.

**Results:** The response rate for the survey was 40.5 percent (79/195 programs). Forty-six programs reported they had a waiting list with a mean (SD) 14.5 (12.0) people. Fifty-three percent (40/76 programs) reported they would prioritise their program's referrals to people who were more severe (75%), more likely to benefit (55%), required rehabilitation prior to a medical procedure (70%), or had a medical request (60%). Seventy-four percent (56/76 programs) reported some form of selection of their participants which was mainly for safety reasons (84%) and to select people more likely to benefit (52%). This recipient selection was mainly performed by physiotherapists (79%) and respiratory nurses (60%). Common reasons for participant exclusion included severe cognitive impairment (93%), unstable heart disease (88%), infectious disease (62%), musculoskeletal problems (48%) and smoking (17%). Inclusion criteria used to select participants were walking ability (24%), lung function (19%), dyspnea level (12%) and muscle strength (5%).

**Conclusions:** While the majority of pulmonary rehabilitation programs appear to select their participants on safety criteria, inclusion criteria are less commonly used. Better selection criteria are needed to improve the access to pulmonary rehabilitation programs for individuals that are most likely to benefit.

### The BODE Index After Pulmonary Rehabilitation

Mark W Tran, St Vincent's, Melbourne

John R Conway, Darebin Community Health, Melbourne

**Introduction:** The benefits of Pulmonary Rehabilitation (PR) are well known for people with chronic obstructive pulmonary disease (COPD). The BODE index (BI) is an aggregated score which predicts survival of COPD comprising body-mass index, obstruction, dyspnoea, and exercise tolerance.

**Question:** Is BI sensitive to change after PR in a local Australian context?

**Design:** Prospective observational study.

**Method:** Demographic information, respiratory function test results and BI scores were collected routinely pre and post PR in a two year period from a metropolitan PR program. Pre and post PR data were compared to observe the response of BI and find which components of BI contribute to change after PR.

**Results:** 109 people with COPD (mean age 69.3, mean FEV1 53%) commenced the program. 37 (34%) discontinued and 72 (66%) completed the program. The BI of 27 (41%) of those who completed the program was improved, 29 (45%) remained stable while 9 (14%) scored worse. There was a statistically significant improvement in BODE for this COPD cohort (Wilcoxon's Signed Ranks Test,  $p = 0.005$ ), attributable to an improvement in Medical Research Council (MRC) dyspnoea score (Wilcoxon's Signed Ranks Test,  $p = 0.002$ ) and a 25m mean improvement in 6MWT (Paired t-test,  $p = 0.002$ ).

**Conclusions:** This study verifies current evidence based practice that PR remains beneficial for people with COPD. Furthermore, the BODE index which is a predictor of survival, is sensitive to change after PR due to an improvement in dyspnoea (MRC dyspnoea score) and exercise tolerance (6MWT).

### A Bibliometric Analysis of 65 years of the Journal Physical Therapy

Louise K Wiles, Division of Health Sciences, University of South Australia, Adelaide

Timothy S Olds, Division of Health Sciences, University of South Australia, Adelaide

Marie T Williams, Division of Health Sciences, University of South Australia, Adelaide

**Question:** How have the nature of original research articles published in Physical Therapy changed between 1945 and 2010?

**Design:** Retrospective document audit. Findings were analysed descriptively.

**Participants:** Original research articles (excluding letters, editorials, corrections, commentaries and book reviews) published at three-monthly and five-year intervals between 1945 and 2010 inclusive were audited.

**Outcome measures:** Thirty six bibliometric items relating to demographic details of the audit item (i.e publication) ( $n=5$  items), research design ( $n=2$ ), sample population ( $n=5$ ), research topic ( $n=1$ ), data analysis and presentation ( $n=4$ ), reporting ( $n=6$ ), authorship ( $n=8$ ), funding ( $n=2$ ) and references and citations ( $n=3$ ). Data extraction was consistent within and between raters (intra-class coefficient 0.8 to 1.0 for intra-rater and inter-rater reliability).

**Results:** A total of 319 original research articles were audited, the volume of which doubled ( $n=14$  original research articles published in 1945,  $n=37$  in 2010) over the study period. In 1945, the typical paper was anecdotal and authored by 1.4 American authors (working in hospitals), and consisted of 4 pages and 4 references. In 2010, the typical paper used either a cross-sectional survey or randomised-controlled trial design, with 4.6 multi-national authors (working in universities), consisting of 11.6 pages and 48.8 references.

**Conclusion:** There have been substantial shifts in the nature of research published over the last 65 years in Physical Therapy. The changes seen mirror the shifts that have occurred in other industries and publications, those of increasing quantification, standardisation, collaboration, and internationalisation. These trends are likely to continue in the future.



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### Physiotherapists have positive attitudes and knowledge about evidence-based practice but implementation into practice is limited: a survey

Erin M Wilson, The Peter James Centre, Eastern Health

Amy Cusworth, The Peter James Centre, Eastern Health

Nicholas F Taylor, Eastern Health–La Trobe University

**Questions:** How do physiotherapists rate their attitude, knowledge and practice of evidence-based practice?

**Design:** Prospective observational study.

**Participants:** Physiotherapists working in a large metropolitan health service.

**Outcome measures:** A published survey tool investigating self-rated attitude, knowledge and practice of evidence-based practice.

**Results:** Of 100 surveys distributed, 87 were completed. Clinician's attitudes towards evidence-based practice were positive (Mean 4.2 SD 0.8; scale very negative 1 to very positive 5). At least 90% of clinicians reported at least some understanding of research terminology. However, frequency of practice was limited: For example, only 28% of clinicians reported that they searched databases at least monthly. Recent graduates were more confident with terminology than experienced physiotherapists (e.g. understanding of publication bias OR 3.8 (95%CI 1.1. to 12.8) but did not report greater ability or frequency of practice. Physiotherapists with post-graduate training (N=15) reported better knowledge of terminology, better ability to practice and greater frequency of practice (e.g. searching data databases OR 5.7 (95%CI 1.6 to 19.8) than entry-level physiotherapists. There were no differences between work settings. Eighty-three percent of physiotherapists rated time as the major barrier to evidence-based practice and 38% suggested more workplace professional development to promote evidence based practice.

**Conclusion:** Physiotherapists' attitude and knowledge of evidence based practice were positive but practice of evidence-based principles was limited. Post-graduate training was associated with increased practice. These results suggest that a positive attitude and knowledge does not translate into the implementation of evidence-based principles into practice.

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### Exploring the perspectives of allied health practitioners toward the use of journal club as a medium for promoting evidence-based practice

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Saravana Kumar, International Centre for Allied Health Evidence, University of South Australia

**Karen Grimmer-Somers**, International Centre for Allied Health Evidence, University of South Australia

**Background:** The International Centre for Allied Health Evidence (iCAHE) in collaboration with the Department of Health South Australia developed an innovative model of journal club to promote evidence-based practice (EBP) in allied health. The iCAHE journal club (JC) model has the potential to address commonly encountered barriers associated with implementing evidence into practice.

**Objectives:** To understand the feasibility of iCAHE JC model, it is important to explore the perspectives of allied health practitioners (AHP) as their attitudes could play an important role in the uptake of evidence.

**Methods:** A qualitative descriptive study utilising focus group interviews with various groups of AHP was undertaken-- those who are currently exposed to iCAHE JC model and those who are unexposed. Maximum variation sampling was used to recruit participants. Transcripts of focus groups were coded and analysed for emergent themes.

**Results:** Six focus groups with 43 AHP were facilitated. Several themes emerged: benefits of a JC, elements of an effective and sustainable JC, barriers to and enablers for participation, and opportunities for improvement in the current model.

**Conclusion:** The innovative iCAHE JC model was embraced by AHP and hence could be utilized as a viable tool to promote EBP in health care. While this particular model can address some barriers (access, time), workload and limited knowledge of statistics continue to be major issues. Support from managers/peers, and continued access to research evidence could improve sustainability of JCs. Ongoing refinement of iCAHE JC model is required to reflect emerging challenges in the health care context.

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### The new frontier of physiotherapy education: Leadership

Jason T Smith, Back In Motion Health Group

The undergraduate curriculum of most, if not all, physiotherapy schools around the country have long been criticized for their lack of attention to developing intentional leadership attribute and management skills in their graduating cohorts. Without passing judgment as to the role of the physiotherapy schools and what their teaching objectives should be, one thing that's certain is that our new graduates could certainly benefit from carefully developed leadership training to be more effective clinicians and professional managers. In the absence of industry specific material of this nature, and the expressed need of an emerging workforce within both the public and private sector craving such non-clinical professional development, senior physiotherapists of the Back In Motion Health Group have developed a unique 12 month Leadership Development course. Designed as a master class format for a maximum of 15 participants, there have now been 8 graduated streams achieved by teaching concurrent programs. Covering topics from vision casting, self management, team building and conflict resolution through to how to nurture loyalty in clients and the community around you, the course also teaches the basics of financial literacy and resource management to ensure well intentioned physios don't go bust in the pursuit of their courageous dreams. Take a fresh tour of the anatomy of this leadership program that has been created by a physiotherapist for physiotherapists, with the view that it might inspire similar type curriculum suitable for other contexts within our profession.

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### Threshold concepts in physiotherapy – helping to decide what to teach, how to teach it and when to teach it

Sarah Barradell, La Trobe University

Entry level physiotherapy programs must comply with independent bodies such as the Australian Physiotherapy Council (APC). Such bodies provide quality assurance for the profession, ensuring competency for practice. Furthermore, these bodies require that physiotherapy programs consider what to teach, how to teach it and when to teach it. A challenge for academics is to produce curricula not excessive in volume, as this may run the risk of detracting from the students' meaningful learning.

Threshold concepts offer a way to streamline what is taught – whereby what is lacking in content is made up for by the insights gained through the coverage of each concept. Threshold concepts offer the learner a new perspective or new insights on a topic – they define critical points in learning. Whilst many disciplines have explored the identification of threshold concepts, healthcare is not well represented. There is currently no literature related to physiotherapy.

This presentation reports on the first stage of a project related to threshold concepts in physiotherapy. The purpose of this stage was to use Nominal Group Technique to support a group of clinical educators to identify threshold concepts for an undergraduate neurological physiotherapy subject. The process identified and ranked 13 concepts.

The research undertaken in this project was unique in that it involved stakeholders new to the identification of threshold concepts. Whether this research has identified threshold concepts or something else remains to be seen. Nonetheless, the outcomes of the research have informed subsequent curriculum design of the undergraduate subject.

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### Application of higher education theory to inform curriculum development in cardiorespiratory physiotherapy in the Registration Board Project

Katherine Doiron, Bond University

Nancy Low Choy, Bond University

Michael Pahoff, Bond University

Christine Tom, Bond University

**Question:** What is the effect of applying the principles of mind mapping and constructive alignment to the curriculum for adult learners returning to study under two different learning models?

**Design:** A prospective randomised study.

**Participants:** Sixteen physiotherapists were randomly allocated to either an independent learning package (ILP) or a problem based learning (PBL) group.

**Intervention:** An introduction to mind mapping and constructive alignment was delivered to both groups at the commencement of their cardiorespiratory coursework. These principles were applied to the ILP curriculum and fostered informally during weekly PBL on-line discussions about the weekly problem. Assessment tasks were aligned to the learning outcomes and activities.

**Outcome Measure:** A survey was undertaken at mid and end of semester with questions related to awareness, use and understanding of the role of mind mapping and constructive alignment in learning. A 10-point Likert scale was used to evaluate any change.

**Results:** Whilst the PBL group showed a greater change in their awareness of the process of mind mapping, (Mean: Before=3.75; After=6.50) compared to the ILP group (Mean: Before=4.0; After=4.6), the curriculum design appeared to have less effect in the use of mind mapping in both groups: PBL (Mean: Before=2.29; After=3.40) and ILP (Mean: Before=3.43, After=4.50). Awareness of the use of constructive alignment to assist study was marginally improved in the ILP group but not the PBL group. (ILP Mean: Before=2.14, After=2.75).

**Conclusion:** This survey demonstrated that this curriculum design facilitated student awareness of mind mapping particularly in the PBL model thus enhancing student learning.

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### The Australian Musculoskeletal Education Collaboration: relevance for standards of practice and interdisciplinary collaboration in physiotherapy

Mellick Chehade

David J Bentley, Adelaide University

Teresa A Burgess

The International Bone and Joint Decade (BJD) (2000–2010) identified the education requirements related to the examination and management of musculoskeletal (MSK) conditions did not reflect the clinical requirements necessary to meet the worldwide burden of this problem. The training of medical and allied medical professionals in the management of MSK conditions should be based around an evidence base and standards of practice reached through extensive interdisciplinary collaboration and consensus. The Australian Musculoskeletal Education Collaboration (AMSEC) was initiated with the aim of defining evidence based standards of MSK education of medical students appropriate for Australian universities considering Australian health demographics. The AMSEC competencies are the result of five years of widespread collaboration between representatives of Australian Universities, key professional colleges and bodies as well as national and international experts in MSK medicine. A health education framework has been developed to give the MSK competencies a clinical context and by necessity, shares a base or foundation in the basic and clinical science components which is common with other medical disciplines and health professions, such as physiotherapy. The Australian standards for Physiotherapy represent a considerable development for quality assurance in physiotherapy practice in Australia. However competency standards of practice in the examination and management of MSK conditions in physiotherapy has not yet been clearly defined. The purpose of this paper is to provide an overview of the AMSEC competencies and present a means with which the AMSEC framework can be used to facilitate mapping of discipline specific competencies into existing physiotherapy curricula.

### Developing a virtual metacarpophalangeal joint: A first step towards a palpable virtual reality model of an articulated musculoskeletal system

Neil Tuttle, Griffith University

Raul Wirz, Universidad Politécnica de Madrid, Spain

Manuel Ferre, Universidad Politécnica de Madrid, Spain

Ignacio Galiana, Universidad Politécnica de Madrid, Spain

**Questions:** Can virtual reality systems including tactile (haptic) feedback be developed to simulate musculoskeletal assessment and treatment?

**Background:** The use of simulated patients have been shown to be an effective strategy for improving clinical skills of physiotherapy students in both cardiorespiratory and musculoskeletal fields. Trained actors can effectively simulate taking a history and, for cardiorespiratory simulations, there are effective physical and virtual reality simulators for some of the necessary physical tasks. To date, however it has not been possible to simulate physical assessment and treatment for musculoskeletal conditions. This paper describes the preliminary development of a virtual reality simulator for musculoskeletal conditions.

**Methods:** Three dimensional locations and forces applied by two fingers were measured while assessing range of movement of the second metacarpophalangeal joint. The results were applied to a pre-existing virtual model of the hand.

**Results:** The resulting angular stiffness and range of movement was comparable to published movement characteristics for the metacarpophalangeal joint. The resulting virtual finger joint could be manipulated using a haptic device with two points of contact. Even producing a simulation of this simple musculoskeletal assessment required finding solutions to enable contact between multiple interfaces and multiple virtual bodies, produce articulations between rigid bodies with complex non-linear stiffness, and still enable the reflected force to be calculated and refreshed at 1000Hz.

**Conclusions:** Development of virtual reality simulations for musculoskeletal conditions is complex, but the solutions required for this simple example are currently being applied to a fully articulated virtual model of the cervical spine.

### Preliminary Evidence On The Effectiveness Of Commercial Mentoring For Physiotherapists

Jon J Ford, La Trobe University

Michael A Kenihan, LifeCare Health

Cameron Geddes, Mindshop

A significant proportion of Australian physiotherapists work in private practice motivated at least in part by commercial returns. An understanding of commercial principles is of potential value in ensuring a durable career in private practice. Insufficient education on the commercial nature of private practice may account for the relatively high rates of physiotherapists changing careers within 10 years of graduation. This paper aims to explore the impact of a structured commercial mentoring program on practitioner commercial outcomes and retention. Data was collected from 91 practitioners engaged as subcontractors from January 2007-April 2011 across 11 private practices in Metropolitan Melbourne. Overall improvement in key performance indicators over time was observed including dollars billed per hour (19.2%) and per patient (17.1%) with minimal change in patients seen per hour (1.6%). Forty-six practitioners participated in a commercial mentoring program consisting of group inservices on commercial principles, annual review of commercial performance, short-long term goal setting and quarterly evaluation of progress/ assistance with specific strategies. Practitioners engaged in the commercial mentoring had significantly greater improvement in key performance indicators compared to those not engaged. The average duration of subcontractor retention was confounded by the fact that more established practitioners tended not to engage in commercial mentoring. Methods as well as potential benefits and limitations of commercial mentoring for physiotherapists in private practice are discussed.

### Bibliometric measures in health research: a systematic review

Louise K Wiles, Division of Health Sciences, University of South Australia, Adelaide

Timothy S Olds, Division of Health Sciences, University of South Australia, Adelaide

Marie T Williams, Division of Health Sciences, University of South Australia, Adelaide

**Question:** Which are the most frequent bibliometric measures used in peer reviewed bibliometric studies of medical, nursing and allied health literature?

**Design:** Systematic review with data from quantitative studies analysed descriptively and synthesised in a narrative format.

**Participants:** Bibliometric studies published between 2000 and 2009 across medical, nursing and allied health in peer-reviewed journals, published in English as full articles.

**Outcome measures:** All bibliometric measures used in included articles were recorded verbatim. Data extraction was consistent between and within raters (85–100% agreement).

**Results:** There were 3279 different bibliometric measures recorded. The number of measures used in bibliometric audit tools increased from 7.5 in 2000 to 11.6 in 2009. Most frequent measures were: country of author affiliation (29% of articles), research design (25%), journal impact factor (25%), citation index (20%), research topic (15%), number of authors (13%), author name (12%), affiliation name (11%), sample size (11%) and keywords (11%).

**Conclusion:** In health literature there are a wide variety of bibliometric measures in use. The measures used are relatively standardised, quantitative and efficient to record. In the future it is likely bibliometric audit tools will contain more items that are more sophisticated in their capture (such as citation networks). This information may assist bibliometric researchers in health disciplines to select commonly used measures that facilitate more direct comparison with outcomes used in existing literature. Using the results of this study, health researchers may better understand the bibliometric measures used to evaluate their research performance.

### Muscle power generation and motor skill predict mobility outcomes following traumatic brain injury

Gavin Williams, Epworth Hospital, Melbourne

Anthony Schache, School of Mechanical Engineering, The University of Melbourne, Melbourne

Meg Morris, School of Physiotherapy, The University of Melbourne, Melbourne

Paul McCrory, School of Physiotherapy, The University of Melbourne, Melbourne

**Question:** Which motor impairments predict mobility outcome following traumatic brain injury (TBI)?

**Design:** Observational study where participants were assessed before and after a 6-month period of rehabilitation.

**Participants:** Thirty-one people (23 male) with severe TBI.

**Intervention:** Participants attended a specialist rehabilitation centre and received usual care.

**Outcome Measures:** The five motor impairments assessed were balance (total single limb support time for each leg, eyes open and eyes closed), strength (ankle power generation at push-off), contracture (goniometry), spasticity (Tardieu score) and motor control (Gait Profile Score). The outcome measure for mobility was the HiMAT score.

**Results:** Two variables, Ankle Power Generation ( $\beta = .48$ ,  $p < .01$ ) and Gait Profile Score ( $\beta = -.29$ ,  $p = .05$ ) were statistically significant in the final model. Together they explained 66.5% [ $F(4, 22) = 10.9$ ,  $p < .001$ ] of the variability in mobility outcome. Contracture infrequently impacted on the range of motion required to mobilize. Although large gains in the ability to balance also occurred, they were unrelated to mobility outcomes.

**Conclusion:** The ability to generate ankle power at push-off was the strongest predictor of mobility outcome at six month follow-up. Ankle power generation and motor skill for walking predicted the majority of variability in mobility outcome. Despite the prevalence of balance disorders and spasticity, neither added to the predictive strength of the model generated for mobility outcome.

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### A randomised controlled trial of a Running Program in neurological rehabilitation

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Gavin P Williams, School of Physiotherapy, University of Melbourne, Epworth Rehabilitation Hospital, Melbourne

John Buchanan, Department of Physiotherapy, Royal Perth Hospital, Perth

Garry T Allison, School of Physiotherapy, Curtin University, Department of Physiotherapy, Royal Perth Hospital, Perth

**Question:** What is the effect of a high-level mobility exercise group ('Running Program') compared to standard outpatients at progressing high-level mobility in the final two months of neurological outpatient treatment?

**Design:** Randomised, single blind, prospective, stratified parallel group study with intention-to-treat analysis.

**Participants:** Fifty-four individuals who experienced an acquired brain injury (stroke or traumatic brain injury) greater than two months previously who were able to independently walk 20 metres.

**Intervention:** The experimental group completed an eight-week Running Program that involved high-level mobility training (once per week). The control group completed eight weeks of standard neurological physiotherapy outpatient treatment (twice per week).

**Outcome measures:** The primary outcome measure was the High-Level Mobility Assessment Tool, secondary measures were the ten-metre walk test, six-minute walk test, Community Integration Questionnaire and the Assessment of Quality of Life- 6D. Measures were taken before and after treatment and one-month after the final treatment session.

**Results:** There was a statistically ( $p < .0001$ ) and clinically significant improvement for high-level mobility, quality of life and participation which was maintained at one-month follow-up. Both groups improved with no statistically significant difference detected between treatment groups for high-level mobility ( $p > .60$ ), quality of life ( $p > .41$ ), or participation ( $p > .81$ ).

**Conclusion:** This is the first randomised controlled study into high-level mobility training providing evidence validating neurological outpatient physiotherapy treatment interventions. High-level mobility training in the form of a Running Program is a valid, safe, and time-efficient treatment intervention in late-stage acquired brain injury outpatient rehabilitation.

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### Capacity to mobilize is unrelated to cardiovascular fitness following traumatic brain injury

Gavin Williams, Epworth Hospital

Ross Clark, The University of Melbourne

Natasha Weragoda, Epworth Hospital

Kade Paterson, Australian Catholic University

**Question:** To what extent does mobility and activity levels determine cardiovascular fitness following traumatic brain injury (TBI)?

**Design:** Cross-sectional observational study.

**Participants:** A sample of 30 people with TBI and 30 matched healthy controls were recruited.

**Outcome Measures:** Mobility was assessed using the 10 metre walk test (10MWT), the six minute walk test (6MWT) and the high-level mobility assessment tool (HiMAT). Activity was assessed using the Kinetamap activity monitor (reported as steps per day) and cardiovascular fitness was assessed using the PWC-130 sub-maximal VO2 exercise bike test.

**Results:** HiMAT scores ranged from 4–54 for the TBI cohort, indicating a wide range in capacity to mobilize. Significant differences ( $p < 0.001$ ) were found for the measures of mobility between TBI patients and HC participants. Results revealed no relationship ( $p > 0.05$ ) between cardiovascular fitness and any of the measures of mobility. Further, no significant relationship was found between activity levels and cardiovascular fitness.

**Conclusion:** Despite reduced and wide range in capacity to mobilize, no relationship was identified between mobility and cardiovascular fitness following TBI.

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### Assessment of the effectiveness of botulinum toxin for spasticity management using the Goal Attainment Scale: an observational study

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Natalie A Fini, Caulfield Hospital, Alfred Health, Victoria

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Denita Wild, Caulfield Hospital, Alfred Health, Victoria

Anne Holland, Latrobe University and Alfred Health, Victoria

**Questions:** Does the Goal Attainment Scale effectively measure change after botulinum toxin injections for spasticity management, when other relevant objective measures have not measured significant change? Which goals are most likely achieved?

**Design:** Prospective observational study.

**Participants:** Sixty-seven clients who received botulinum toxin injections for spasticity management. Forty-six clients (69%) had strokes and twenty-one (31%) had other diagnoses. Median time since onset of spasticity was 2.4 years.

**Outcome Measures:** Goals were set by clients and/or carer and weighted for importance, prior to injection. One month following injection goal achievement was rated on the Goal Attainment Scale. Goal achievement was rated as a change of equal to />ten points.

**Results:** Thirty-five clients (52%) had mobility and transfer goals, whilst 33 clients (49%) had cosmesis goals. Fifteen clients (22%) had pain and comfort goals and eight clients (12%) had hygiene goals. Twenty-four clients (36%) had upper limb function goals. The proportion of clients who reached their goals was high for hygiene (100%), cosmesis goals (85%), and goals related to pain and comfort (80% of clients). However the rate of goal attainment was lower for mobility and transfers (54%), and upper limb function (42%). Clients who reached their mobility and transfer goals had a longer duration of spasticity than those that did not, ( $p=0.03$ ).

**Conclusion:** The Goal Attainment Scale is useful to assess the effectiveness of botulinum toxin for spasticity management. Goals related to pain, comfort, hygiene and cosmesis may be achieved more often than those related to function, following botulinum toxin injection.

### Long-term outcomes following tendon transfer surgery for people with tetraplegia compared to conventional therapy alone

Anna C Huebert, Bond University

Nancy L Low Choy, Bond University

Damien Barratt

Jayne Yeomans

Michael Steele, Bond University

**Questions:** Do long-term upper limb outcomes following tetraplegia and level of satisfaction differ when tendon transfer surgery is undertaken compared to conventional therapy alone?

**Design:** A prospective survey study was undertaken.

**Participants:** The Tetraplegic Hand Clinic database at the Royal North Shore Hospital, Sydney was accessed to identify patients with a C4-C7 spinal cord injury. Sixty-eight patients were invited to participate in our study.

**Outcome measure:** The Michigan Hand Questionnaire (MHQ) was the measure of upper limb function and a satisfaction survey was completed by consenting respondents.

**Results:** Thirty respondents (44%) completed the MHQ and the satisfaction survey. Fifteen had undertaken tendon transfer surgery approximately  $8\pm 4.5$  years ago ( $11.9\pm 13.1$  years after their injury) while the balance had conventional therapy alone ( $14.1\pm 8.9$  years since injury). Both groups were matched for general health ( $t=0.21$ ;  $p=0.836$ ) and age ( $t=1.53$ ,  $p=0.136$ ). Three sub-scales of the MHQ (hand function, ADL, satisfaction) showed the tendon transfer group had better right upper limb outcomes than the non-surgical group. The satisfaction survey revealed that the surgery group reported significantly more ability to use their upper limbs to reach, grasp and manipulate objects ( $p<0.05$ ), with no improvements in transferring or propelling a wheelchair compared to the conventional therapy group. 93% would recommend tendon transfer surgery to another person with tetraplegia.

**Conclusion:** These new findings are important as long term outcomes of upper limb function for people with tetraplegia are reported. The findings support improved upper limb function and higher satisfaction levels with function following tendon transfer surgery.

### An intensive program of passive stretch and motor training to manage severe knee contractures after traumatic brain injury: a case report

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Lisa Harvey, University of Sydney

Anne Moseley, The George Institute of International Health

**Background:** Contractures are a common secondary problem of acquired brain injury and can be difficult to treat. Contemporary management includes passive stretch, however recent evidence indicates that passive stretch alone may not be effective. The apparent ineffectiveness of stretch may be because clinical trials have not provided a sufficient dose of passive stretch or have not combined passive stretch with other treatments.

**Objective:** To describe the use of an intensive program of intensive passive stretch combined with motor training for the treatment of severe knee contractures.

**Method:** A case report of an adolescent five months after traumatic brain injury with severe bilateral knee flexion contractures who underwent an intensive stretch program including serial casting and splinting administered for 9 months in conjunction with a motor training program administered for 1.5 years.

**Results:** The adolescent regained full knee extension range and progressed from being totally dependent to walking short distances with assistance. The effects were maintained at follow-up 5.5 years post-injury.

**Conclusion:** The use of a high dose of passive stretch in conjunction with motor training may be an option to consider for correcting severe contractures following acquired brain injury.

### Ankle contracture causes the knee to hyperextend on walking: a biomechanical study

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Lisa Harvey, University of Sydney

Anne Moseley, The George Institute of International Health

Joe Chapparo, Premier Prosthetics and Orthotics

**Background:** Ankle contracture is common amongst adults with neurological disorders and known to cause secondary gait deviations. It is, however, unclear if ankle contracture causes the knee to hyperextend.

**Objective:** To describe the effects of ankle contracture on knee kinematics during stance phase and spatiotemporal characteristics.

**Method:** Thirteen healthy adults participated in the biomechanical study. Ankle contracture was simulated by restricting ankle dorsiflexion range using an ankle-foot-orthosis. Data were collected via a fourteen-camera high resolution passive marker motion analysis system. Comparison was made between the restricted and unrestricted conditions.

**Results:** Two distinct gait patterns were observed. Eleven of the thirteen participants (85%) demonstrated an increase in knee extension. Two participants (15%) showed an increase in knee flexion instead. Significant changes in various spatiotemporal parameters were also observed including a reduction in walking speed and cadence.

**Conclusion:** This study provides the first evidence that ankle contracture leads to an increase in knee extension. Ankle contracture also has a deleterious effect on walking performance. These findings contribute to a better understanding of the impact of ankle contracture on walking and gait.

### The association between motor proficiency and body composition in pre-primary children is influenced by body composition classification and sex

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**Question:** Is there an association between motor proficiency and body composition in pre-primary children?

**Design:** Cross sectional correlational study.

**Participants:** Pre-primary children aged between four and six years ( $n = 435$ ), from eight schools in metropolitan and regional Western Australia participated as part of a larger intervention study.

**Measures:** Motor proficiency was assessed using the Bruininks-Oseretsky Test of Motor Proficiency - 2nd edition, short form. Body composition measures were waist circumference and BMI. Weight classification was based on BMI age-and-gender specific z-scores.

**Results:** No overall relationship was found between motor proficiency and BMI z-scores or waist circumference. However motor proficiency and BMI and waist circumference were significantly correlated within some weight classifications for girls only (BMI normal weight  $r = 0.190$ ,  $p = 0.02$ ; BMI overweight  $r = -0.530$ ,  $p = 0.003$ ; waist circumference overweight  $r = -0.455$ ,  $p = 0.04$ ).

**Conclusion:** There is an association between motor proficiency and body composition within weight categories for females, although causality cannot be inferred. Clinicians working with children should assess motor proficiency of children who are overweight; and assess the body composition of children who show poor motor proficiency. For children identified with poor motor proficiency, clinicians should provide appropriate activities to enable them to partake in physical activity to help prevent the consequences of childhood obesity.

### Initial assessment of the StepWatch Activity Monitor™ to measure walking activity in Rett syndrome

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**Questions:** What is the accuracy of a StepWatch Activity Monitor™ accelerometer for measuring physical activity in girls and women with Rett syndrome? What is the daily walking activity of girls and women with Rett syndrome and how does this vary with age?

**Design:** Prospective observational study.

**Participants:** Twelve subjects (age  $12.9 \pm 8.0$  years) with confirmed Rett syndrome who were participating in the Australian Rett Syndrome Database.

**Outcome measures:** The girls and women wore a StepWatch during a videoed session of activities (duration  $16.2 \pm 5.4$  minutes) to assess its agreement with the criterion method of observation and then over whole day periods. Relationships between agreement, gross motor skills, average daily step count and age were analyzed.

**Results:** The number of steps obtained using the StepWatch was similar to that viewed on video, the bias (mean difference) was 0 steps per minute and the limit of agreement ( $2 \times$  standard deviation of the difference between both step counts) was 10 steps per minute. This difference was not systematic. Subjects were significantly less active than their healthy peers (difference 6086 steps per day;  $p = 0.001$ ) and physical activity reduced with advancing age ( $r = -0.615$ ,  $p = 0.044$ ).

**Conclusion:** There is no previously validated measure of physical activity for Rett syndrome but accelerometer devices are likely to provide relevant information. Physical activity is an important outcome measure for future clinical trials aiming to reverse the effects of Rett syndrome and also for clinicians and families who monitor progress.

## 360

### A multidisciplinary program for overweight and obese adolescents

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Melissa Davis, Curtin University

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**Introduction:** Approximately 25 percent of Australian adolescents are overweight or obese. There is a gap in evidence around the prevention of the progression to morbid obesity in adolescence. This study aimed to develop and evaluate a multi-disciplinary, family-centred intervention targeting activity, food and behavior change in overweight/obese adolescents.

**Method:** 30 adolescents completed an 8 week program in 2009 and 2010. Curtin University's Activity, Food and Attitudes Program (CAFAP) consisted of twice weekly 2 hour sessions. Adolescents participated in a 1 hour exercise program at each session followed by education and support sessions. Parents participated in education and support sessions. Sessions were facilitated by physiotherapy, dietetics, psychology and social work professionals and undergraduate/postgraduate students. The program aim was sustainable behaviour change in relation to physical activity, healthy diet and a positive attitude, rather than weight loss.

**Results:** Activity initially increased after the program (pre daily accelerometer count mean 856 (95% confidence interval 619-1093); post 916 (577-1255)) but was reduced at 3 month follow-up (720 (603-838)  $n=7$ ). Daily serves of vegetables and fruits were greater at follow-up (vegetables pre 1.2 (0.6-1.7), post 1.4 (0.7-2.1), 3 month 1.4 (0.2-2.7)). Daily intake of extras and fats were reduced at follow-up (extras pre 4.0 (1.8-6.1), post 3.1 (2.2-3.8), 3 month 3.4 (1.6-5.1)). Qualitative data were also collected.

**Conclusion:** Participation in CAFAP resulted in some pleasing changes in behaviours with regards to a healthy diet. Initial changes showed increased physical activity levels, however this was not sustained and is the focus of ongoing research.

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### Participation in children with a primary language disorder

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Kathryn Holzberger, The University of Queensland, Brisbane.

Fiona Mackay, The University of Queensland, Brisbane.

Kajal Patel, The University of Queensland, Brisbane.

Grace Robertson, The University of Queensland, Brisbane.

**Question:** Children with Primary Language Disorder (PLD) have affected language development without hearing/motor/ neurological/ cognitive deficits, with impairments in body structure and function and activity limitations, requiring interprofessional management. As associated participation restrictions are not well reported, this study evaluated activity preferences and participation in children with PLD attending The Glenleighden School (TGS) in Brisbane.

**Participants:** Children aged 5–16 years ( $n=32$ , males=27) were recruited from TGS.

**Measures:** The Children's Assessment of Participation and Enjoyment (CAPE) and Preferences for Activities of Children (PAC).

**Analysis:** Pearson's correlations (within/between CAPE/PAC scores) and one-way analysis of variance (effect of gender, age and time at TGS on study measures) were calculated using SPSS, using  $p < 0.05$ .

**Results:** Children at TGS performed more informal (mean=24) than formal activities (mean=1.91), and enjoyed informal (mean=4.12) more than formal activities (mean=3.29). CAPE overall 'diversity' correlated with PAC 'Social' ( $r = 0.72$ ,  $p = 0.000$ ) and "Skills" Preference Scores ( $r = 0.73$ ,  $p = 0.000$ ). Time at TGS had a significant effect on CAPE Overall 'Where' ( $p = 0.016$ ) and Informal 'Where' ( $p = 0.010$ ) scores. Formal 'enjoyment' scores correlated with formal 'with whom' ( $r = 0.742$ ,  $p = 0.000$ ) and 'where' ( $r = 0.915$ ,  $p = 0.000$ ).

**Conclusions:** Participation of these children is biased towards informal activities, done with family members in, or near the family home; there is a mismatch between what these children do versus what they would like to do. Studies of the impact on participation of reduced impairments and activity associated with intervention, should now be undertaken.

### Back to basics: a course to train physiotherapists in developmental paediatrics

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The "Back to Basics" Course was developed in response to the need for a comprehensive training activity to up-skill physiotherapists with a paediatric caseload. The primary objective was to equip physiotherapists to work in developmental paediatrics. Additional objectives were to stimulate interest in paediatric physiotherapy, especially among rural and regional physiotherapists, and to develop a professional support network. The ICF was adopted as the framework for the course to give participants transferrable skills across the paediatric age range and various settings. Family-centred practice was embedded throughout the content which covered early intervention frameworks, current theories of motor development, typical/atypical development, collaborative assessment and management, evidence based intervention and evaluation of outcomes. A combination of lectures, practical demonstrations, case discussions and field visits was utilised to facilitate effective learning, with speakers drawn from a wide range of medical and allied health professions. Participants were selected using criteria relevant to the course objectives. They completed a self-evaluation questionnaire using 5 point Likert scale before, on completion and three months after the course. Analysis of the responses showed all participants had improved knowledge, skills and confidence at least one point following the course. After 3 months knowledge and skills were maintained and confidence improved further. The course has met the objectives of equipping physiotherapists with the skills to work in developmental paediatrics. The increasing demand nationally for the course has resulted in it being offered on a yearly basis.

### Development of the paediatric physiotherapy clinical capability framework, a clinical education and training planning tool: refocussing on capability

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Annabel Wilson, Allied Health Clinical Education & Training Unit, ClinEdQ

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**Questions:** How do we determine the capabilities required by a physiotherapist to work safely in paediatric settings, and how do we design a targeted professional development program to meet their individual learning needs?

**Design:** Action research design incorporating qualitative data.

**Participants:** Paediatric physiotherapists with a broad range of clinical and managerial experience in paediatric physiotherapy.

**Intervention:** The paediatric clinical capability framework was developed using an iterative action research approach and piloted in paper format on ten paediatric physiotherapists of varying levels of clinical experience.

**Outcome Measures:** Qualitative participant feedback data on the paediatric capability framework was obtained via interviews and a survey.

**Results:** The paediatric clinical capability framework identifying the knowledge, skills and attitudes required to provide safe sustainable high quality paediatric physiotherapy services was developed. Results of the pilot demonstrated positive responses from all participants, particularly entry-level physiotherapists, regarding the framework and its content, utility and ability to identify learning needs. The piloted paper format was criticised as unwieldy and overwhelming. All participants recommended development of an electronic version. Professional development plan outcomes are being assessed for impact of the framework, consistency and identification of gaps in learning resources available.

**Conclusion:** The framework will provide tools for individual professional development planning and underpin future learning & development needs in paediatric settings. Upgrading to a software format will improve accessibility and facilitate workforce acceptance in a contemporary and cost-effective way. Learning resources continue to be developed collaboratively by key stakeholders as well as progressing the framework within other workforce levels.

### Functional mobility of intensive care survivors at the time of discharge from acute care

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**Questions:** In patients intubated and ventilated for  $\geq 168$  hours who survive their acute care stay, what proportion are able to ambulate independently at the time of hospital discharge? What was the delay between intensive care admission and the attainment of functional milestones?

**Design:** Comprehensive retrospective review of medical records.

**Participants:** All 2590 patients admitted to the intensive care unit at Sir Charles Gairdner Hospital during 2007–08 were screened; of these, 190 met study criteria.

**Outcome measures:** Ambulation status at time of hospital discharge and timing of when each patient first sat out of bed, stood and ambulated.

**Results:** The prevalence of patients ambulating independently prior to their intensive care admission was 95% (95% CI: 92 to 98%), decreasing to 28% (95% CI: 22 to 34%) at the time of discharge from acute care. A further 18% (95% CI: 13 to 24%) were independent with a walking aid. A total of 68% (95% CI: 61 to 75%) of the patients sat out of bed during their intensive care stay. The delay between admission to the unit and first time sitting out of bed, standing and walking was  $13 \pm 8$  days ( $n=183$ ),  $19 \pm 19$  days ( $n=163$ ), and  $23 \pm 22$  days ( $n = 155$ ), respectively.

**Conclusion:** A prolonged stay in intensive care compromises the capacity to ambulate of half of all patients who survive their acute care admission. For those who were able to ambulate at discharge, ambulation was initiated more than 3 weeks following admission to the unit.

### A tool for screening safety to mobilize in adult intensive care unit patients is not clinically useful for junior physiotherapists

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**Question:** What is the clinical utility of the Stiller and Phillips tool for assessing safe mobilization in intensive care?

**Design:** Prospective observational study.

**Participants:** Thirty-nine tertiary-level intensive care unit patients (mean age 67; APACHE range 16 to 152).

**Intervention:** Safety to mobilize was assessed using the Stiller and Phillips tool in 39 consecutive patients. Seventy potential mobilization interventions were screened. The treating junior Physiotherapist then agreed or disagreed with the tool using clinical judgment. Mobilization involved bed and sitting exercises, sitting to standing, marching on the spot or ambulation.

**Outcome Measures:** A standardized definition of adverse events was used to measure safe mobilization.

**Results:** According to the tool, 68 (97%) of potential mobilization events were considered at risk of an adverse event. Of these, the Physiotherapist disagreed with the tool in 56 (82%) occasions and proceeded to mobilize the patient. Two (4%) adverse events occurred of the 56 mobilizations events. This tool had high sensitivity (100%) in predicting an adverse event, however, its specificity (3%) was poor with 94% of mobilization events a false positive for an adverse outcome.

**Conclusion:** The Stiller and Phillips tool did not have adequate specificity in predicting intensive care patients who were safe to mobilize. In the absence of a senior Physiotherapist, this tool did not assist decision making and had poor clinical utility for junior Physiotherapists. This study supports further investigation into developing a more specific screening tool for Physiotherapists to use in intensive care prior to mobilizing patients.

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### The safety and feasibility of exercise rehabilitation in intensive care

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**Question:** Is exercise safe and feasible in patients who are critically ill?

**Design:** Prospective observational study.

**Participants:** Seventy-four patients, who had an intensive care unit (ICU) length of stay of five or more days and who, as part of a prospective randomised controlled trial, were randomised to the exercise arm of the study. Participants, who were considered safe to exercise according to pre-defined criteria, commenced a standardised exercise protocol.

**Outcome measurement:** Number of exercise sessions delivered compared to the total available sessions, the number of sessions when patients did not meet the pre-determined safety criteria, the number of adverse events that occurred.

**Results:** Out of a total of 699 exercise sessions, intervention was delivered on 590 occasions (84%) with the remaining 109 (16%) patients declining to participate predominantly due to fatigue. A further 286 sessions were not completed due to patients temporarily not meeting safety criteria to exercise most frequently cardiovascular reasons. A further 81 sessions were missed due to patients being unavailable because of medical procedures that were performed both in and outside of the ICU. On 35 (5%) occasions patients were not able to complete greater than 10 minutes of their 15 minute exercise session. No adverse events occurred.

**Conclusion:** This is the first study in Australia to report the safety and feasibility of exercise rehabilitation for patients who are critically ill. The results show that a protocolised exercise intervention that adheres to strict safety protocols is both safe and feasible in critically ill patients.

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### A Physical Function Test For Use In The ICU: Scoring, Validity And Responsiveness Of The PFIT

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**Question:** The aim of this research was to improve the utility of the physical function in ICU test (PFIT) by scoring the test and assessing the responsiveness and validity of the scored PFIT.

**Method:** This nested study within a larger randomized trial administered the PFIT at intensive care (ICU) recruitment, then at ICU discharge. Using principal component analysis the PFIT components were modified. Rasch analysis, based on item response theory, was used to investigate the unidimensionality of the PFIT and create an interval score between 0–10. Validity was analyzed using correlations with the 6-minute walk test, the timed up and go test and the Medical Research Council (MRC) score. Predictive utility was analysed using regression. The effect size index was used to calculate responsiveness.

**Results:** 150 participants were included (median(IQR) age 62(50-75), 63% male; median APACHE II 19(16-23); median ICU length of stay 7(6-11) days). Overall fit to the Rasch model was achieved. There was a 22% ceiling effect at ICU discharge. Concurrent validity was present between discharge PFIT with the timed up and go test ( $r = -0.60$ ), the six-minute walk test ( $r = 0.41$ ) and the MRC ( $\rho = 0.49$ ). The effect size index was large at 0.82. Increased baseline PFIT score predicted discharge home (OR=1.20); increased MRC (OR=1.28); length of acute stay ( $\beta = 2.1$ ,  $p < 0.001$ ) but not mortality.

**Conclusion:** The PFIT provides a responsive and valid test of physical function that is appropriate to use in ICU. Performance on the initial PFIT may predict aspects of hospital resource use.

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### Modest changes in muscle strength are required to overcome individual variability, when measured with dynamometry, in survivors of a critical illness

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**Questions:** What is the standard error of measurement and minimal detectable difference in peripheral muscle strength, in survivors of a critical illness? What is the relationship between strength measured with dynamometry and the medical research council (MRC) scale?

**Design:** Prospective observational, with repeated measures made two days apart.

**Participants:** Seventeen survivors of a critical illness (10 males, median age 78 years [range 30-87]) and twelve healthy controls (six males, age 55 years [24–71]).

**Outcome measures:** Bilateral isometric hand grip, elbow flexion and knee extension forces measured with both portable dynamometry in modified recumbent positions, and, the MRC scale.

**Results:** Changes of at least 20.8[57.8]%, 18.5[51.2]% and 19.5[54.0]% may be required in right grip, elbow flexion and knee extension, to reflect real force changes in survivors of a critical illness. Furthermore, changes of at least 35.5[98.5]%, 39.5[109.6]% and 17.1[47.3]% may be required in the respective left sided tests. The higher MRC grades encompassed a large range of force values, in this critically ill sample. Due to the overlap of forces measured within grades 4 and 5, it was not possible to establish a cut-off force to objectively differentiate these grades.

**Conclusion:** There was generally lower individual variability in the right sided dynamometry tests compared to the left, across both samples. However, modest improvements in strength would be required to be confident that true changes have occurred, on repeated testing of critically ill survivors. Despite this, dynamometry may still be more sensitive to change than the upper end of the MRC scale.



## Health Related Quality of Life Assessment in an Australian Intensive Care Unit: Patient and proxy responses over a 12 month period

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**Question:** Do patient and proxy decision makers differ when rating health related quality of life (HRQoL) using two different health status measures prior to and up to 12 months following intensive care (ICU) discharge.

**Method:** Nested observational study within a larger randomized trial administered the Short Form 36 Version 2 (SF 36v2) and Assessment of Quality of Life (AQoL) instruments at four time points: recruitment on day five after ICU admission, 3, 6 and 12 months to both patients and their proxy decision maker.

**Results:** Ninety-eight patients (62 male), mean (SD) age 59±15, median (IQR) APACHE II 18 (15-21) and ICU length of stay 7 (5-8) days were included. For the SF36, proxies underestimated patient scores in all domains at recruitment, but by 6 and 12 months the differences were smaller (SF36 physical component score  $F = 0.58$ ,  $p = 0.63$ ). For the AQoL utility score there were no significant differences at recruitment but clinically and statistically significant differences at 3, 6 and 12 months. At 3 months Bland Altman plots demonstrated that proxies underestimated the patient's mean AQoL utility scores by 0.09 with 95% limits of agreement between an underestimation of 0.17 and an overestimation of 0.35. There was generally good agreement between patient and proxy for both instruments with intra class correlation coefficients ranging from 0.73 to 0.96, with improvement following the recruitment time point.

**Conclusion:** Proxy respondents can reliably assess most domains of HRQoL but systematically underestimate, particularly at recruitment for SF36 and later time points for AQoL.

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## Airway clearance techniques in chronic obstructive pulmonary disease: a Cochrane review

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**Question:** Are airway clearance techniques (ACTs) safe and effective in individuals with chronic obstructive pulmonary disease (COPD)?

**Design:** Cochrane systematic review with meta-analysis of randomised controlled and crossover trials.

**Participants:** Individuals with acute or stable COPD. **Intervention:** ACTs compared to a no-treatment control.

**Outcome measures:** Primary outcomes were exacerbations, hospitalisations and quality of life. Secondary outcomes included pulmonary function, gas exchange, sputum clearance, symptoms and mortality.

**Results:** 37 studies (13 acute, 24 stable COPD) of 945 participants were included in the review, of which 19 had suitable data for quantitative analysis. Meta-analyses were limited by the infrequent utilisation of the primary outcomes, clinical heterogeneity and poor study quality. ACT use during acute exacerbations of COPD was associated with a reduced need for assisted ventilation (OR 0.21, 95% CI 0.05 to 0.85), reduced duration of assisted ventilation (mean difference -2.05 days, 95% CI -2.60 to -1.51) and reduced hospital length of stay (mean difference -0.75 days, 95% CI -1.38 to -0.11). In stable COPD, some beneficial effects on hospitalisations and quality

of life were reported by single studies. Trends in favour of improved outcomes were apparent for ACTs utilising positive expiratory pressure compared to other ACTs. There was minimal evidence of adverse events due to ACTs.

**Conclusion:** ACTs are safe and may reduce the need for and duration of assisted ventilation and hospital length of stay during acute exacerbations. Their overall clinical impact in COPD, however, appears low. Additional high quality studies in both acute and stable COPD are indicated.

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## Airway clearance techniques in acute exacerbations of chronic obstructive pulmonary disease: a survey of Australian physiotherapists

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**Question:** What is current practice and opinion of airway clearance techniques (ACTs) amongst Australian physiotherapists for patients with acute exacerbations of chronic obstructive pulmonary disease (AECOPDs)?

**Design:** Paper-based surveys administered to all Australian 'large' and 'principal referral' public hospitals (identified via a Government health report).

**Participants:** Physiotherapists who usually treat patients admitted with an AECOPD. **Outcome measures:** Rate of ACT prescription; perception of ACT indications, aims, importance and effectiveness; factors influencing ACT choice; and knowledge of the ACT literature.

**Results:** 91/112 hospitals (response rate 81%) yielded 189 surveys for analysis. Most physiotherapists (65%) prescribed ACTs for 60–100% of patients with AECOPDs. The most frequently prescribed ACTs were physical exercise (89%), the forced expiratory technique (81%) and the active cycle of breathing technique (79%), and most were rated highly effective. The main influences on ACT choice were precautions/contraindications to individual techniques (78%) and the degree of dyspnoea (72%). ACTs were prescribed to clear sputum (94%) and enhance patients' recovery from AECOPDs (68%). 73% of physiotherapists perceived ACTs to be fairly or very important to the overall management of AECOPDs. Understanding of the evidence for ACTs in AECOPDs was mixed, with 43% citing it as supportive, 30% inconclusive and 19% unsure.

**Conclusion:** Australian physiotherapists frequently prescribe ACTs for patients with AECOPDs and perceive their role to be important. Physical exercise is the most frequently used modality to achieve airway clearance.

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## Positive Expiratory Pressure (PEP) therapy: a survey of current physiotherapy clinical practice in New South Wales

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**Question:** How is PEP therapy currently practiced by physiotherapists in New South Wales public hospitals.

**Design:** A cross-sectional, observational design using a custom designed anonymous written survey. Ethics approval from the University of Newcastle HREC.

**Participants:** A list of all physiotherapy departments in NSW public hospitals was collated from publicly available listings (n=175). A senior physiotherapist from each site was invited to participate.

**Outcome measures:** As there was no published or validated survey instrument, a questionnaire was custom designed for the study. The questionnaire contained 35 questions in four sections: demographics, clinical use of PEP therapy, equipment used and background rationale.

**Results:** The response rate was 60% (n=89). Sixty eight (76%) respondents reported using PEP therapy in their clinical practice. Patients with medical respiratory conditions were the group most commonly treated with PEP therapy (n=59, 87%). Parameters for prescription of PEP therapy were variable, manometer use was uncommon and PEP was frequently used in combination with other treatment techniques. Non-commercial devices (n=63, 93%) were used more often than commercial devices (n=27, 40%). The most commonly used non-commercial device was bubble PEP (n=61, 90%). The process and equipment used for the construction of bubble PEP devices was variable. The most influential factor in a physiotherapist's choice to use PEP therapy was personal experience (n=42, 61%).

**Conclusion:** Positive Expiratory Pressure therapy was commonly used by physiotherapists in NSW in the management of cardiorespiratory patients. Non-commercial PEP devices were frequently used and the equipment and manufacture of these devices was variable.

## 373

### Implementing an exercise program with inpatients during an acute exacerbation of chronic obstructive pulmonary disease (COPD) is safe and feasible

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Nicholas F Taylor, Eastern Health - La Trobe University

**Question:** Is it safe and feasible to implement an exercise program for patients admitted to hospital with an acute exacerbation of COPD?

**Design:** A phase I exploratory, randomised controlled trial with allocation concealment and blinded assessor.

**Participants:** Thirty-two participants admitted to hospital with an acute exacerbation of COPD.

**Intervention:** Participants were randomly allocated to: low intensity exercise group (40%), moderate to high intensity exercise group (70%), or a routine physiotherapy control group. The exercise program consisted of two 15-minute aerobic and strength training exercise sessions conducted daily by a physiotherapist.

**Outcomes measures:** Primary outcome measures were number and classification of adverse events, and adherence. Secondary outcome measures included the 3 minute walk distance and length of stay.

**Results:** Six participants had 13 minor adverse events (40% n=3, 70% n=1, and control n=2) of short term heart rate increase or oxygen saturation reduction. There were no major adverse events that resulted in a withdrawal from the allocated intervention. Percentage of scheduled sessions completed were: 40% group = 78%, 70% group = 71%, and control group = 90%. The observed difference in adherence between the control and the 70% group (Mean difference 19%, 95% CI -0.7% to 40.0%) was not significant. There were no significant between group differences in 3 minute walk distance at discharge, or length of stay.

**Conclusion:** There is preliminary evidence that it is safe and feasible to conduct an exercise program for patients admitted to hospital with an acute exacerbation of COPD.

**Trial registration:** ACTRN12608000605392.

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### Rapid response teams and physiotherapy - a new member of the team?

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**Background:** Ensuring patients who deteriorate in hospitals receive appropriate and timely care is a key safety and quality challenge identified by the Australian Commission on Safety and Quality in Health Care. Mortality rates of patient admissions from wards to ICU are higher than admissions from emergency departments or operating theatres, suggesting that ward patients are not receiving optimal care prior to an ICU admission. Along with Emergency

Response Teams, ICU Liaison services are methods of responding to clinical deterioration.

**Objectives:** To review the indications for and referral rates to Physiotherapy in acutely deteriorating ward patients at a major metropolitan public hospital.

**Method and results:** ICU Liaison caseload review showed 40% of cases involved respiratory problems, top interventions being O2 therapy and suctioning. Ward areas of highest usage were general surgical and respiratory, with 20% of referrals resulting in ICU admission. ICU Liaison caseload history audit showed 50% of patients presented with significant respiratory compromise, including CXR changes, sputum retention and poor oxygenation. 50% of these patients had not been appropriately referred to Physiotherapy.

**Conclusions:** Results indicate a significant proportion of the ICU Liaison caseload have indications for high priority physiotherapy intervention. There is a need for appropriate referral processes to and guidelines for physiotherapy for deteriorating patients. Rapid response teams should be encouraged to use the knowledge and skills of Physiotherapists. Future exploration of Physiotherapists as members of rapid response teams is warranted.

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### Paediatric ambulatory cystic fibrosis physiotherapy: a new service to South Australia

Wee-Ren Kong, Department of Physiotherapy, Women's and Children's Hospital, Adelaide

Angela Potter, Department of Physiotherapy, Women's and Children's Hospital, Adelaide

**Question:** What is the effect of a 12 month intensive ambulatory physiotherapy service for patients with cystic fibrosis on number of admissions and occupied bed days for pulmonary exacerbations, lung function, aerobic fitness and health related quality of life?

**Design:** Clinical trial.

**Participants:** Nine patients (eight female) with a high frequency of admissions in 2010, under the care of the paediatric cystic fibrosis team.

**Intervention:** Commencing January 2011, participants were offered outpatient physiotherapy appointments every one to three weeks including personalised airway clearance techniques, nebulised osmolytic agents, aerobic and anaerobic exercise, and education.

**Outcome measures:** Number of admissions and occupied bed days, percentage of predicted forced expiratory volume in one second, maximum oxygen uptake calculated from the modified shuttle walk test and the Cystic Fibrosis Questionnaire - revised.

**Results:** Mean age of patients at commencement was 9.5±3.9 years. In 2010, patients averaged 3.8±1.1 admissions, 40.6±21.5 occupied bed days and 97.6%±12.6% of predicted forced expiratory volume in one second. Six months of data has been collected for 2011. In the first six months, patients averaged 1.1±0.6 admissions, 7.9±9.4 occupied bed days and 96.3%±13.6% of predicted forced expiratory volume in one second. Data shows a change of 31m±163m in the modified shuttle walk test (p = 0.6) and 0.9±4.7ml/min/kg maximum oxygen uptake (p = 0.6) after six months. Patients averaged 67.8±13.7 on the Cystic Fibrosis Questionnaire on commencement of the trial.

**Conclusion:** Based on 6 month data, the ambulatory physiotherapy service may result in a significant reduction in admissions and occupied bed days.

**Note:** The Paediatric Ambulatory Cystic Fibrosis Physiotherapy Service is funded by the GP Plus Health Care Strategy - a SA Health Initiative. The study was approved by the Children, Youth and Women's Health Service Human Research Ethics Committee.

## 376

### Timing of physiotherapy for airway clearance in relation to dornase alfa inhalation in people with cystic fibrosis: a systematic review

Ruth L Dentice, University of Sydney

Mark R Elkins, University of Sydney

**Question:** Does the administration of physiotherapy for airway clearance before versus after dornase alfa (DNase) inhalation affect clinical outcomes in people with cystic fibrosis?

**Design:** Systematic review with meta-analysis of randomised and quasi-randomised trials, identified with electronic searches of the Cochrane Central Register of Clinical Trials (CENTRAL) and the Physiotherapy Evidence Database (PEDro), and with hand searches of relevant conference proceedings.

**Participants:** People with cystic fibrosis. **Intervention:** Timing of physiotherapy before vs after DNase inhalation.

**Outcome Measures:** FEV1, FVC, quality of life and symptom scores were the primary outcomes. Secondary outcomes were sputum clearance, exercise capacity, mortality, other lung function measures, exacerbations, adherence and adverse events.

**Results:** The searches identified 87 trials, of which 4 trials (involving 103 participants) met our inclusion criteria. All 4 studies used a cross-over design. Intervention periods ranged from 2 to 8 weeks. Administering airway clearance physiotherapy before versus after DNase inhalation did not change FEV1 (mean difference -0.03 litres, 95% CI -0.08 to 0.03). Similarly, FVC, quality of life and symptom scores were not significantly affected. Only one secondary outcome, MEF25, was significantly higher with physiotherapy after DNase inhalation (mean difference 0.17 litres, 95% CI 0.05 to 0.28).

**Conclusion:** FEV1 and FVC are not affected by the timing of airway clearance physiotherapy with respect to DNase inhalation. Although one secondary measure of lung function was affected by the timing, this did not cause significant changes in quality of life and symptoms.

## 377

### The Cough Assist® device positively impacts on quality of life in children with neuromuscular disorders and their families: A qualitative study

Kate E Drew, Royal Perth Hospital

Vivienne Travlos, School of Physiotherapy, The University of Notre Dame Australia

Shane Patman, School of Physiotherapy, The University of Notre Dame Australia

**Question:** How does the Cough Assist® device impact on quality of life for children and their families living with neuromuscular disorders?

**Design:** Qualitative case study.

**Participants:** Three children aged between six and eight years old with neuromuscular disorders and weak respiratory muscles, their parents and their current physiotherapist.

**Outcome Measures:** Data from nine semi-structured interviews was analysed according to the principles of thematic content analysis.

**Results:** Interview responses suggest that neuromuscular disorders affect the lives of both the child and their parents over several domains, with the most notable effects on social and emotional quality of life. The Cough Assist® device has perceived physical benefits for the user, as well as positive implications for their social, emotional and physical quality of life, and that of their family. However, poor adherence was identified as the major barrier to effective use of the Cough Assist® device, and was governed by factors such as child resistance, time constraints, treatment preference, practitioner support and fear of pressure trauma.

**Conclusion:** The Cough Assist® device has perceived benefits for both respiratory function and quality of life in this cohort. However barriers to adherence must be identified and addressed for the device to be considered an effective adjunct to respiratory management.

## 378

### Clinical skill performance – the effect of video self modelling and reflection

Stephen Maloney, Physiotherapy Department, Monash University

Prue Morgan, Physiotherapy Department, Monash University

Michael Storr, Physiotherapy Department, Monash University

**Question:** What is the impact on undergraduate clinical performance of supplementing practical skill tutoring with video self-modelling and guided reflection?

**Design:** Randomised controlled cross-over trial.

**Participants:** Year 3 pre-clinical physiotherapy students (n=60).

**Intervention:** Students were randomly divided into two groups. Both groups were exposed to four skills (Skills A-D) taught via practical class delivery. Students in Group 1 supplemented practical skill A (education for pregnancy-related lumbar pain) with video self-modelling, electronically submitted for remote tutor review, and completed guided reflection of self-performance. Group 2 supplemented skill C (cervical spine assessment) with the same video self-modelling task. Students then completed a formative practical examination of both skills (A and C) and post-exam questionnaire.

**Outcome measures:** The primary outcome was examination score. Secondary outcome was level of agreement (5-point Likert scale) to statements about experiences with video skills tasks and exam.

**Results:** Mean exam score for Skill A performance was non-significantly higher for Group 1, whose regular tutoring for skill A was supplemented with video self-modelling and guided feedback (mean (sd) Group 1; 19.78 (4.36), Group 2; 17.26 (6.27),  $p = 0.09$ ). Mean exam score for Skill C performance was significantly higher for Group 2 (mean (sd) Group 1; 18.96 (3.95), Group 2; 21.22 (4.24),  $p = 0.048$ ), whose regular practical class tutoring was supplemented with video self-modelling and guided feedback. Sixty-seven percent of students reported more confidence with the examination skill for which they had completed the video self-modelling activity.

**Conclusion:** Video self-modelling with structured reflection may improve clinical skill performance.

## 379

### Finding ways to facilitate student learning in practical laboratories

Jacqui Francis-Coad, The University of Notre Dame Australia, Fremantle Campus

**Question:** What do students report facilitates their learning in practical laboratory sessions?

**Design:** Action research study.

**Participants:** Thirty two undergraduate physiotherapy students enrolled in second year gerontology laboratories.

**Intervention:** Tutor observations, minute papers and semi structured interviews were conducted over a nine week teaching period to gain the student perspective on what facilitated their learning.

**Outcome measures:** Data from the interventions were used to develop a questionnaire of items representing the construct of valued learning facilitators; these were ranked using a 5-point Likert scale.

**Results:** Valuable learning facilitators identified by students were categorised under three key headings: those provided by the tutor, those initiated by the students themselves and material resources. These were concept mapped to reveal three emergent themes: provide multiple opportunities for learning addressing all learning styles, provide formative learning support and provide resources to consolidate learning. Laboratory teaching plans were modified and a skills and behaviour checklist and expert video clips were developed for student use during the research cycle. Students ranked timely feedback from the tutor while they practiced the required skills and behaviours the highest valued learning facilitator (78.6%) followed by watching the tutor modelling the skill or behaviour required (67.9%).

**Conclusion:** Discovering what students say facilitates their learning in practical laboratories can guide successful auditing of laboratory teaching plans to modify and create new learning opportunities and resources. This has the potential to improve student satisfaction and achievement of intended learning outcomes along with teaching performance through reflection and action.

## 380

### The changing roles of physiotherapy assistants

Cherie Hearn, Princess Alexandra Hospital

Leah A Clements, Princess Alexandra Hospital

**Question:** With increasing service demands, how can physiotherapy assistant roles be utilised to enable physiotherapists more time to undertake higher complexity tasks?

**Design:** Redesign methodology was used to examine existing practices, identify opportunities to redistribute tasks and develop processes to support changes.

**Intervention:** Advanced assistant roles were implemented using on-job training, monitoring and evaluation across 10 months in spinal injuries, orthopaedics, general medicine and geriatric rehabilitation physiotherapy teams.

**Outcome Measures:** Workload data was collected and analysed for one month periods at baseline and end of the trial. Staff satisfaction was also examined.

**Results:** In all trials physiotherapist satisfaction was high (76% to 100%) regarding workload, and patient care. Physiotherapist confidence was high (>82%) regarding task delegation, assistant scope of practice, communication with and training of assistants. In the spinal injuries trial assistant:physiotherapist ratio changed from 1:4 to 1:3. For group therapy there was a 34% increase in patient attendance, 64% decrease in physiotherapist time required for the group and 29% decrease in cost per patient attendance. Additionally, overall physiotherapists increased patient contact time by 12%. In the orthopaedics trial assistant:physiotherapist ratio changed from 1:3.8 to 1:2.8. There was a 23% increase in number of patient treatments, physiotherapists increased patient contact time by 21% and a 15% reduction in cost per hour of therapy provided.

**Conclusion:** With adequate training, supervision and defined work processes, physiotherapy assistant roles can be effectively utilised to increase service productivity, decrease the relative cost of service provision and maintain high levels of staff satisfaction.

## 381

### Changes in entry-level physiotherapy students' evidence-based practice knowledge, attitudes and behaviour following exposure to EBP training

Katherine Long

Maureen McEvoy, University of South Australia

Lucy Lewis, University of South Australia

Louise Wiles, University of South Australia

Marie Williams, University of South Australia

Tim Olds, University of South Australia

**Question:** How do entry-level physiotherapy students' EBP knowledge, attitudes and behaviours change following exposure to EBP training?

**Design:** Longitudinal pre-post study.

**Participants:** Seventy-seven entry-level physiotherapy students were surveyed before and after completing EBP training courses to explore changes in self-reported EBP knowledge, attitudes and behaviours, and actual EBP knowledge.

**Outcome measures:** Two validated and reliable surveys, the Evidence-Based Practice Profile Questionnaire (EBP<sup>2</sup>) and the Knowledge of Research Evidence Competencies (K-REC) survey were used. The EBP<sup>2</sup> included self-reported domains: relevance, sympathy, terminology (knowledge), practice and confidence. The K-REC survey measured actual EBP knowledge.

**Results:** Paired t-tests and effect sizes (ES) were used to assess the change in scores after exposure to one or both EBP training courses. In the group of 77 students, completion of EBP courses resulted in significant change in all self-reported domains; relevance  $p < 0.001$  (ES = 0.57), sympathy  $p = 0.005$  (ES = 0.31), terminology  $p < 0.001$  (ES = 1.08), practice  $p < 0.001$  (ES = 1.40), and confidence  $p < 0.001$  (ES = 0.90), and also actual knowledge  $p < 0.001$  (ES = 1.14).

**Conclusion:** Completion of entry-level EBP courses resulted in significant improvement in participants' knowledge (self-reported and actual), attitudes, and behaviours with large effect sizes in all outcomes. The findings allow identification of the size of change likely to result from current EBP courses. This provides a basis for measuring the effect of modifications to EBP courses and for future EBP training interventions.

## 382

### A description of physiotherapy student neurological clinical placements

Wendy Chesworth, University of Canberra

**Questions:** What do physiotherapy students see and do on a typical neurological placement? How many and what type of clients do they see? How does this compare to other placements? What are the most common conditions seen?

**Design:** Prospective, observational study.

**Participants:** 45 GEM students enrolled in a Master of Physiotherapy at the University of Canberra.

**Intervention:** Students completed a 36 criteria log required by the University for all clients seen during each placement.

**Outcome measures:** Client demographics, presentation, number and student role.

**Results:** Students saw 26.5 (95% CI 21.5 to 31.6) clients over a four week placement. This was less than other placements (mean 59, 95% CI 52.8 to 65.2 clients). Students managed 56.9% of all clients seen, assisted 37.7% and observed/discussed 5.4%. 41% of clients were seen once. Repeat sessions averaged seven in number. 55.2% of clients were male. 47% of clients were aged 66 to 80 years and 11% were > 80 years. 8.9% of clients had mental health issues, compared with 3% for cardio-respiratory and orthopaedic placements. 11.5% of clients spoke English as a second language. The most conditions were stroke (65%), mobility assessments (8%) and Parkinson's disease (5%).

**Conclusion:** This study quantifies a physiotherapy student's typical neurological placement. Stroke and mental health issues are a feature of this placement. Students can expect to see fewer clients, undertake more repeat treatments, and will have more of a managing or assisting role than other placements. This information is useful for those involved in supervising physiotherapy students.

### Patients' perceptions of consultations undertaken by physiotherapy undergraduate students

Fiona Kent, Peninsula Health, Monash University

Elizabeth Molloy, Monash University

**Questions:** What are patients' perceptions of care undertaken by undergraduate physiotherapy students? How does clinical education of physiotherapy students affect patient care, as perceived by patients?

**Design:** A mixed methodology design was conducted, collecting both quantitative and qualitative patient data about student-led consultations. Thematic analysis of qualitative data was undertaken. Purposeful sampling of patients by questionnaire was facilitated by a Research Assistant.

**Participants:** Eighty one patients who had been treated by 16 third or fourth year physiotherapy students across core rotations of musculoskeletal, neurology and cardiothoracic were investigated.

**Outcome measures:** A five point (0–4) scale rated the physiotherapy students' skills in relation to communication, assessment, treatment and education. The patient assessment tool also contained open ended questions to identify perceived benefits and limitations to student consultations.

**Results:** Mean patient rating for student communication, assessment, treatment and education was 3.09, 2.96, 3.01 and 2.95 respectively. The majority of patients reported positively on all aspects of student-led care, a key benefit being the altruistic opportunity to support student learning. Qualitative data revealed that student consultations may be longer and more enthusiastic and 27/81 (33%) of patients reported learning more about their condition when listening to the educator and student talking.

**Conclusion:** Consultations undertaken by physiotherapy students tend to be well regarded by the patients involved. Many patients who consent to clinical education want to support student learning. Students should be informed of the support patients have for their learning and patients should be informed of the potential benefits of a student-led consultation.

### Interprofessional learning in physiotherapy: how early is too early?

Jennifer M Murphy, Australian Catholic University

Meg Stuart, Australian Catholic University

**Objective:** Interprofessional learning is recognised as an important component of health sciences education, preparing graduates to work in teams and practice collaboratively to improve the quality of care delivery. Physiotherapy students undertake four foundation biological and behavioural sciences units with other students of the Health Sciences Faculty (nursing, midwifery, paramedicine, exercise science). The aim of this project was to assess the value of interprofessional learning in the first year of a physiotherapy program.

**Methods:** The staff of the school of physiotherapy had input to the planning stage of these units, particularly around tailoring assessment tasks that required the students to apply foundation knowledge to physiotherapy. As part of the Australian Catholic University's ongoing quality assurance processes all students were asked to complete a Learning and Teaching Evaluation form at the conclusion of each unit. The form contains both closed and open ended questions; students rank closed ended statements on a Likert scale. Students indicate their professional group to allow profession specific analysis.

**Results:** In 2010 and 2011 physiotherapy students formed approximately 10% of the student cohort of interprofessional units. Average response rate for physiotherapy students was 63%. In general physiotherapy students enjoyed the interaction with other students in these units. However, they were less likely to value the experience of learning in these units compared to professional specific units.

**Conclusion:** The challenges of interprofessional learning in foundation units arise from disparate entry scores of commencing students and the complexities of choosing examples and applications that have relevance across multiple professions.

### Enhancing positive attitudes towards neurological disability – evaluation of an integrated physiotherapy program

Prue E Morgan, Monash University, Frankston

Kristin Lo, Monash University, Frankston

**Question:** Can attitudes towards acquired and/or developmental neurological disability in second year undergraduate physiotherapy students be enhanced by an on-campus integrated curriculum package?

**Design:** Mixed methods pre test-post test study.

**Participants:** Forty seven second year (pre clinical) physiotherapy students.

**Intervention:** Year 2 students participated in a twelve week integrated curriculum focused on optimising attitudes towards people with acquired or developmental neurological disability.

**Outcome measures:** Factor 1 subscale of the Interaction with Disabled Persons (IDP) scale, rated on a six point Likert scale ('strongly disagree' [1] through to 'strongly agree' [6]), applied prior to and at completion of the twelve week program. Higher scores are reflective of greater discomfort. Quantitative data was supplemented with qualitative data from Year 2 reflective narratives at completion of the program to assist confidence in interpretation of results and add depth to analysis.

**Results:** The difference in mean Factor 1 Scores (paired t test) between week 1 and week 12 of Year 2 students was statistically significant ( $p = 0.002$ ) with a lower mean score at the completion of the program. Qualitative data analysis identified themes of emotional change, knowledge impact, evolving insight and awareness of aspects of a positive therapeutic relationship and critical elements of optimal client-centred approach.

**Conclusion:** Student attitudes towards people with acquired and/or developmental neurological disabilities can be enhanced through an on-campus integrated curriculum program facilitating optimal attitudes prior to clinical placements.

### Supporting students' fitness to practice in the transition to clinical practice

Kristin J Lo, Monash University

Jenny Keating, Monash University

Alison Francis-Cracknell, Monash University

Stephen Maloney, Monash University

Prue E Morgan, Monash University

**Question:** Does declaring fitness to practice (FTP) assist students in transition to clinical practice? Are there any negative or positive consequences?

**Design:** Mixed methods observational study.

**Participants:** Five cohorts (two Year 3, three Year 4) of Monash University Bachelor of Physiotherapy students.

**Intervention:** After liaison with university legal staff and equity officers, students were invited to declare any self-assessed FTP issues to enable university staff to negotiate accommodations in placement arrangements and facilitate a safe and healthy transition to clinical practice.

**Outcome measures:** Number of students attending FTP meetings, results and responses to a survey about whether their needs had been adequately met.

**Results:** In 2009 and 2010 respectively 10/59 and 3/50 Year 3 students reported FTP issues. In 2009, 2010 and 2011 the corresponding Year 4 data were 2/56, 17/64 and 9/52. Each student corresponded with university staff and proactive support strategies addressing student concerns were put in place prior to commencing clinical placements. Twelve students responded to the survey, all indicating that their needs had been adequately met and offering positive responses about the supportive nature of the university staff. Based on the 2009 and 2010 results, 2/25 students that attended FTP meetings failed a unit versus 11/145 who did not attend.

**Conclusion:** Despite university concerns regarding the invasive nature of the invitation to declare potential FTP issues, this initiative enabled students to seek support and devise plans to facilitate

their transition to clinical practice. There were many positive and no apparent negative consequences to this initiative.

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### Can mid-semester examinations predict outcomes of final examinations when mature adult learners participate in different modes of on-line learning?

Nancy L Low Choy, Bond University

Michael Pahoff, Bond University

Nikki Milne, Bond University

Mary Lynch, Australian Catholic University

Michael Steele, Bond University

**Question:** Do mid-semester exams predict outcomes at the end of semester when traditional online learning curricula or web based problem based learning (PBL) with tutorial support was undertaken by physiotherapists returning to the work-force?

**Design:** A prospective observational study.

**Participants:** Sixteen physiotherapists (15 female; 1 male), working less than two days each week were recruited and randomized into two models of on-line learning.

**Intervention:** Musculoskeletal (MS) and Neurological (Neuro) Physiotherapy were two subjects delivered across two semesters. An Objective Structured Clinical Examination with written and practical stations with/without standardized patients was undertaken at mid and end of semester.

**Outcome Measure:** Examination results from these subjects were used to explore associations between mid, end-semester exams and final results.

**Results:** Scores at mid semester (MS:  $r=.897$ ,  $p=0.000$ ; Neuro:  $r=.724$ ,  $p=0.002$ ) and end semester (MS:  $r=.958$ ,  $p=0.000$ ; Neuro:  $r=.854$ ,  $p<0.000$ ) were highly associated with the final result. For MS physiotherapy, interpretative questions at mid-semester were highly associated with the final score ( $r=.807$ ,  $p=0.000$ ) more than procedural questions (history taken and physical assessment:  $r=.193-.403$ ;  $p>0.05$ ). For neurological physiotherapy, stations involving clinical decisions (handling/transfers/balance) better predicted final results ( $r=.541$ ;  $p=0.031$ ) than stations examining techniques or outcome measures ( $r=.190-.445$ ;  $p>0.05$ ). Stations with standardized patients (end semester exam) were highly associated with the final result ( $r=.830<0.000$ ).

**Conclusion:** Interpretative questions modeled on case studies with clinical decisions at mid-semester were highly associated with the final examination result and predicted outcomes for mature aged learners ready to return to, or increase participation, in the work-force.

## 388

### Do outcomes differ for physiotherapists returning to the workforce when learning is delivered via two different online models?

Michael Pahoff, Bond University

Nancy Low Choy, Bond University

Christine Tom, Bond University

**Design:** Prospective observational study.

**Participants:** Sixteen registered physiotherapists (15 female; 1 male) who were not practicing or working less than two days each week (26.7 +/- years since graduation) were randomised into two learning groups: eight registered physiotherapists participated in a PBL model (PBL Group) delivered through desktop videoconferencing (DVC) and resource sessions, and eight registered physiotherapists participated in flexible delivery (online learning) model with DVD case studies to illustrate content (Online Group).

**Intervention:** Four subjects (Evidence Based Practice (EBP), Musculoskeletal (MS), Cardiorespiratory (CR) and Neuromotor (NM) Physiotherapy Practice) were delivered across two, 12 week semesters with on-campus mid and end semester exams.

**Outcome Measure:** Examination results across four subjects and degree of satisfaction with coursework and the mode of delivery were explored.

**Results:** Between group mean scores for each subject were not significantly different ( $p > 0.05$ ). A repeated measure ANOVA showed the final mean score for neurological physiotherapy was significantly lower than other subjects (Mean difference 7.013-10.638 marks;  $p<0.01$ ). A higher proportion of the PBL Group (77.8%) was very or extremely satisfied with their coursework compared to 50% of the Online Group. Some participants were somewhat satisfied (PBL Group: 22.5%; Online Group: 50%) but none were dissatisfied.

**Conclusion:** Online delivery yielded successful outcomes irrespective of mode of delivery. Level of satisfaction was highest when support for learning was provided.

## 389

### 'Just walking, no physio': Why Older People with Limited English Proficiency Undervalue Their Physiotherapy after Stroke

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Shylie Mackintosh, School of Health Sciences, University of South Australia, Adelaide

Mandy Stanley, School of Health Sciences, University of South Australia, Adelaide

Jonathan Crichton, School of Communication, International Studies and Languages, University of South Australia, Adelaide

**Question:** How do older people with limited English proficiency experience their physiotherapy after stroke?

**Design:** Qualitative study using a constructivist grounded theory approach.

**Participants:** 13 older people with limited English proficiency and one English proficient older person who had returned home after stroke and 8 informal carers from 7 language groups.

**Methods:** Fourteen in-depth interviews were conducted approximately 6 weeks after the older person was discharged from inpatient care, and 10 follow-up interviews were conducted 12 weeks later. Professional interpreters assisted with 19 interviews.

**Results:** Participants experienced their physiotherapy care after stroke as an imposed model of 'being told and tested'. Participants trusted physiotherapists as experts in stroke care with responsibility for helping them to regain familiar abilities and return home; and so chose to follow instructions without questioning. They perceived physiotherapy as simple activities or walking instructed by simple commands. However, the model of 'being told' left participants with little information to determine the relevance of physiotherapy to their own personal goals. This resulted in participants undervaluing their physiotherapy and choosing not to continue treatment unless they observed an obvious functional benefit from therapy.

**Conclusion:** Older people with limited English proficiency need to be involved in directing their physiotherapy after stroke so they can see the value of their therapy in order to engage with it. This will require that physiotherapists achieve two-way communication with older people with limited English proficiency by regularly using language assistants during therapy after stroke.

## 390

### Biofeedback improves activities of the lower limb after stroke: a systematic review

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Louise Ada, University of Sydney

Catherine M Dean

Elisabeth Preston, University of Sydney and University of Canberra

**Question:** Is biofeedback during the practice of lower limb activities after stroke effective in improving those activities, and are any benefits maintained after intervention ceases?

**Design:** Systematic review with meta-analysis of randomised trials.

**Participants:** People who have had a stroke.

**Intervention:** Biofeedback during practice of sitting, standing up, standing or walking.

**Outcome measures:** Continuous measures of activity congruent with the activity trained.

**Results:** Twenty two trials met the inclusion criteria and 19 contained data suitable for analysis. Effect sizes were calculated as standardised mean differences since different outcome measures were used. Since inclusion of all trials produced substantial statistical heterogeneity, only trials with a PEDro score > 4 (11 trials) were included in the final analysis (mean PEDro score 5.7). In the short-term, biofeedback improved lower limb activities compared with usual therapy/placebo (SMD = 0.49, 95% CI 0.22 to 0.75). Lower limb activities were still improved compared with usual therapy/placebo 1–5 months after the cessation of intervention (SMD = 0.41, 95% CI 0.06 to 0.75).

**Conclusion:** Augmenting feedback through the use of biofeedback is superior to usual therapy/placebo at improving lower limb activities in people following stroke. Furthermore, these benefits are largely maintained in the longer term. Given that many biofeedback machines are relatively inexpensive, biofeedback could be utilised more widely in clinical practice.

## 391

### How weak are people with stroke?

Simone L Dorsch, The University of Sydney

Louise Ada, The University of Sydney

Colleen G Canning, The University of Sydney

**Questions:** How weak are people with stroke and what is the distribution of this weakness?

**Design:** An observational study.

**Participants:** Thirty people over 50 years of age, more than one year post stroke and able to walk 10m independently and thirty age-matched controls.

**Outcome measures:** Strength was measured as peak isometric force in N in 12 muscles of the leg and adjusted to bodyweight.

**Results:** People with stroke were significantly weaker than normals in all muscle groups. The weakest muscle group was the ankle dorsiflexors at 33% of normal strength, followed by the hip extensors at 35%, the knee flexors at 36%, the hip adductors at 39%, the knee extensors at 41%, the hip external rotators at 49%, the hip internal rotators at 50%, the hip abductors at 51%, the hip flexors at 52%, the ankle evertors at 54% and the ankle invertors at 61%. Strength in the affected leg in the people with stroke was on average 46% of the strength of the age-matched controls and their intact leg was 64% of the age-matched controls.

**Conclusion:** The strength of the affected leg muscle groups in this group of ambulatory people with stroke was on average between one third and two thirds of normal. On the whole, the flexors were not weaker than the extensors and the distal muscles were not weaker than the proximal muscles.

## 392

### Application of Rasch Analysis to develop a shortened Acute Stroke Mobility Scale to simply measure stroke severity in an acute setting

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**Objective:** Apply Rasch Analysis to develop a shortened Acute Stroke Mobility Scale (ASMS) for simply measuring of stroke severity in acute stroke services.

**Methods:** Using ASMS data collected in 657 patients admitted with an acute stroke diagnosis to eight hospitals across Victoria, Rasch analysis was undertaken to evaluate scale construct validity in terms of unidimensionality, test item response bias and targeting to the abilities of the acute stroke sample. Redundant ASMS test items, identified by significant  $\chi^2$  probability values, and/or negative standardized fit residuals of < -2.5, were sequentially removed and analyses were re-run. Multinomial logistical regression was applied to compare the capacities of the shortened and full ASMS in correctly predicting discharge destination.

**Results:** The full ASMS was unidimensional with excellent targeting to the acute stroke sample abilities (floor effects 7.1%, ceiling effects 14.1%, Person Separation Index 0.95). No item response bias was detected. Three redundant test items were removed (Sitting from supine, Sitting to standing, and Balanced standing), and the resulting 3-item ASMS (Bridging, Balanced sitting, and Walking) remained well targeted to the acute stroke sample (floor effects 8.4%, ceiling effects 14.1%) with good capacity to differentiate between patient groups based on motor ability (Person Separation Index 0.86). Predictive validity of the scales was comparable. Discharge destination from the acute stroke setting was correctly predicted in 72.1% of patients by their shortened ASMS score, and in 71.8% of patients by their full ASMS.

**Conclusion:** The shortened ASMS demonstrates strong measurement qualities for simply measuring severity of acute stroke.

## 393

### Incidence and prediction of contractures after stroke: a prospective cohort study

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Joanna Diong, The George Institute for Global Health, University of Sydney

Rob Herbert, The George Institute for Global Health, University of Sydney

**Question:** What is the incidence of contractures six months after stroke? Can factors measured within four weeks predict change in elbow, wrist and ankle joint range six months after stroke?

**Design:** Prospective cohort study.

**Participants:** Consecutive sample of 200 people with stroke admitted to St George Hospital.

**Outcome measures:** Loss of general range of motion was measured using a 4-point ordinal contracture scale and defined as a loss of  $\leq$  one-third range of motion in major joints of the body. Loss of specific range of motion was measured using torque-controlled devices and defined as a loss of  $\geq 10^\circ$  in elbow, wrist extension and ankle dorsiflexion. Potential predictors were age, pre-morbid function, severity of stroke, muscle strength, spasticity, motor function and pain.

**Results:** Using the contracture scale, incidence of contractures varied across joints from 12 to 28%. Using torque-controlled devices, incidence of contracture was 18% (elbow extension), 18% (wrist extension) and 12% (ankle dorsiflexion). Multivariate linear regression models were developed using bootstrap variable selection methods. Muscle strength was identified in more than 80% of bootstrap samples for each model. However, models containing all variables only explained 6–20% of variance in elbow, wrist and ankle joint range ( $r^2 = 0.09$  to  $0.23$ , adjusted  $r^2 = 0.06$  to  $0.20$ ).

**Conclusion:** Incidence of contractures after stroke was 12 to 28%. Even though muscle strength was significantly correlated with change in elbow, wrist and ankle joint range, none of the models were adequate in predicting change in joint range.

## 394

### The encounter and avoidance of environmental challenges by community-dwelling individuals with Parkinson's disease when walking within the community

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Sandra G Brauer, Division of Physiotherapy, University of Queensland, St Lucia, Brisbane 4072

**Questions:** What environmental factors impact community mobility in people with Parkinson's disease? Is there a relationship between clinical gait characteristics and reported difficulty mobilizing within the community?

**Design:** Cross-sectional observational survey.

**Participants:** Fifteen community-dwelling individuals with Parkinson's disease.

**Outcome Measures:** The Environmental Aspects of Mobility Questionnaire was used to ascertain the prevalence of encounter and avoidance responses to environmental challenges during community mobility. Spatio-temporal gait parameters were recorded during single and dual task conditions using a GAITrite mat. Other measures included the Activity Specific Balance Scale (balance confidence) and Timed up and go.

**Results:** Participants frequently encountered challenges across all environmental domains. They reported avoiding walking long distances (66.7%), going out in the dark (66.7%), carrying more than two heavy items (60%) and going into crowded places (66.7%). In general, participants reporting difficulty mobilising outdoors showed a reduced step length (mean 0.44 m versus 0.58 m,  $p = 0.032$ ), velocity (mean 0.6 m/s versus 0.89 m/s,  $p = 0.013$ , during a language dual task and 0.76 m/s versus 1.15 m/s,  $p = 0.006$  during a narrow gait task) and cadence (mean 90.1 steps/minute versus 108.7 steps/minute,  $p = 0.039$ ), particularly when performing an added language task, or walking on a narrow path.

**Conclusion:** People with Parkinson's disease encounter a variety of environmental dimensions when mobilising within the community, but show avoidance of environmental challenges similar to disabled older adults. Individuals reporting mobility difficulty generally have changes in clinically measured gait outcomes during dual tasking and in challenging environments.

## 401

### Canine drop foot after Cranial Cruciate Ligament reconstruction—a case study

Paula T Davidson, All Animal Physio

Canine drop foot following Cranial Cruciate Ligament reconstruction is a rare consequence. In this case study, physiotherapy treatment was used to expedite a German Shepherd Dog's recovery from this disorder.

## 402

### Altered tissue dynamics after surgical treatment of Achilles tendon rupture. A methodology and case description 6, 18 and 32 months after surgery

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Achilles tendon rupture is a common injury as a consequence of sports- and exercise accidents. The period of rehabilitation is long (6 to 12 months) and only approximately 54% of patients will regain the same level of performance after either surgical or conservative treatment. New ultrasound techniques, can provide information about regional tissue dynamic. A 30 year old male, active runner, who had undergone surgical treatment with a primary suture, has been followed up at 6, 18 and 32 months after surgery with ultrasound registrations. In the evaluation, a speckle tracking software divides the image field of the tendon into regional segments which are compared according to displacement and deformation rate. The test person's healthy side is used as a reference. The callus in the injured side decreased in volume between the three measurements (6–18–32 months post-surgery) but the tissue dynamic within the callus were highly limited compared to the healthy side. The intra-tendinous relationship could be described as a shear strain relationship between three portions of the tendon. This pattern was characterized by larger strains in the ventral part than the dorsal part of the tendon. This strain differentiation pattern was not seen in the injured side at any time point during the follow up period. On the contrary, the three portions moved in parallel, showing hardly any internal dynamic at all. The tissue dynamics in the injured tendon shows an altered stiffer tendon and callus which may affect the calf muscle function at least 32 months after injury.

## 403

### Magnetic resonance imaging assessment of regional abdominal muscle function in elite Australian Football League players with and without low back pain

Julie A Hides, School of Physiotherapy, Australian Catholic University and Mater Back Stability Clinic

Brita K Hughes, University of Queensland, School of Health and Rehabilitation Sciences, Division of Physiotherapy & Royal Brisbane and Women

Warren R Stanton, Australian Catholic University and Mater Back Stability Clinic, Mater Health Services

Changes in the motor control of trunk muscles have been identified in people with low back pain including elite football players. Previous research has found functional differences in the anatomical regions of abdominal muscles; however, this has not been examined in football players with low back pain. The aim of this study was to investigate if the ability to draw-in the abdominal wall is altered among football players with low back pain, and to determine if there are functional differences between the middle and lower abdominal regions in participants with and without low back pain. Forty-three elite Australian Football League players were imaged using magnetic resonance imaging as they drew in their abdominal walls, and the trunk cross-sectional area was measured in relaxed and contracted states. At the lower region, participants with low back pain (1.1%) reduced their trunk cross-sectional area to a lesser extent than those without low back pain (3.2%) ( $P = 0.018$ ). The results also showed that the draw-in of the abdominal wall was smaller in Region 1 (8.8%) compared to Region 2 (16.0%) and Region 3 (19.7%) ( $P < 0.001$ ). This study provides evidence of regional differences in motor control and altered control of the lower region in participants with low back pain. This may direct physiotherapists, especially those treating athletes, to focus on the lower abdominal region in those with low back pain.



## 404

### Predicting outcome in individual and team athletes through technology based bio-psycho-social screening and repeated outcome measures

Charles P Gabel, University of the Sunshine Coast

**Question:** Can prediction of athletes' recovery time and rate for return to sport, particularly at elite levels, be facilitated through interactive web-based technology.

**Design:** Consecutive case studies.

**Participants:** Two cases, individual and team sport.

**Interventions:** Nil.

**Outcome measures:** Graphical interface charting in real time with progress extrapolation feedback from interactive software with prediction and repeated composite global outcome scores.

**Results:** Prediction of recovery was made through decision support software that reflected on statistically analysed test-case data. The integrated outcome software provided real-time status assessment within a quantifiable model. A direct comparison to the immediate past history, previous injury recovery, with subsequent direct prediction of future recovery and competition return, was provided. In both test cases the predicted recovery and actual recovery were within five percent on the time base scale (days).

**Conclusion:** The world of elite sports is demanding of time, costs and athlete life commitment. Web based interactive decision support systems provide a unique testing ground to forecast recovery time-frames for return to sport. However, technology currently plays a limited role in the measurement of the sporting individual's status and predicted recovery. This presentation demonstrates the current level of technology in this area and its future direction as it highlights the software that facilitates and quantifies this process which in turn drives the decision pathway for both rehabilitation and sporting endeavour. An integrated system with graphical representation of status ensured a common language and visual history. The system was simple and practical for the athlete and therapist.

## 405

### Prevalence of low back pain in adolescent rowers

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Angus Burnett, Department of Sports Science and Physical Education, Chinese University of Hong Kong, Hong Kong

Amity Campbell, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University

Peter O'Sullivan, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University

**Questions:** What is the prevalence of Low Back Pain (LBP) in adolescent rowers?

**Design:** Quantitative survey design.

**Participants:** One hundred and fifty-three male and 239 female adolescent rowers aged between 14 to 19 years who were competing in regular rowing regattas in Perth, Western Australia.

**Outcome measures:** Lifetime and point prevalence of LBP, self-reported factors associated with LBP onset and Visual Analogue Scale (VAS) for pain intensity.

**Results:** Lifetime prevalence of LBP was significantly higher in males 93.0% than females 63.1% ( $p < 0.001$ ). Point prevalence was also higher in males 72.2% than females 45.8% ( $p = 0.001$ ). The males mean VAS at the time of completing the questionnaire was significantly less 4.1 (2.3) than females 5.0 (2.0) ( $p < 0.001$ ). Those rowers able to recall the provocative behaviours associated with their first incidence of LBP listed rowing activities such as ergometer rowing, lifting the boats and increased training load.

**Conclusion:** Male and female adolescent rowers are at significant risk of LBP. This pain is typically of moderate intensity when they train or row, suggesting continued training and competition in the presence of pain. Furthermore, mechanical factors such as rowing posture and sudden change in training intensity are factors in the initial onset of LBP. The LBP prevalence reported in boys is higher than in female adolescent rowers suggesting gender related risk factors. Further research should be directed toward identifying the mechanisms associated with LBP in this population and structuring interventions to manage this condition.

## 406

### Size and symmetry of the hip abductor muscles in elite Australian football league players during the season

Christopher Newman, The University of Queensland

M Dilani Mendis, Australian Catholic University

Warren R Stanton, Australian Catholic University

Julie A Hides, Australian Catholic University

**Objective:** To examine size and symmetry of the gluteus minimus and gluteus medius muscles and their relationship to injury during a football season.

**Methods:** Magnetic resonance imaging was used to examine 46 elite male football players at the start and end of a playing season. Muscle cross-sectional area of the gluteus minimus and gluteus medius muscles was measured on the kicking leg and the support leg. Injury data was collected from club records.

**Results:** Both muscles increased in cross-sectional area by the end of season ( $p < 0.001$ ). Gluteus minimus muscle size was significantly larger on the support leg ( $p < 0.001$ ) throughout the season, however, no asymmetry in gluteus medius muscle size was seen over the playing season ( $p > 0.05$ ). By the end of season all players with and without injury had developed asymmetry in gluteus minimus muscle size.

**Conclusion:** Hip abductor muscle size increases over a playing season, however, muscle asymmetry exists in the deeper hip abductor musculature in elite football players. These changes in muscle size may reflect adaptations to the demands of playing football and may be influenced by a muscle's specific functional role. These findings may be useful in injury prevention measures and the development of rehabilitation programs for elite football players.

## 407

### The reliability of measuring quality of performance on the single leg squat task in active post-pubescent females

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Kay M Crossley, University of Melbourne

Sallie Cowan, University of Melbourne

Natalie Collins, University of Melbourne

**Question:** Can the quality of performance on the single leg squat task, as an indicator of neuromuscular control, be measured reliably in active post-pubescent females?

**Design:** Cross-sectional study.

**Participants:** Thirteen active post-pubescent females (four with patellofemoral pain, nine asymptomatic controls; age 14.8±0.9).

**Outcome measures:** Two experienced physiotherapists measured lower limb alignment angles on two occasions using Silicon Coach Pro photo editing software. Frontal plane projection angle was measured in standing (FPPA-st) and at 60° knee flexion during a single leg squat (FPPA-sq) as an indicator of hip internal rotation and adduction and knee valgus. Frontal plane hip angle (FPHA) was also measured at 60° knee flexion as indicator of pelvis and hip control.

**Results:** All measures had very high to almost perfect intra-rater reliability (FPPA-st: ICC 0.96-0.99; FPPA-sq: 0.96-0.97; FPHA: 0.74-0.9) and inter-rater reliability (FPPA-st: 0.93-0.94; FPPA-sq: 0.94-0.98; FPHA: 0.74-0.85) reliability, although lower correlations were seen for the FPHA measure.

**Conclusion:** FPPA-st, FPPA-sq and FPHA are reliable measures when used in active post-pubescent females with and without patellofemoral pain. Although further studies are required to determine validity and responsiveness, physiotherapists can confidently utilise these measures in the clinical assessment of neuromotor control in young active females.

## 408

### Changes in Cerebral Oxygenation during Tai Chi and Qigong

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Hector WH Tsang, Center for East-meets-West in Rehabilitation Sciences, The Hong Kong Polytechnic University, Hong Kong

**Questions:** Mental activities could be reflected by changes in cerebral blood flow. Body movements during Tai Chi and Qigong are believed to be a consequence of mental work. Do these mental-controlled exercises induce similar changes in cerebral oxygenation during practice?

**Design:** Prospective observational study.

**Participants:** Eight Tai Chi and six Qigong practitioners with more than 3 years of practicing experience.

**Outcome measures:** Cerebral oxyhaemoglobin (O<sub>2</sub>Hb), deoxyhaemoglobin (HHb), total haemoglobin (cHb) (measured by Near Infrared Spectroscopy) and heart rate variability (HRV) were recorded before, during and after a 10-minute Tai Chi or Qigong practice.

**Results:** O<sub>2</sub>Hb increased during the 10-minute practice as well as during the 5-minute recovery for both Tai Chi and Qigong. Such pattern of increase in O<sub>2</sub>Hb was significantly higher on the right than the left side in the Qigong practitioners, but not apparent in the Tai Chi group. Increase in cHb was also higher in the right side compared to the left in the Qigong group at the last 5-minute of exercise ( $1.51 \pm 0.58$ ,  $p=0.048$ ). Minimal changes in HHb were observed during either form of exercise. HRV analysis demonstrated an increasing trend of sympathetic shift in the Qigong but not Tai Chi group.

**Conclusion:** Cerebral oxygenation increased during Tai Chi and Qigong. The asymmetrical changes in cerebral oxygenation during Qigong may suggest that this exercise is associated with more dominant activation of the right prefrontal area, a possible consequence of increased sympathetic output. Relationship between "mindful" exercises, cerebral oxygenation and autonomic nervous modulation warrants further investigation.

## 409

### The effect of low back pain and lower limb injuries on piriformis muscle size in elite football players

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M Dilani Mendis, Australian Catholic University

Warren R Stanton, Australian Catholic University

Julie A Hides, Australian Catholic University

**Question:** Does the size and symmetry of the piriformis muscle in elite football players change across the playing season, and is it affected by low back pain and lower limb injuries?

**Design:** Observational longitudinal study.

**Participants:** 46 elite male Australian Football League players.

**Outcome Measures:** The cross-sectional area of the piriformis muscles measured by magnetic resonance imaging at the start and end of the football season.

**Results:** The piriformis muscle increased in size from the start of season to end of the season from  $14.08\text{cm}^2$  to  $15.30^2$  ( $p<0.001$ ). Players who reported LBP, a lower limb injury or both during the playing season, were found to have a lesser increase in the size of the piriformis muscle compared to players who did not report any injury ( $p=0.03$ ). There was a trend for asymmetry of the piriformis muscle in players with the piriformis muscle size 2.7% larger on the kicking leg ( $p=0.08$ ).

**Conclusion:** Piriformis muscle size increased in elite football players over the playing season. Hypertrophy of piriformis was substantially greater in players that did not have low back pain or lower limb injuries during the season. These findings may be explained by the role of piriformis in maintaining optimal hip joint load in single-leg stance activity and may reflect an adaptation to the physical demands of playing football. Further research examining piriformis muscle activity and its role in injury may have implications for injury prevention in elite football players.

## 410

### The effect of transversus abdominis thickness and activation on the prevalence of exercise-related transient abdominal pain

Jason L Mole, University of Tasmania

Marie-Louise Bird

James Fell, University of Tasmania

**Question:** Does thickness and activation of core musculature, particularly transversus abdominis, influence the prevalence of exercise-related transient abdominal pain in runners?

**Design:** 12-month retrospective investigator-blinded observational study.

**Participants:** Fifty (28 male, 22 female) healthy recreational to elite runners.

**Outcome measures:** Transversus abdominis thickness change between rest and contracted states were measured using ultrasound imaging (GE Logiq book). Functional activation of core musculature was measured using The Sahrman Test; a five-stage graded exercise test. Prevalence and characteristics of exercise-related transient abdominal pain, and the participants exercise habits, were recorded via a retrospective questionnaire.

**Results:** The mean thickness change between the prevalence of exercise-related transient abdominal pain groups was not found to be significantly different. Participants who were asymptomatic of exercise-related transient abdominal pain recorded Sahrman test scores (mean =  $3.6 \pm 0.4$ ) greater than three times higher than participants who experience exercise-related transient abdominal pain weekly (mean =  $1.1 \pm 0.4$ ) ( $p = 0.002$ ).

**Conclusion:** This is the first study to determine whether core musculature activation and thickness influence the prevalence of exercise-related transient abdominal pain in any athletic population. The results show that functional activation and strength, as measured by the Sahrman test, may be an influencing factor in the prevalence of exercise-related transient abdominal pain. Further research, using EMG measurement of transversus abdominis and internal oblique abdominis, in this population may delineate the role of these core muscles. A randomised controlled core-musculature strength intervention may provide more evidence on the role of core muscle control and exercise-related transient abdominal pain.

## 411

### Isokinetic and functional performance in middle east professional football players: influence of injury history and playing position

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Rodney Whiteley, ASPETAR Hospital (Doha, Qatar)

Ben Simpson, ASPIRE Sports Academy (Doha, Qatar)

**Introduction:** This study was designed to provide some normative physiologic data and investigate the influence of injury history and playing position on this in Middle East professional football players.

**Methods:** 203 players were tested. They underwent isokinetic knee assessment, 20m sprint test and vertical jump test. Injury history and playing position were also recorded.

**Results:** Injury history comparison showed a significantly higher incidence ( $p = 0.006$ ) of hamstring injury for central defender and forward, and lowest for goal keeper. Peak Torque data showed central defender to be stronger across all measures. No differences were found hamstring to quadriceps ratio for any group. Surprisingly, a history of anterior cruciate ligament injury was associated with higher PT measures. For the 20m sprint, goal keeper tested slower than all except central defender. Forward and wide defender were the fastest groups. Forward had the highest vertical jump in comparison to all other groups ( $p=0.004$ ).

**Discussion:** Normative data examined differed from values in other football populations. Players with a history of anterior cruciate ligament reconstruction had significantly greater hamstring and quadriceps muscle peak torques than those without anterior cruciate ligament reconstruction which may reflect rehabilitation and training methods. Isokinetic and functional scores differed by playing position. The unique physiological characteristics of these Middle Eastern professional players may well reflect the developing nature of professional football in Qatar.

**Conclusion:** Establishing sport and player-specific data for this population has allowed more accurate tailoring of rehabilitation and prevention programs in this population.

## 412

### The Effect of Unstable Sling Exercise Training for a Long Jump Athlete with Lumbar Spondylolisthesis: A case report

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Hsiao-Yun Chang, School of Physical Therapy, Chung Shan Medical University, Taichung, Taiwan

Chia-Ling Chen, Department of Physical Therapy, Tzu-Hui Institute of Technology, Ping-Tung, Taiwan

**Question:** Is conservative treatment effective to athletes with lumbar spondylolisthesis?

**Design:** A case report.

**Participant:** A 21-year-old long jump athlete who was diagnosed with the 5th lumbar spine spondylolisthesis with manual tests and radiology. The athlete suffered from severe back pain during sprinting and long jump with low back hyperextension.

**Intervention:** The athlete took conservative rehabilitation treatments with 3 stages, including physiotherapy, 8 weeks basic core muscles training and 6 months unstable resistance training, such as suspension exercise.

**Outcome measures:** Lumbar stability test, lumbar proprioception test, trunk forward bending with weight test, Oswestry disability index (ODI) and sports performance evaluation were used in this study.

**Results:** The results showed 75% improvement in lumbar stability test, 100% in lumbar proprioception test, 17 points in ODI, and 23 cm better in long jump performance.

**Conclusion:** The conservative treatment with 3 stages is beneficial to the long jump athlete who successfully returned to sport with better performance.

## 413

### Community ambulation after hip fracture: completing walking tasks to enable access to common community venues

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Nicholas F Taylor, Eastern Health–La Trobe University

Kevin Mulrain, Peter James Centre, Eastern Health, Burwood East

**Questions:** Can older people after hip fracture complete walking tasks to enable access to common community venues? What impact does self-confidence and self-perceived mobility participation restriction have on their walking performance?

**Design:** Observational, cross-sectional.

**Participants:** 22 patients independently living in the community following hip fracture.

**Outcome Measures:** Ability to complete 5 standardised walking tasks from measurements taken at 70 metropolitan sites: flight of 3 steps, slope of 3° over 16 m, up and down kerb, walking speed of 0.44 ms<sup>-1</sup> over 10 m, 315 m walk, Ambulatory Self-Confidence Questionnaire, London Handicap Scale.

**Results:** Most participants (18/22) were able to complete all the walking tasks reflective of walking in the community. However, participants reported variable levels of confidence (Mean 6.5/10 SD 1.4) and half (50%) self-reported significant mobility restriction when walking in their community. The ability of participants to complete the kerb task (the task participants found most difficult) was independent of their London Handicap Scale score (Fisher's test  $p=1.00$ ) and their Ambulatory Self-Confidence Questionnaire score (Fisher's test  $p=0.22$ ).

**Conclusions:** People living in their communities after hip fracture were able to complete walking tasks reflective of community ambulation but reported a lack of confidence in their walking ability and significant mobility restriction.

## 414

### Physiotherapy management of hip fracture in an acute setting: evidence-based or not?

Susie Thomas, Flinders University

Shylie Mackintosh, University of South Australia

Julie Halbert, University of South Australia

**Background:** Physiotherapy has an important role in hip fracture rehabilitation to address issues of mobility and function, yet current best practice guidelines fail to make recommendations for specific physiotherapy interventions beyond the first 24 hours post-surgery.

**Objectives:** The aims of this study were to gain an understanding of current physiotherapy practice in an Australian acute care setting, to determine what physiotherapists consider to be 'best practice' physiotherapy management and their rationale for their assessment and treatment techniques.

**Design and methods:** Three focus group interviews were run with physiotherapists and physiotherapy students, as well as a retrospective case note audit of 51 patients who had undergone surgery for hip fracture.

**Results:** Beyond early mobilisation and a thorough day one post-operative assessment, great variability in what was considered to be 'best practice' management was displayed. Senior physiotherapists considered previous 'clinical experience' to be more important than available research evidence and junior physiotherapists modelled their behaviour on senior physiotherapists. The amount of therapy provided to patients during their acute inpatient stay varied considerably, and none of the patients audited were seen on every day of their admission.

**Conclusion:** Current physiotherapy management of hip fracture in the acute setting for patients following hip fracture varies and is driven by system pressures as opposed to evidence based practice.

## Measures of physical functioning after hip fracture: construct validity and responsiveness of performance based and self-reported measures

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Anne M Moseley, George Institute for Global Health, University of Sydney, Sydney

Stephen R Lord, Neuroscience Research Australia, University of New South Wales, Sydney

Ian D Cameron, Rehabilitation Studies Unit, Sydney Medical School, University of Sydney, Sydney

**Questions:** What is the construct validity of commonly used performance-based and self-reported measures of strength, mobility and balance after hip fracture? What is the responsiveness of these measures?

**Design:** Prospective observational study.

**Participants:** One hundred and fifty older people with hip fracture receiving inpatient and community-based rehabilitation intervention over a period of four months.

**Outcome measures:** Correlation coefficients were utilised to assess construct validity between performance-based and self-reported measures. Internal responsiveness was assessed by calculating effect sizes (ESI, ESII) for all measures. Area under the receiver operating characteristic curve (AUC) assessed external responsiveness of all measures with change in utility-based quality of life (Euroqol) as the reference standard.

**Results:** Correlations between performance-based and self-reported measures were small to medium (strength  $r = 0.17$ , mobility  $r = 0.40$  and balance  $r = 0.33$ ). The most responsive performance based measures, with one or more large effect sizes included walking speed (ESI 1.6, ESII 1.1); Physical Performance and Mobility Examination (PPME) (ESI 1.2, ESII 0.9) and step-test (ESI 1.0, ESII 0.7). For self-reported measures the most responsive was mobility (ESI 0.8, ESII 0.6), followed by strength (ESI 0.8, ESII 0.6) and balance (ESI 0.3, ESII 0.2). The external responsiveness of performance-based was higher than for self-reported measures (AUC for performance-based measures: strength 0.59, 95% CI 0.50 to 0.69; mobility 0.73, 95% CI 0.64 to 0.81; balance 0.66, 95% CI 0.57 to 0.75.)

**Conclusion:** Self-report and performance-based indices appear to assess different constructs providing complementary information about physical functioning in people after hip fracture.

## 601

### How do rehabilitation consultants in Perth decide whether to admit a patient to inpatient rehabilitation?

Jacey Kraut, Royal Perth Hospital, Rehabilitation in the Home

Roslyn Jones, Royal Perth Hospital, Rehabilitation in the Home

**Purpose:** To identify and explore the factors that are used by consultant geriatricians working in rehabilitation units to decide whether a patient has rehabilitation potential and how this relates to admission to an inpatient rehabilitation unit.

**Design:** A qualitative research design involving non-schedule standardised interviews of consultant geriatricians in Perth. Interview responses were qualitatively analysed using NVivo9.

**Participants:** Seven consultant geriatricians, a rehabilitation consultant and a medical consultant from six Perth hospitals (secondary and tertiary).

**Results:** It was clear that all patients are considered on a case-by-case basis and all consultants consider patient diagnosis, prognosis and previous functional ability to gauge rehabilitation potential. Consultants, who provided rehabilitation for a specific neurological diagnosis such as stroke, stated that the diagnosis itself indicated rehabilitation potential. There was disagreement about whether

deciding rehabilitation potential was the same as deciding to admit a patient to an inpatient rehabilitation unit. Interviewees indirectly indicated that site specific factors such as proximity to acute medical services, wait list management and resource availability influenced whether a patient was admitted to inpatient rehabilitation, rather than rehabilitation potential alone.

**Conclusion:** The factors considered in the rehabilitation selection process in Perth, are in keeping with those identified in the literature. The literature indicates that this approach to decision making may result in variability and potential inequity of access to rehabilitation. Further examination of rehabilitation selection process is required.

## 602

### Combined one-on-one/group-circuit physiotherapy affords cost-benefits over one-on-one physiotherapy without compromising clinical outcomes for people with ortho-geriatric problems undergoing rehabilitation

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Lauren Earles, John Flynn Private Hospital

Nancy Low Choy, Bond University

Philip Abery, John Flynn Private Hospital

Matthew Fields, John Flynn Private Hospital

Michael Steele, Bond University

**Question:** Is a combined one-on-one/group-circuit physiotherapy format as effective as one-on-one physiotherapy for post-acute lower-limb orthopaedic in-patient rehabilitation?

**Design:** Prospective randomised controlled trial with allocation concealment and intention-to-treat analysis.

**Participants:** Eighty-nine-patients admitted to a Private Hospital Rehabilitation Ward for post-acute lower-limb orthopaedic in-patient rehabilitation.

**Intervention:** All participants received physiotherapy twice daily, comprising of a one-on-one session in the morning and, either a second one-on-one session (control-group) or a group-circuit session (experimental-group) in the afternoon. A standard session-time applied to all sessions and physiotherapy continued five-days-per-week until discharge.

**Outcome Measures:** The primary outcome was 'cost-savings' as measured by length-of-stay and required physiotherapist-contact-hours. Secondary outcomes were perceived pain as measured on a Visual-Analog-Scale and functional mobility as measured by the 'Berg-Balance-Scale', 'Modified-Elderly-Mobility-Scale', 'Timed-Up-and-Go' and timed '10m-Walk-Test'. All measures were assessed on admission and at discharge.

**Results:** Both groups were similar at baseline. No significant between-group difference was found for length-of-stay, although required physiotherapist-contact-hours were found to be substantially less (280-hours across the trial period) for the combined one-on-one/group-circuit format as compared to one-on-one only. Both groups showed significant within-group improvement in all secondary measures between admission and discharge. However, no significant between-group difference was found at discharge, with a mean difference [95% CI] for the 10mWT 2.11seconds [-6.76 to 2.55]; TUG 0.07seconds [-6.19 to 6.04]; Pain-VAS 0.7points [-1.6 to 0.5]; MEMS 0.1points [-1.5 to 1.8]; and, BBS 1.2points [-4.2 to 1.9].

**Conclusion:** Combined one-on-one/group-circuit physiotherapy affords cost-benefits over one-on-one physiotherapy without compromising clinical outcomes during post-acute lower-limb orthopaedic in-patient rehabilitation.

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## 603

### The feasibility and validity of a remote pulse oximetry system for pulmonary rehabilitation: a pilot study

Jonathan T Tang

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Trevor G Russell

**Question:** Is remote pulse oximetry technically feasible and valid when compared to conventional methods for pulmonary rehabilitation?

**Design:** Pilot Study.

**Participants:** Thirty-seven (23 F) healthy adults.

**Intervention:** Participants performed a single pulmonary rehabilitation exercise session and were supervised remotely via the Internet using the eHAB® telerehabilitation system which is a computer based videoconferencing and remote consultation system. The telemedicine system was configured to receive data from a Bluetooth pulse oximeter which was then transferred to the therapist device to produce a graph of the participant's heart rate and peripheral oxygen saturation. This data was compared to the locally obtained values to assess the validity of the telerehabilitation method.

**Outcome measures:** Heart rate and peripheral oxygen saturation values obtained both locally and remotely via the telerehabilitation system.

**Results:** There was an 80% exact agreement between local and remote data. The mean absolute difference for heart rate (0.21 bpm) and peripheral oxygen saturation (0.04% points) fell within the minimum clinically important difference ( $\pm 3$  bpm and  $\pm 4\%$  points, respectively). The 95% limit of agreement for heart rate (-2.90 to 2.89 bpm) and peripheral oxygen saturation (-0.67 to 0.67% points) also fell within the minimum clinically important difference. Participants found this system easy to use (89/100 visual analogue scale) and felt confident that they would be able to use it at home (87/100 visual analogue scale).

**Conclusion:** Remote measurement of pulse oximetry data for pulmonary rehabilitation exercise sessions was feasible and valid when compared to conventional face to face methods.

**Results:** Participants mean volume of breathing was at vital capacity 3123 ml (SD 153), at mid-volume 1603 ml (SD 153) and at quiet breathing was 673 ml (SD 151). A Pearson correlation demonstrated a significant relationship between tidal volume and tidal variation of impedance  $r = 0.96$ ,  $p < 0.001$ .

**Conclusion:** The tidal variation of impedance correlates highly with tidal volume in spontaneous breathing adult males. The tidal variation of impedance could be used to assess the effectiveness of interventions aimed at increasing ventilation in spontaneously breathing adult males.

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## 605

### Cyber-management of health outcomes for people with cancer

Jessica Tandy, Private Practice

Liisa Laakso, Griffith University

**Question:** Can on-line, interactive eHealth tools promote engagement in evidence-based health information; and obtain valid self-report data regarding physical and psychosocial health outcomes?

**Design:** Within-subject, repeated-measures, beta-test over 8 weeks (N=1 design).

**Participants:** A 64 year-old survivor of breast cancer ('participant') and her partner ('observer').

**Outcome measures:** Online self-report of physical activity and diet behaviours were compared with objective measures (pedometer, Sensewear actigraph, 24 hour diet recall and observer diary reports), pre-/post- measures of BMI, and progressive measures of depression, anxiety and stress (DASS) and Quality of Life (QoL) (EORTC QLQ-C30).

**Results:** Previous research was verified demonstrating the tendency of participants to over-estimate activity (eight week mean agreement between self-report and objective measures = 1.06, SD = 0.38), under-estimate energy consumption (participant/observer data; mean = 0.94, SD = 0.14, participant/24 hour recall; mean = 0.87, SD = 0.15) and failure to meet evidence-based physical activity and dietary guidelines. Improvements in BMI, measures of depression, anxiety and stress (DASS), and of symptom/function scores for QoL were achieved. Positive and negative factors regarding the utility of the website were noted by the participants.

**Conclusion:** The validity of the web-based tool was not established in this beta-test however, some outcome measures showed improvement demonstrating the potential value of eHealth strategies. The results of this beta-test will inform continuing developments around this model of service delivery, which (with proposed wireless applications) has the potential for use in a wide range of health priority areas.

**Ethics approval:** John Flynn Hospital (AB/11711/1); Griffith University (PES/03/10/HREC) Human Research Ethics Committees

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## 604

### Electrical impedance tomography can detect changes in the tidal volumes of spontaneously breathing males. A within participant experimental study

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Oystein Tronstad, The Prince Charles Hospital: Critical Care Research Group, Brisbane

Adrian G Barnett, The Queensland University of Technology, Brisbane.

Jennifer Paratz, The Burns Trauma and Critical Research Centre, The University of Queensland, Brisbane.

Angela T Chang, The University of Queensland, Brisbane.

John F Fraser, The Prince Charles Hospital: Critical Care Research Group, Brisbane. The University of Queensland, Brisbane.

**Question:** Can electrical impedance tomography accurately detect changes in the tidal volumes of spontaneously breathing adult males?

**Design:** Within-participant experimental study.

**Participants:** Five healthy adult male participants.

**Intervention:** Participants were positioned in supine lying. During a two minute recording period participants were instructed to take 5 large vital capacity breaths followed by 5 mid-volume breaths and then to breathe at comfortable relaxed normal breaths for the remainder of the two minute recording period. Measurements were taken in the morning and repeated in the afternoon.

**Outcome measures:** Tidal volumes as measured by pneumotachometer and tidal variation of impedance as measured by electrical impedance tomography.

## 606

### Can regular use of the Cough Assist machine maintain lung function in children and adolescents with neuromuscular disease?

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Vivienne Travlos, The University of Notre Dame Australia

Shane Patman, School of Physiotherapy,  
The University of Notre Dame Australia

**Question:** Does regular use of the CoughAssist maintains lung function in children/adolescents with neuromuscular disease?

**Design:** Prospective pilot observational case-matched cohort trial, combined with retrospective medical record review. **Participants:** Eight children (seven male) with neuromuscular disease.

**Intervention:** Four children regularly using the CoughAssist were matched by age, height and mobility status with four currently not using the CoughAssist acting as a control group. Participants performed regular spirometry over a four month period using a Vitalograph alpha 6000 spirometer. **Outcome measures:** vital capacity, peak expiratory flow rate, and peak cough flow measures. **Results:** Mean age was 13.8 years (range 10–17 years). All required electric wheel chair for mobility. Time series analysis revealed no differences with vital capacity ( $p = 0.71$ ), peak expiratory flow ( $p = 0.20$ ) or peak cough flow ( $p = 0.54$ ) associated with CoughAssist use. Vital capacity, peak expiratory flow rates and peak cough flow readings were all maintained in those regularly using the CoughAssist, while the control group had varied readings.

**Conclusion:** This pilot study has identified that regular use of the CoughAssist may assist maintenance of lung function in the short term in those with neuromuscular disease. These findings warrant substantiation in a larger sample with consideration of using a random sampling methodology.

## 607

### The Effect of Motor Control Training on Muscle Size and Function, Games Missed from Injury and Low Back Pain among Elite Football Players

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M Dilani Mendis, Australian Catholic University

Jan E Gildea, The University of Queensland

Margot J Sexton, Australian Catholic University

**Objective:** This RCT was designed to examine the effect of a motor control training program for elite AFL players with and without low back pain (LBP).

**Methods:** The outcome measures included the cross sectional-area (CSA) of trunk muscles (multifidus, quadratus lumborum and psoas), symmetry of trunk muscles and change in the CSA of the trunk in response to an abdominal drawing in task. Measures of muscle size and function were performed using magnetic resonance imaging (MRI). Availability of players for competition games was used to assess the effect of the intervention on injury rates. LBP was measured using a VAS pain rating. Measurements were taken before and after an intervention period focusing on motor control retraining. As all players were to receive the intervention, the RCT was delivered as a panel design with 3 groups.

**Results:** The intervention program was associated with an increase in the size of the multifidus muscles relative to results from the control group. When the waitlist group received the intervention, the size of the multifidus also increased. The program was also associated with an improved ability to draw in the abdominal wall. Intervention was commensurate with increased availability for games and decreased LBP.

**Conclusion:** Motor control retraining resulted in changes in the size of the multifidus muscles and an improved ability to draw in the abdominal wall in elite footballers. The outcomes related to availability for team selection and intensity of LBP also showed positive changes.

## 608

### Are static lumbar postures a signature for predicting landing postures in elite gymnasts?

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Peter O'Sullivan, School of Physiotherapy and Curtin Health Innovation Research Institute, Curtin University, Perth

Jo Norcott, Ascend Physiotherapy, Perth

**Questions:** Does a relationship exist between regional lumbar spine angles in static habitual postures and dynamic landing postures in gymnasts? How close are regional lumbar spinal postures to end of range postures at the time of peak ground reaction force (GRF) during landing?

**Design:** Randomised, within-participant experimental study.

**Participants:** Twenty-one healthy, elite, female gymnasts (aged nine to 18yrs).

**Protocol:** Participants performed three dynamic gymnastic skills; a drop landing, back somersault and plyometric front somersault. Static sitting and standing postures and full, active lumbar flexion were captured.

**Outcome measures:** Lumbar (Lx), upper lumbar (ULx), and lower lumbar (LLx) angles were measured (Vicon; Oxford Metrics, inc) and GRF was calculated. A Pearson's correlation was used to investigate relationships between the angles in different postures.

**Results:** Large, significant correlations ( $r=0.77-0.89$ ,  $p<0.001$ ) were found between all the static/dynamic postures in the LLx angle. Fewer and less significant correlations were found in the ULx angle. Following a back somersault 30% of the gymnasts landed with their LLx spine flexed beyond their active range of lumbar flexion, while experiencing GRF 6.8 to 13.3 times their body weight.

**Conclusions:** The strong static/dynamic posture correlations suggest a posture signature exists in the LLx spine across static and dynamic loading conditions. The LLx spine may be more vulnerable to injury during gymnastics due to the lack of variability of LLx posture, the high levels of GRF and high frequency of loading beyond end range flexion.

### Clinical Pilates Directional Bias Assessment: Reliability and Predictive Validity

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Gisela Sole, Centre for Physiotherapy Research, University of Otago, New Zealand

Allan Carman, Centre for Physiotherapy Research, University of Otago, New Zealand

**Question:** Is the Clinical Pilates directional bias assessment reliable between raters, and is it valid for predicting immediate changes in dynamic postural stability and muscle performance following directionally-biased exercises?

**Design:** Randomised, blinded, repeated measures cross-over design.

**Participants:** Thirty three participants with a history of more than one unilateral lower limb injury. **Intervention:** Firstly, two researchers independently assessed the participants for directional bias. Participants were then randomly allocated to perform matched bias (MB) or unmatched bias (UB) exercises first, in two crossover groups.

**Outcome measures:** Inter-rater reliability was evaluated using Kappa (K), and prevalence-adjusted and bias-adjusted kappa (PABAK) coefficients. Changes in dynamic postural stability and muscle performance were assessed using time to stabilisation (TTS) and rebound hopping (RH), measured on a forceplate, before and after each exercise intervention. Crossover trial data were analysed by t-tests for period, interaction and treatment effects, and repeated measure ANOVAs were used to investigate differences between baseline, MB and UB.

**Results:** Inter-rater reliability of the directional bias assessment was substantial, with  $K = 0.75$  and PABAK  $K = 0.76$ . Following MB exercises, medial-lateral TTS and time on the ground during RH were significantly shorter ( $p = 0.02$ ,  $p = 0.05$ , respectively) compared with UB exercises. Compared with baseline, pairwise change in anterior-posterior TTS ( $p = 0.008$ ) improved following MB exercises, while time in the air deteriorated following UB ( $p = 0.04$ ) exercises.

**Conclusion:** Directional bias assessment demonstrates substantial reliability. Results suggest validity for predicting immediate improvements in dynamic postural stability and muscle performance following matched directionally-biased exercises.

## 610

### Six minute walk distance in healthy elderly active and sedentary female

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Jennifer A Alison, Faculty of Health Sciences, The University of Sydney.

**Question:** Does the practice of regular physical activity influence the distance walked during the six minute walk test in an ageing population?

**Design:** Observational study.

**Participants:** A convenience sample of 77 healthy Brazilian females composed two groups: 46 were in the active group and 31 in the sedentary group.

**Outcome measures:** age, height, weight, body mass index, spirometric values and the six minute walk distance.

**Results:** The mean age of the participants was 66 years ( $SD = 6$ ). The groups only differed in the distance walked, where the active group walked  $520 \pm 64$  m and the sedentary group walked  $476 \pm 64$  m ( $p < 0.01$ ). Equations created by four other authors under or overestimated the distance walked on the six minute walk test by the participants of this study. The knowledge of activity level added significantly to the predictive value of previously published equations for the six minute walk test that was evaluated in this study. In the predictive model developed, activity level remained an important independent predictor explaining a 43 meter difference in the six minute walk distance after allowing for age and body mass index.

**Conclusion:** it is important to consider activity level when assessing elderly women using the six minute walk test. An active lifestyle is shown to be beneficial for the elderly population.

## 611

### The six minute walk test: validity, reliability, reference distances and predictors in outpatient cardiac rehabilitation

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Norman R Morris, Griffith Health Institute, Griffith University, Gold Coast

**Question:** Is the six-minute walk test (6MWT) valid and reliable in cardiac rehabilitation (CR)? What reference values and predictors for 6MWT distance (6MWD) exist in CR?

**Design:** Systematic review of data from quantitative and qualitative studies.

**Participants:** Outpatient CR patients, excluding primary diagnosis of heart failure. **Intervention:** 6MWT.

**Outcome measures:** Articles were examined for repeated or single 6MWTs and comparisons to standardized tests; 6MWDs before and after CR; and predictors of 6MWD.

**Results:** 13 articles with a mean Pedro score of 3.3 were identified. Four were randomized controlled trials, five retrospective database or chart reviews and four were prospective cohort trials. Only 3 trials compared 6MWD with symptom-limited exercise testing. The better of repeated 6MWDs correlated with maximum METs ( $r = 0.69$ ) and power ( $r = 0.93$ ) achieved at symptom-limited exercise tests, however, when a single 6MWT was conducted the 6MWD only moderately correlated with  $VO_2$  peak for the 6MWT and the cycle ergometry exercise test ( $r = 0.58$ ,  $0.56$  respectively). 6MWD increased by 2% to 8% with test-retest but achieved strong test-retest reliability ( $ICC = 0.97$ ). 6MWD improved by 10% to 26% ( $43 - 74$ m) following CR. Age, sex, and left ventricular function were identified as determinants of 6MWD and initial 6MWD is inversely related to improvement post-CR.

**Conclusion:** The reliability of 6MWTs in CR is established and the literature demonstrates a learning effect occurs with repeated 6MWTs in CR. Age, gender and left ventricular function are determinants of 6MWD. The validity of the 6MWT in this population requires further research.

## 612

### Repeated Six Minute Walk Tests in Patients with Chronic Heart Failure: Are They Clinically Necessary?

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Ellen Gibson

Kylie Houlihan

Alison Mudge

Robert Mullins

**Background:** The 6 minute walk test (6MWT) is frequently used as a submaximal measure of exercise capacity in patients with chronic heart failure (CHF). Due to a reported learning effect, repeated tests (6MWT) are recommended as standard practice. Patients with CHF are frequently elderly and frail and it is unknown whether current guidelines are plausible in a clinical setting.

**Aims:** The aim of this study was to investigate the effect of baseline performance and the duration of time between repeated 6MWTs, on the distance walked in each test.

**Methods:** Eighty-eight subjects (45 females, age 65 +/- 14 years) with stable CHF (NYHA II, III) were asked to complete 2 6MWTs. Subjects were recruited from Heart Failure Services at 4 different hospitals in Queensland and were randomized into 1 of 5 groups based upon the duration of time between the 2 tests (15mins, 30mins, 45 mins, 60mins and 90 mins) as well as baseline performance (<300m, 300-450m, >450m) The difference in the distance walked between the repeated tests was compared.

**Results:** For the total group, mean distance walked increased from 301 metres in test 1 to 313 metres in test 2 ( $p < 0.001$ ). No significant change was recorded between test 1 and test 2 for those whose baseline distance was <300 metres. The interval between tests had no significant effect on the distance walked.

**Conclusion:** The change in 6MWT distance was significantly associated with better baseline performance but not with the interval between tests.

## 613

### Repeated six minute walk tests for outcome measurement and exercise prescription in outpatient cardiac rehabilitation: a longitudinal study

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Norman R Morris, Griffith Health Institute, Griffith University, Gold Coast

**Questions:** Are repeated six minute walk tests (6MWTs) required for outcome measurement and exercise prescription in cardiac rehabilitation (CR)?

**Design:** Prospective longitudinal observational study.

**Participants:** Sixty-one of 154 consecutive patients referred to community health CR.

**Outcome measures:** Two 6MWTs were conducted at commencement, post-completion and 6-months post-completion of CR. The 6MWT distance (6MWD) for 6MWT1 and 6MWT2 was compared at each assessment point and across assessment points. Immediately post-6MWT heart rate, systolic and diastolic blood pressure, and ratings of perceived exertion, were recorded.

**Results:** Mean 6MWD for 6MWT1(6MWT2) at the 3 assessment points were 507±85(523±84), 533±85(560±87), 550±99(577±107) meters. Repeat 6MWDs were strongly correlated at each assessment point, with intra-class correlation coefficient (95% CI) = 0.96(0.93 to 0.98), 0.96(0.92 to 0.98) and 0.80(0.67 to 0.89) respectively. The relative increase in mean 6MWD from 6MWT1 to 6MWT2 at each assessment point was 3%, 5%, and 5%, respectively ( $p < 0.001$  in each case). Differences in walking speed derived from 6MWD1 and 6MWD2 (5.1 kph and 5.2 kph, respectively) did not translate into tangible differences in exercise prescription.

**Conclusions:** The difference between 6MWD1 and 6MWD2 was consistent at three separate assessments over a 6 month period regardless of previous exposure to 6MWTs. A single 6MWT was as effective as two repeated 6MWTs for outcome measurement and exercise prescription. We therefore recommend, when 6MWDs are used for CR outcome measurement, either a single 6MWT is used, or that the number of 6MWTs performed is consistent at all assessment points.

## 614

### Repeated Timed Up and Go tests for outcome measurement in outpatient cardiac rehabilitation and comparison with the Six Minute Walk test: a longitudinal study

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**Objective:** To determine if Timed-Up-and-Go-Tests (TUGTs) are reliable outcome measures in the cardiac rehabilitation (CR) population and if TUGTs are comparable to the Six-Minute-Walk-Test (6MWT) in CR.

**Design:** Prospective observational study.

**Setting:** Outpatient community health.

**Participants:** Sixty-one of 154 consecutive patients referred to CR.

**Intervention:** Repeated TUGTs and 6MWTs at commencement, post-completion and 6-months post-completion of CR.

**Outcome measure:** TUGT time (TUGTT) and 6MWT distance (6MWD).

**Results:** Mean times for TUGT1(TUGT2) were 6.28±1.29(5.94±1.20), 5.78±1.22(5.49±1.11), 5.39±1.60(5.01±1.28) seconds ( $p < 0.001$  commencement to post-CR, commencement to 6-months-post-CR and post-CR to 6-months-post-CR). Repeat TUGTTs were strongly correlated at each assessment point, with ICC (95% CI) = 0.85(0.76 to 0.91), 0.85(0.74 to 0.91) and 0.90(0.83 to 0.94), respectively. Time reduced between TUGT1 and TUGT2 at each assessment point by 5%, 5%, and 7%, respectively ( $p < 0.001$  in each case). The relative change from commencement to post-CR and commencement to 6-month-post-CR for TUGT1(TUGT2) was -7.9%(-7.5%) and -14.2%(-15.5%) while for 6MWD1(6MWD2) it was 5.2%(7.2%) and 8.6%(10.4%), respectively ( $p < 0.001$  in all cases). Across all time points Pearson's Correlation Coefficient for 6MWD1 to TUGT1(TUGT2) was -0.61(-0.68) and 6MWD2 to TUGTT1(TUGT2) was -0.49(-0.60), (2-tailed  $p < 0.001$  in all cases).

**Conclusions:** The TUGT is a reliable outcome measure in CR providing similar relative changes to the 6MWT. A significant correlation between the TUGTT and 6MWD was demonstrated and we suggest that these tests measure similar aspects of functional capacity in CR.



## 615

### The role of qualitative research in exploring the experiences associated with the adult diagnosis of Cystic Fibrosis

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**Objective:** Qualitative research has its origins in the humanistic and social sciences and explores the interpretation of human and social experiences. An adult diagnosis of Cystic Fibrosis has significant implications to the individual who has to accept living with a genetic and potentially life limiting condition, which requires considerable commitment to daily rigorous therapy. The aim of this investigation was to look at the role of qualitative research in exploring the experiences associated with the adult diagnosis of Cystic Fibrosis.

**Methods:** A search of the databases Medline, Cinahl and PsychInfo was conducted using keywords of adult, diagnosis, cystic fibrosis, qualitative research and phenomenology.

**Results:** This search located two published articles, one which investigated the experience of medical professionals in delivering the diagnosis while the second explored the implications of an adult diagnosis for the social work profession. Both these articles used an interpretive phenomenological approach.

**Conclusion:** Phenomenology is a methodology well suited to inquiry in health sciences as it explores the understanding of individuals and their interactions with others and the environment. The experiences of individuals are a rich source of information which can increase our understanding of the way in which they perceive health, manage their own health and utilise health services. The current use of qualitative research in this field is limited, however the exploration of these experiences using qualitative methodology could produce evidence which health professionals can use to develop treatment management plans best suited to meet the unique requirements of each individual with Cystic Fibrosis.

## 616

### Measuring the protocol compliance of physiotherapists in a randomised controlled trial

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**Objective:** Assessing the compliance of physiotherapists with a study protocol and the occurrence of contamination bias in a randomised controlled trial (COPE-II study).

**Study design and setting:** In the COPE-II study, intervention patients received a standardised physiotherapeutic reactivation intervention (COPE-active) and control patients received usual care, which could include regular physiotherapy treatment. Information about the compliance of physiotherapists with the study protocol was collected by performing single interviews with both intervention and control patients. Patients were only interviewed when they were receiving physiotherapy at that point in time. Interviews were performed during two separate time periods, ten months apart. Nine characteristics of the COPE-active intervention were scored. Scores were converted into percentages (0%: no aspects of COPE-active – 100%: full implementation of COPE-active).

**Results:** A total of 51 patients were interviewed (period 1: **intervention:** n=14 and control: n=10; period 2: **intervention:** n=18 and control: n=9). Compliance with the COPE-active protocol was high (median scores: period 1: 96.8% and period 2: 92.1%), and a large contrast in scores between the intervention and control group was found (period 1: 96.8% versus 22.7%; period 2: 92.1% versus 25.0%). The scores of patients treated by seven physiotherapists who trained patients of both study groups were similar to the scores of patients treated by physiotherapists who only trained patients of one study group.

**Conclusion:** The compliance of physiotherapists with the COPE-active protocol was high, remained unchanged over time, and no obvious contamination bias occurred.

## 617

### Measures of sensation of breathlessness in people with obesity: a systematic review

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**Question:** How has the sensation of breathlessness been assessed in adults with increased adiposity? **Design:** Systematic review of studies published between 2005 to January 2011 with data synthesised in a narrative format.

**Participants:** Adults ( $\geq$  nineteen years) with obesity (body mass index  $\geq$  30kg/m<sup>2</sup>).

**Intervention:** All surgical, pharmacological and non pharmacological interventions were included. **Outcome measures:** All primary outcome measures used to assess breathlessness or dyspnoea.

**Results:** The search yielded 41 studies (22 experimental, 19 observational), 14 of which investigated obesity as the primary health concern with the remainder investigating obesity as a co morbidity. Of the 20 instruments identified, the Modified Borg scale (breathlessness intensity) was the most common (16 studies) followed by the Medical Research Council scale and Baseline Dyspnoea Index (breathlessness related impairment (5 studies each)). Few instruments had been tested for reliability and validity in people with increased adiposity. Of the 20 instruments, the visual analogue scales, descriptors (sensory quality) and modified Medical Research Council scale (respiratory related impairment) displayed acceptable reliability (correlations  $>0.8$ ) and concurrent validity (significant correlation with severity of airways obstruction and walking distance).

**Conclusion:** The sensation of breathlessness in adults with increased adiposity has been measured in terms of frequency, intensity, sensory quality, and respiratory related functional impairment. Based on the available psychometric data, visual analogue scale for intensity, breathlessness descriptors, and the modified Medical Research Council dyspnoea scale could be recommended assessing intensity, sensory quality of breathlessness and respiratory related functional impairment respectively in adults with increased adiposity.

## 618

### Does ventilation limit exercise in overweight and obese adolescents during a step test?

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**Questions:** Do ventilatory constraints occur during submaximal exercise in overweight/obese children? How do their ventilatory responses and effort perception differ during this test from those of normal weight? How do indirect estimates (ventilation as a proportion of maximal voluntary ventilation) compare with direct measures of ventilatory limitation (dynamic lung volumes and flow/volume relationships?).

**Design:** Prospective observational study.

**Participants:** Overweight/obese adolescents (body mass index  $\geq$  85thcentile), matched by age and sex with non-overweight adolescents. Doctor-diagnosed lung conditions were excluded.

**Outcome measures:** Height, weight, pulmonary function tests and static lung volumes using standard procedures. Six minute step test with breath-by-breath gas analysis, tidal flow volume loops, and ratings of perceived exertion during exercise.

**Results:** 54 participants (26 overweight/obese) completed the study. Overweight/obese adolescents used a greater proportion of estimated maximal voluntary ventilation at end-test (40[10]% vs 27[5]%,  $p < 0.0001$ ) and described greater exertion for legs (5[2] vs 3[2] out of 10,  $p = 0.004$ ), but not for breathing, than those who were non-overweight. Direct measures of lung volumes found lower end expiratory lung volume (as % of lung capacity) in overweight/obese adolescents at end-test (41[9.5]% vs 48.2[7.3]%,  $p = 0.004$ ), but no difference in end inspiratory lung volumes. Directly measured expiratory flow limitation was observed in 38% ( $n = 10$ ) of overweight/obese and in 8% ( $n = 2$ ) of normal weight children. In most cases this was associated with low FEF25-75% predicted at rest.

**Conclusion:** While breathing effort perception was not greater, overweight/obese children were constrained during low-level, steady state exercise by ventilating at low lung volumes, and a subset experienced flow limitation.

## 619

### Physiotherapists' knowledge and uptake of the ABC approach to smoking cessation

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**Questions:** What knowledge do New Zealand physiotherapists have about smoking cessation education? What is their uptake of the health ministry's ABC training approach and how frequently do they integrate evidence-based advice and support into patient management?

**Design:** Cross-sectional web-based national survey.

**Participants:** Members listed on Physiotherapy New Zealand's email database.

**Outcome measures:** Frequency distributions matched with national workforce data.

**Results:** 19% ( $n = 608$ ) of members responded and their demographics indicated they were a representative sample of the New Zealand physiotherapy workforce. Over 50% knew about the ABC programme but only 30% had completed training. Uptake varied according to province, employment area and work type, Otago having the highest percentage uptake (53%) and Taranaki the lowest (9%). District Health Board employees were more likely to have completed training (60%) than those in private practices (16%) particularly musculoskeletal practices, or those in other employment (24%). Furthermore 68% of respondents who had completed the ABC training always or usually asked their patients if they smoked compared to 34% of respondents who were not aware of the ABC. Respondents who had completed training correctly answered survey questions related to social misconceptions of smoking more frequently than untrained respondents did.

**Conclusions:** Data revealed geographic and employment related differences in the numbers of physiotherapists who had taken up smoking cessation education. It is recommended that the profession specifically targets training for physiotherapists in provinces and private practices, in particular musculoskeletal practices, where the uptakes were lowest and also explores alternative methods of promoting the education.

## 620

### Core curriculum content required for appropriate skills in the prescription of exercise for management of blood pressure

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**Background:** Hypertension is a preventable risk factor for cardiovascular disease that can be managed through lifestyle modifications such as physical activity. In clinical practice, this is poorly managed by health care professionals.

**Aim:** To define the core knowledge, skills and competencies required for the management of hypertension with exercise

**Methods:** A literature review of MEDLINE, PEDro database and Google was conducted to identify best practice in teaching health care professional students about the role of exercise in the management of hypertension. A Steering Committee was assembled to develop learning objectives for management of hypertension with exercise. These learning objectives were distributed electronically to health care professionals across multiple disciplines for comment. The Steering Committee refined the draft curriculum following the analysis of survey data and produced a final set of relevant learning objectives.

**Results:** Survey results indicated strong agreement with most objectives. The Steering Committee refined and approved 102 learning objectives.

**Conclusion:** This work provides an example of application of scientific principles to the development of learning objectives for specific skill development of health professionals. The 102 learning objectives for competent prescription of exercise for blood pressure are relevant to the education of all professionals who will provide these services to the care seeking public.

## 621

### Prevalence and impact of incontinence in men with chronic obstructive pulmonary disease

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**Question:** Is incontinence more prevalent in men with chronic obstructive pulmonary disease compared to men without lung disease? What is the impact?

**Design:** Observational.

**Participants:** Forty men with chronic obstructive pulmonary disease attending outpatient services and 13 volunteer men with no diagnosed lung disease.

**Intervention:** Questionnaires including International Consultation on Incontinence Questionnaires (Urinary Incontinence Short Form and Male Lower Urinary Tract Symptoms).

**Outcome measures:** Reported prevalence and impact of incontinence.

**Results:** There were no significant difference in age, BMI or history of prostate issues between men with chronic obstructive pulmonary disease and controls. Fifteen (38%) men with chronic obstructive pulmonary disease reported urinary incontinence, compared to 3 (19%) men without lung disease. Men with urinary incontinence were older ( $p=0.039$ ), and there was no difference in report of 'bother' related to urinary incontinence between men with chronic obstructive pulmonary disease and controls. In men with chronic obstructive pulmonary disease, those with urinary incontinence had lower lung function compared to continent men (mean [SD] FEV1% pred 39[15] vs. 58 [23],  $p=0.019$ ). However, there was no difference in respiratory symptoms between men with and without urinary incontinence. In men with chronic obstructive pulmonary disease, those with urinary incontinence scored higher on the hospital anxiety and depression scale (anxiety 6.9 [5.4], depression 6.2 [4.6]) compared to continent men (anxiety 5.8 [4.5], depression 4.4 [3.4]) but this difference was not statistically significant.

**Conclusion:** Prevalence of urinary incontinence appears to be higher in men with chronic obstructive pulmonary disease compared to men without lung disease.

## 622

### Urinary incontinence in people with chronic heart failure

Rita Hwang, Princess Alexandra Hospital

Alaina Krumins, Princess Alexandra Hospital, Brisbane

Suzanne Kuys, School of Physiotherapy and Exercise Science, Griffith University & Allied Health Research Collaborative

Francine Chuan, Princess Alexandra Hospital, Brisbane

Colleen Marsh, Princess Alexandra Hospital, Brisbane

Robyn Peters, Princess Alexandra Hospital, Brisbane

**Question:** What are the prevalence of urinary incontinence in people with heart failure and the effects of continence education on this group of people?

**Design:** Prospective observational study.

**Participants:** A 26-item survey was sent to 181 people with heart failure.

**Outcome measures:** Tools such as the Revised Urinary Incontinence Scale and the Incontinence Impact Questionnaire Short Form were used. Participant demographics, risk factors for incontinence and dosages of prescribed heart failure medications were also collected.

**Results:** A total of 89 people responded to the survey, with 44 people (49%) self-reported urinary incontinence, and of these, 30 experienced a slight to moderate level of incontinence. Some of the risk factors in this population included being female, having had children and high dose of diuretics ( $p<0.05$ ). The presence of incontinence was associated with a poor quality of life. Continence education including pelvic floor exercises, good bladder and bowel habits and access to a specialist continence nurse were subsequently offered to study participants. Of these 89 people, a total of 48 people responded to the re-survey, with 26 people (54%) self-reported urinary incontinence, including 17 people with a slight to moderate level of incontinence.

**Conclusions:** The prevalence of urinary incontinence in people with heart failure is high and incontinence was associated with a poor quality of life. In view of the high prevalence of incontinence, it is important to screen and incorporate continence education as part of routine care in heart failure management programs.

## 623

### The feasibility of using Wii exercises in residential aged care: 4 single case studies

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Shylie F Mackintosh, University of South Australia

Jane Coffee, University of South Australia

**Aim:** This study investigated the feasibility and benefits of WiiTM exercises for older people in residential care.

**Methods:** Four single case studies (ABA design) with structured interviews before and after the intervention phase were undertaken. The primary outcome was gait speed, was analyzed using the two standard deviation method. The participants (three females, one male; aged 65–94 years) were residents in a low level care facility who were able to walk. Baseline and follow up phases were three and two weeks respectively and the intervention phase was four weeks. The intervention consisted of three supervised, 30 minute, one-to-one sessions per week of selected exercises from the Nintendo WiiTM.

**Results:** It was feasible to use the Wii for exercise sessions in this group; however, grab rails were required for safety and an assistant was required to help participants navigate the software and "coach" with ways to improve performance. Participants thought that the sessions were stimulating and engaging, making exercise more enjoyable. Three of the four participants recorded improvements in their gait speed. Two of these were significant improvements in the follow-up phase. No adverse events were reported. Three participants were eager to continue with the Wii exercises if they were available; however, one participant thought it had been strenuous and did not wish to continue.

**Conclusion:** Wii exercises are feasible in a residential care setting; however, personal preferences need to be considered when planning exercises and close supervision is required.

## 624

### Physiotherapy students demonstrate that limited intervention benefits aged care residents

Wendy Chesworth, University of Canberra

**Questions:** What do physiotherapy students perceive about residential aged care facilities and working with older adults? Does experiencing residential care aid student learning? Can students develop effective interventions to improve balance and walking in one session a week for 5 weeks? Are aged care facilities confronting for physiotherapy students?

**Design:** Prospective observational study.

**Participants:** 136 GEM physiotherapy students at the University of Canberra across 7 cohorts and 52 residents across 3 years.

**Intervention:** As part of an academic unit students assessed and delivered an intervention for residents once a week, for five weeks.

**Outcome measures:** A 26 question 6 point survey of all students and a 16 question 6 point survey of residents.

**Results:** The visits stimulated student learning (90.4% students, 47.4% strongly agreed) and enabled students (80.2%) to identify areas of needed proficiency. Students had mixed reactions to visits, with 41.4% reporting visits as emotionally confronting. Most students (72.7%) found interviewing an older person fulfilling. Students developed a good rapport with residents (98.1%). Residents (68.8%) improved their balance and walking in 5 visits. Residents' benefits (96.2%) were beyond physical intervention alone. Most clients (71.7%) reported the visits making a difference to their life or lifestyle.

**Conclusion:** This study reports benefits in a once per week, 5 week student intervention for aged care residents. It demonstrates expanded physiotherapy services for aged care residents will improve walking and balance in this population. A novel, yet beneficial approach in facilitating an aged care experience for physiotherapy students is reported.

## 625

### Responsiveness of physical performance measures among aged care rehabilitation inpatients

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Inez Farag, The George Institute for Global Health, University of Sydney, Sydney

Steve J Kamper, The George Institute for Global Health, University of Sydney, Sydney

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Elizabeth Barraclough, Neuroscience Research Australia, University of New South Wales, Sydney

Morag Taylor, Neuroscience Research Australia, University of New South Wales, Sydney

Stephen R Lord, Neuroscience Research Australia, University of New South Wales, Sydney

**Question:** What is the internal responsiveness of performance-based measures of mobility among aged care rehabilitation inpatients?

**Design:** Prospective observational study.

**Participants:** 372 aged care rehabilitation inpatients from two hospitals.

**Measures:** Performance-based measures of sit-to-stand (ability and speed), gait (speed) and standing balance (ability and time in different positions) and the Short Physical Performance Battery were administered within 48 hours of admission to aged care rehabilitation wards and repeated within 48 hours prior to discharge from the wards. Internal responsiveness was calculated using effect sizes (ES I and II).

**Results:** The average length of stay was 24 days (SD 15). Responsiveness of measures of sit-to-stand was small (ES < 0.5). A simple 4-point scale assessing the ability to stand up from a height of 45 cm without assistance and without using the hands showed the highest responsiveness (ES I 0.45, ES II 0.50). Measures of gait showed moderate responsiveness (ES > 0.5). The gait measure with the highest internal responsiveness was gait speed over 4 metres (ES I 0.62, ES II 0.70). Measures of standing balance showed small responsiveness (ES < 0.5). The standing balance measure with the highest internal responsiveness was the total time standing in 4 positions (feet together, semi-tandem, tandem and single leg stance, ES I 0.46, ES II 0.48). The Short Physical Performance Battery 12-point lower limb summary score also showed moderate responsiveness (ES I 0.64, ES II 0.68).

**Conclusion:** Performance-based measures of mobility showed small to moderate responsiveness in aged care rehabilitation inpatients.

## 626

### The impact of pain on physical performance among older people on discharge from inpatient aged care rehabilitation

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Morag Taylor, Neuroscience Research Australia, University of New South Wales, Sydney

Stephen R Lord, Neuroscience Research Australia, University of New South Wales, Sydney

**Question:** What is the impact of pain on physical performance among older people on discharge from inpatient aged care rehabilitation?

**Design:** Observational study.

**Participants:** 420 inpatients from two public hospitals.

**Measures:** Physical performance measured using the lower limb summary performance score (LLSPS) version of the Short Physical Performance Battery (timed sit-to-stand, gait and standing balance) within 48 hours prior to discharge. Pain, co-morbidity (count of health conditions and symptoms) and cognition (MMSE) measured by questionnaire.

**Results:** Pain lasting for more than 3 months which affected daily activities was associated ( $p = 0.002$ ) with a poorer LLSPS. Depression, increased age, more co-morbidities and a lower MMSE score were also associated ( $p < 0.05$ ) with poorer LLSPS. Being troubled by pain, the presence of leg/back pain, arthritis in the legs/spine and gender were not significantly ( $p > 0.05$ ) associated with LLSPS. In multivariate models the relationship between pain affecting daily activities and LLSPS remained statistically significant ( $p = 0.009$ ) after adjusting for depression, age, co-morbidity and MMSE. This model explained 10% of the variability in LLSPS.

**Conclusion:** Self-reported lasting pain that affects daily activities was associated with impaired physical performance in older people being discharged from inpatient aged care rehabilitation. This relationship persisted after adjusting for depression, age, co-morbidity and cognition but these variables together explained a relatively small amount of the variability in LLSPS.

## Increased trunk lean gait modification for medial knee load reduction in people with medial knee osteoarthritis

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Kim L Bennell, Centre for Health, Exercise & Sports Medicine; Physiotherapy; School of Health Science; The University of Melbourne; Melbourne.

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Tim V Wrigley, Centre for Health, Exercise & Sports Medicine; Physiotherapy; School of Health Science; The University of Melbourne; Melbourne.

**Questions:** In medial knee osteoarthritis (OA) participants, does increased lateral trunk lean towards the symptomatic side during gait: (i) reduce medial compartment joint load; (ii) produce a dose-response load reduction with increasing lean; and (iii) immediately change knee pain?

**Design:** Repeated measures experimental study.

**Participants:** People with clinical and radiographic medial knee OA (13F, 9M; age 68.4yr±10.2; mass 78.3kg±16.1).

**Method:** Participants underwent three-D gait analysis along a 10m walkway (8-camera VICON, 3 AMTI force plates) requiring 5 trials for each of four test conditions. Following natural walking trials, a physiotherapist instructed participants to lean their trunk towards the symptomatic limb during ipsilateral stance. Real-time biofeedback of trunk lean angles and target levels was provided to participants via a projector screen. Trunk lean conditions at natural gait speed were recorded in random order where participants attempted the following lean angles: small (6°); medium (9°); and large (12°). Knee pain during walking conditions was evaluated via 11-point numeric rating scale.

**Outcome measures:** Measures of medial knee load, the knee adduction moment (KAM) peaks (early and late stance), and KAM impulse.

**Results:** Increased trunk lean significantly reduced all KAM measures ( $p < 0.001$ ), with larger trunk lean angles achieving greater reductions (early stance  $F = 107.6$ ; late stance  $F = 129.5$ ; and impulse  $F = 264.5$ ). There was no change in knee pain across conditions ( $p > 0.05$ ).

**Conclusion:** Increased lateral trunk lean is easily implemented and reduces medial knee load but does not immediately influence symptoms. Further research should determine if longer-term implementation can modify disease symptoms and structural disease progression.

**Outcome measure:** The primary outcome measure was the multi-attribute utility score from the Euroqol-5D generic health-related quality of life instrument. Patients completed self reports of the Euroqol-5D at admission and discharge. At admission, physiotherapists were asked to predict patients' health-related quality of life at discharge (reported using the Euroqol-5D). Patients with a mini-mental state examination  $> 23/30$  (better cognition,  $n = 151$ ) and  $< 23/30$  (poorer cognition,  $n = 81$ ) were analysed separately.

**Results:** The intraclass correlation coefficients between physiotherapist predicted and self-reported discharge Euroqol-5D by patients in the better cognition group and the poorer cognition group were 0.75(0.67-0.81) and 0.52(0.34-0.66) respectively. Mean differences between predicted and actual discharge health-related quality of life scores were non-significant for patients with better cognition ( $p = 0.151$ ) and lower by a mean(SD) of 0.088(0.030-0.126) for patients in the poorer cognition group ( $p = 0.003$ ).

**Conclusion:** This is the first empirical evidence of this nature demonstrating that physiotherapists have the capacity to integrate their knowledge of likely clinical progression and subjective issues affecting patients' and can predict the discharge health-related quality of life. Important implications from these findings for physiotherapists' role in patient-centred models of care will be discussed.

## Patient Perceived Readiness for Discharge from Rehabilitation to Home: implications from pilot data

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Jacqui Mitchell, Princess Alexandra Hospital

Susanne Kuys, School of Physiotherapy and Exercise Science, Griffith University & Allied Health Research Collaborative

Greg Morrison, Princess Alexandra Hospital

Michael Steele, Bond University

**Question:** Is patient perceived readiness for discharge home at discharge and at 4–6weeks follow-up associated with balance and mobility outcomes measured at discharge to home?

**Design:** A prospective cohort pilot study.

**Participants:** Sixteen female and 15 male in-patients with good cognition (MMSE  $> 23$  or FIM Cognitive  $> 25$ ) consented to participate. Adults with varied disorders (general debility: mean age 70.5  $\pm$  20.45; ortho-geriatric: mean age 76.2  $\pm$  15.88; and neurological: mean age 55.8  $\pm$  15.37) were completing rehabilitation at the Geriatric and Rehabilitation Unit at the Princess Alexandra Hospital in Brisbane.

**Outcome Measures:** The Modified Readiness for Hospital Discharge Scale (MRHDS) sub-scales and total score (/250) were recorded at discharge and by phone interview at 4–6weeks post-discharge. The Balance Outcome Measure for Elder Rehabilitation (BOOMER: 0-16), and the 10 Meter Walk Test (s) at comfortable (10MWT-S) and fast (10MWT-F) paces were measured at discharge.

**Results:** BOOMER scores were associated with personal care, household activities and knowledge of medical care plan at discharge ( $r = 0.437$ - $0.554$ ) and physical readiness, personal care ( $r = .545$ - $.634$ ), knowing medical plans and treatment ( $r = .613$ - $.623$ ) and support for plans ( $r = -0.502$ ) at follow-up. The 10MWT-F was associated with perceived strength, energy, physical abilities at discharge ( $r = -0.504$ - $-.525$ ) and knowing medical care plan at discharge ( $r = 0.554$ ) and follow-up ( $r = -0.777$ ). The 10MWT-S was associated with strength ( $r = -.430$ ) and stress ( $r = .400$ ) at discharge and emotional readiness at follow-up ( $r = -0.701$ ).

**Conclusion:** Balance and mobility tests at discharge showed selective and differing associations with items on the MRHDS at discharge and follow-up. BOOMER scores better predicted physical readiness and personal care ability at 4–6weeks follow-up.

## Are physiotherapists' expectations of patients' health-related quality of life on discharge from acute rehabilitation accurate?

Steven M McPhail, Centre for Functioning and Health Research, Queensland Health

Terry P Haines, Monash University

**Questions:** After a routine initial assessment, are inpatient rehabilitation physiotherapists able to accurately anticipate (predict) older patients' discharge health-related quality of life? Is the accuracy of the prediction dependent on patient cognition?

**Design:** Prospective longitudinal cohort investigation with two assessment points (admission and discharge from inpatient rehabilitation).

**Participants:** Patients ( $n = 232$ , all diagnoses included) at a tertiary hospital geriatric rehabilitation unit (median(IQR) length of stay 42(25-66) days), and their treating physiotherapists ( $n = 29$ ).

## 630

### Anterior knee pain duration is the most consistent predictor of 12-month prognosis

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Robbart van Linschoten, Erasmus University, The Netherlands

Bill Vicenzino, The University of Queensland

Mariénke van Middelkoop, Erasmus University, The Netherlands

**Question:** Which factors predict poor prognosis over 12 months in individuals with anterior knee pain (AKP)?

**Design:** Prospective cohort study, utilising data from two randomised clinical trials (Australia, Netherlands).

**Participants:** 310 individuals with insidious onset AKP (greater than 6 weeks duration).

**Outcome measures:** Pain severity (worst or during activity, 100 millimetre visual analogue scale or 11-point numerical rating scale), Kujala Patellofemoral Score (KPS), Functional Index Questionnaire (FIQ), and perceived recovery (dichotomised as "markedly improved", "not improved") at three and 12 months. Potential prognostic factors included age, gender, body mass index, work type, AKP duration, bilaterality, treatment preference and allocation, baseline pain and function, and recruitment method.

**Results:** Longer duration was significantly associated with poor outcome at three months (pain, KPS: range  $\beta$  4.4, 95% CI 0.7 to 8.2, to 12.3, 3.6 to 21.1; recovery: odds ratio (OR) 0.4, 95% CI 0.1 to 0.9) and 12 months (pain, KPS, FIQ: range  $\beta$  1.6, 95% CI 0.5 to 2.6, to 24.9, 15.5 to 34.4; recovery: OR 0.2, 95% CI 0.1 to 0.6). Higher pain severity and lower KPS scores at baseline were significantly associated with poor outcome on multiple measures at three and 12 months ( $p < 0.05$ ).

**Conclusion:** Long AKP duration is the most consistent predictor of poor outcome on measures of pain, function and perceived recovery over 12 months. Findings suggest that physiotherapists should attempt to prevent AKP chronicity through early management utilising interventions with known efficacy in order to optimise prognosis.

## 631

### Functional measures for anterior knee pain: which one is most responsive?

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Kay M Crossley, The University of Melbourne

Bill Vicenzino, The University of Queensland

**Question:** Which patient-reported and physical tests of function are most responsive to change over 12 months in individuals with anterior knee pain (AKP)?

**Design:** Prospective cohort study.

**Participants:** 179 individuals with insidious onset AKP (> six weeks duration) enrolled in a randomised clinical trial (RCT).

**Outcome measures:** A blinded assessor measured function at baseline, six weeks, and three and 12 months. Patient-reported outcomes included Functional Index Questionnaire (FIQ), Lower Extremity Functional Scale (LEFS) and Patient-Specific Functional Scale (PSFS). Physical tests were the number of pain-free step-ups, step-downs and squats.

**Results:** Of the patient-reported outcomes, the PSFS demonstrated the largest effect sizes (ES) and standardised response means (SRMs) across the three follow up times (PSFS: ES 2.7-3.7, SRM 1.6-1.8; FIQ: 1.2-1.8, 1-1.3; LEFS: 0.8-1.3, 1-1.3). The minimal detectable change (MDC) was substantially greater for the FIQ (27-29% of total possible score versus 9-10% for LEFS and PSFS). Of the physical tests, effect sizes and SRMs were largest for step-ups across 12 months (step-ups: ES 1.4-2.4, SRM 0.9-1.5; step-downs: 1.1-2.2, 0.7-1.2; squats: 0.9-2, 0.6-1). Step-ups had the lowest MDC over time (7%; squats 7-13%; step-downs 19-22%).

**Conclusion:** The PSFS was most responsive to change over 12 months in individuals with AKP, followed by step-ups. The PSFS, LEFS and step-ups were associated with the least amount of measurement error. Researchers and clinicians who choose to utilise a single outcome to measure function over 12 months in those with AKP should select the PSFS, and include step-ups if a physical measure is desired.

## 632

### Lower limb function is reduced in people with patellofemoral osteoarthritis after anterior cruciate ligament reconstruction

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Michael Makdissi, University of Melbourne

Hayden G Morris, University of Melbourne

Belinda Gabbe, Monash University

Marcus G Pandey, University of Melbourne

**Question:** What is the prevalence of patellofemoral osteoarthritis (PFOA) after anterior cruciate ligament reconstruction (ACLR) and; is lower limb function reduced in those with radiographic PFOA compared to those who are free of OA?

**Design:** Cohort study and case-control study.

**Participants:** 70 people who were 5–10 years post ACLR (primary repair, aged >18 at time of surgery) using an arthroscopic hamstring tendon autograft from a single surgeon.

**Outcome measures:** (i) standard radiographs to grade compartment specific OA using established criteria; (ii) patient Reported Outcomes (PRO)s including: Knee Osteoarthritis Outcome Score (KOOS), Anterior Knee Pain Scale (AKPS), Tegner Activity Scale, International Knee Documentation Committee score (IKDC); and (iii) objective measures of functional performance on hop tests.

**Results:** Radiographic PFOA was evident in 47% (33/70). Of the 36 (51%) people with radiographic OA, isolated PFOA was the most common distribution (41%), followed by tri-compartmental distribution (31%). There were no differences age, height, weight between those with and without PFOA. For PROs, individuals with PFOA had significantly worse scores on the AKPS ( $p = 0.01$ ), IKDC ( $p = 0.003$ ) and most scales of the KOOS ( $p = 0.003-0.035$ ) than those without OA. No differences were observed for the Tegner activity scale. Participants with PFOA performed worse on functional tests (hop distance and side hop test) than those who were free of OA ( $p = 0.033$ ;  $p = 0.032$ ).

**Conclusion:** PFOA is relatively common ~7 years after ACLR and is associated with reduced lower limb function (PROs and objective measures of performance).

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## 633

### People with patellofemoral osteoarthritis ambulate with different hip muscle force and joint kinematics

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Timothy W Dorn, University of Melbourne

Marcus G Pandy, University of Melbourne

**Question:** Do individuals with symptomatic radiographic patellofemoral (PF) osteoarthritis (OA) demonstrate differences in gluteus medius muscle force and hip abduction kinematics during walking compared to those who are free of OA?

**Design:** Cross-sectional study.

**Participants:** 53 people with radiographic evidence of PF OA (rated from skyline radiographs) and anterior knee pain symptoms during rising from sitting and/or squatting were compared to 14 aged matched, painfree controls.

**Outcome measures:** A three-dimensional musculoskeletal model was scaled to match individual participant anthropometry and then used to calculate muscle forces. Joint kinematics and ground forces were first input into the model to compute net joint moments. The net joint moments were then decomposed into individual muscle forces by minimizing the square of the sum of muscle activations, while subject to physiological bounds on each muscle according to its force-length-velocity properties. Muscle forces were evaluated against temporal EMG recordings and normalized to body weight. Between-group comparisons were made using an ANCOVA (gender and walking speed as covariates).

**Results:** Participant characteristics were similar between groups. The estimated muscle force calculations revealed that the participants with PF OA utilised lower peak gluteus medius muscle force ( $p = 0.037$ ), and walked with greater peak hip adduction ( $p < 0.001$ ) than healthy controls.

**Conclusions:** This study identified that people with PF OA utilize different hip strategies to ambulate than painfree, aged-matched controls, and has implications for rehabilitation of this subgroup of people with PF OA.

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## 634

### Do People with 'Poor' Single Leg Squat Performance have Reduced Function, Balance And Strength?

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Marcus G Pandy, The University of Melbourne

Kay M Crossley, The University of Melbourne

**Introduction:** The single leg squat is frequently used in clinical sports physiotherapy to assess functional performance and to guide treatments. It is not known whether people rated as 'good' versus 'poor' performers display differences in functional capacity, balance and strength.

**Design:** Cross-sectional study with assessor blinding.

**Participants:** 76 active adults (run > 20 km/week or participate in running-related sport).

**Outcome measures:** Reliable (ICC > 0.80) clinical tests of functional capacity (one-leg rise test, hop for distance, side hop test), hip strength (assessed using a hand-held dynamometer) and balance (measured as centre of pressure excursion on a Wii Balance Board) were evaluated. Single leg squat performance was videotaped and rated by a panel of clinicians as 'good', 'fair' or 'poor' performance. Differences in outcome measures across single leg squat performance were evaluated, in men and women separately.

**Results:** In the female participants, 'poor' performance on the single leg squat was associated with having lower performance on the one-leg rise test ( $p = 0.014$ ) and lower hip abduction torque ( $p = 0.019$ ). No differences in function or strength were observed in the male participants. For a subset of participants ( $n = 45$ ) 'poor' performers displayed significantly greater mediolateral postural sway ( $p = 0.001$ ). Similar results were observed in men and women when analysed separately. **Conclusions:** The single leg squat is a reliable clinical tool that can identify female runners with reduced functional ability and hip strength, and balance deficits in men and women and which may be used to direct preventative interventions.

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## 635

### Caudal occipital malformation: case studies of two Yorkshire Terriers

Lisa G Bedenbaugh, United States

Caudal Occipital Malformation Syndrome (COMS) is a condition that has been described in veterinary literature to describe a malformation of the foramen magnum, causing crowding in the cervicomedullary junction and often producing varying levels of neurological manifestations. It is similar to a Chiari Type I malformation in humans, although canines seldom exhibit cerebellar herniation through the foramen magnum like humans do. This syndrome is most common in small and toy breeds, most notably Cavalier King Charles spaniels, Yorkshire terriers and toy poodles. In addition to the malformation of the occiput, many of the dogs with this condition also exhibit cervical myelopathy, due to syringohydromyelia. This presentation will provide a synopsis of the pathoanatomy and pathophysiology of COMS and describe two cases seen in Yorkshire Terriers presented for physical rehabilitation. One case was being managed conservatively, while the other received rehabilitation following a surgical decompression.

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## 636

### Mechanical properties of the equine flexor tendons: a comparative study between forelimb and hindlimb

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Renate Weller, Royal Veterinary College, United Kingdom

**Objective:** To determine the differences in the mechanical properties of the equine superficial and deep digital flexor tendons and suspensory ligament within and between the forelimb and hindlimb.

**Sample:** Seven pairs of cadaver forelimb and hindlimbs from Thoroughbred type horses without obvious tendon pathology.

**Method:** Tendons were dissected and ultrasonography used to determine length and cross sectional area. Tendons were secured between cryoclamp plates using liquid carbon dioxide in a servo-hydraulic materials testing machine and preconditioned with 20 cycles of 10 N to 4 kN force before testing to rupture. Displacement data, force and smallest cross sectional area were used to determine the stiffness, stress, strain and elastic modulus of each tendon.

**Results:** Cross sectional area was largest in the suspensory ligament ( $p < 0.001$ ). 50% of the deep and 42.8% of the superficial digital flexor tendons ruptured mid-tendon corresponding to the region of the smallest cross sectional area. Tendon stiffness was greatest in the hindlimb and least in the superficial digital flexor tendon. Maximum force was greatest in the deep digital flexor tendon but not significantly different in tendons between limbs ( $p = 0.41$ ). There was no difference between limb maximum strain or stress but strain was greatest and stress was lowest in the suspensory ligament. Elastic modulus was lowest in the suspensory ligament and greatest in hindlimb tendons ( $p = 0.002$ ).

**Conclusion:** Understanding tendon mechanical properties and the amount of load required to cause damage/rupture allows an insight into the threshold of tendon elasticity and risk of injury.

## 637

### EMG and stepping parameters after joint replacement surgery: a nested single case series

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Sandra Brauer, University of Queensland

**Question:** Does the type of inpatient physiotherapy after THR or TKR surgery affect muscle activation patterns in the operated limb when stepping up?

**Design:** Prospective, nested single case series recruited from an existing randomised clinical trial, with blinded assessment.

**Participants:** Eleven patients (7 F) within 2 weeks of joint replacement surgery and ten healthy elders (4 F).

**Intervention:** On day 4 post-operatively, in addition to usual ward physiotherapy, subjects received additional ward physiotherapy (control), aquatic physiotherapy (intervention) or general water exercise (intervention) daily until discharge.

**Outcome measures:** EMG onset of Tensor Facia Lata, Gluteus Medius, Vastus Lateralis and Vastus Medialis in the stance limb relative to movement onset, detected using dual forceplates, during various stepping tasks.

**Results:** Data was analysed graphically using the 2 times standard deviation method. Interpretation of results was difficult because of the within subject variability in onset at baseline. At Day 14 after TKR, onsets tended to be more often anticipatory after aquatic or ward physiotherapy than after general water exercise. The difference was less clear after THR. An interesting additional finding was that muscle onsets during stance in the unaffected limb also tended to be late pre-operatively in many subjects. By Day 180 normal anticipatory onset patterns had been regained by most subjects in both the operated and the unaffected limbs.

**Conclusion:** The clinical significance is difficult to generalise beyond the effect in these specific single cases because of the considerable within and between subject variability in onset timing and stepping parameters.

**Trial registration:** ACTRN12609000766213

## 638

### The hidden risk of a 6 Minute Walk Test in Pulmonary Arterial Hypertension

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**Background:** The 6 minute walk test (6MWT) is a standard clinical estimate of functional capacity and is routinely used to evaluate response to specific pulmonary arterial hypertension (PAH) therapies. While malignant ventricular arrhythmias are reported to be rare in PAH patients, atrial fibrillation and atrial flutter are equally common and invariably associated with deterioration and right ventricular failure which may potentially increase the risk of performing a 6MWT. Electrocardiographic monitoring is not routinely recorded during a 6MWT.

**Design:** Case report of ventricular fibrillation (VF) arrest following a 6MWT.

**Participant:** 25 year old female with surgically repaired congenital heart disease with associated pulmonary hypertension on combination PAH therapy; Echocardiography: Severe RV dilatation, moderate RA dilatation, RVSP 61mmHg, moderate LV dysfunction with LV EF 43%. RHC: mean PAP 37mm Hg, CI 2.1 L/min/m<sup>2</sup> PVR 10 WU, WHO class II. 6 MWT: 610m, SpO<sub>2</sub> nadir 85%.

**Outcome:** One minute post 6MWT patient suffered VF cardiac arrest.

**Results:** Coronary angiogram and IVUS (intravascular ultrasound) with exercise excluded compression of left main coronary artery from a dilated pulmonary artery as possible cause. Review of defibrillator and pacemaker rhythm suggestive of polymorphic VT secondary to LV dysfunction as probable cause. Implantable defibrillator inserted.

**Conclusions:** This case highlights the need for identification of patients at risk of cardiac arrhythmias associated with PAH and the need for ECG monitoring while undertaking simple tests of functional capacity.

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### Effects of exercise training on cardiovascular fitness and quality of life in patients with a left ventricular assist device (LVAD)

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Scott Bradley, Alfred Health

Anne E Holland, Alfred Health, and La Trobe University

**Question:** What is the effect of exercise training on exercise capacity and quality of life in patients with a left ventricular assist device (LVAD)?

**Design:** Prospective, randomised controlled trial with concealed allocation, assessor blinding and intention-to-treat analysis.

**Participants:** Fourteen patients, aged 47.3 ± 14.0 (SD) years, that underwent LVAD insertion as a bridge to heart transplantation.

**Intervention:** Eight weeks of gym-based aerobic and strengthening exercises, for one hour, three times a week, in addition to a daily, progressive mobilisation program, compared to the control group that completed the mobilisation program alone.

**Outcome measures:** Exercise capacity was measured using maximal cardiopulmonary exercise testing on cycle ergometry and six minute walk distance, while quality of life was measured using the SF-36 questionnaire. Measures were taken before and after the eight week intervention.

**Results:** No adverse events were reported during the trial. There was no significant difference between groups for improvements in peak oxygen consumption (Exercise: 4.35 ± 3.67 ml.kg<sup>-1</sup>.min<sup>-1</sup> versus Control: 2.90 ± 2.87 ml.kg<sup>-1</sup>.min<sup>-1</sup>, p = 0.43), six minute walk distance (Exercise: 181 ± 100m, Control: 122 ± 78 m, p = 0.25) and quality of life (all domains p > 0.05).

**Conclusion:** Exercise training is both feasible and safe in patients with a LVAD. Trends towards greater improvement in exercise capacity and quality of life in the patients who underwent exercise training warrant further investigation in a larger trial.

**Trial registration:** ACTRN12609000742279



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### Exercise programmes are effective and safe in a burns population: a controlled trial

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**Question:** What is the effect of an exercise program on safety, physical, functional and quality of life measures in adults post burn injury?

**Design:** A quasi-randomized controlled trial with concealed allocation, assessor blinding and intention to treat analysis.

**Participants:** Thirty patients (24 males), mean age 34.3 (SD 13.1) years, mean TBSA 42.9% (SD 13.3) post final grafting of burns.

**Intervention:** Following baseline tests to establish fitness level, both groups completed stretching and the intervention group also underwent a supervised high intensity (80% maximal heart rate; 70% of 3 repetition maximum) combined aerobic /resisted exercise program for three months.

**Outcome measures:** The primary outcome was the burns specific health scale (abbreviated) (BSHS-A), and secondary outcomes were handgrip, muscle strength, QuickDash score, lower extremity function score, VO<sub>2</sub> peak, distance covered in Shuttle walk. Outcomes were taken at baseline, six and 12 weeks.

**Results:** The intervention group increased their quadriceps strength by 42.5kg (95%CI 37.1 to 53.9), Shuttle walk distance by 118% (95%CI 60 to 189), lower extremity function score by 75% (95% CI 51.6 to 86.8) and decreased the QuickDash score by 14.7% (95% CI -22.8 to -6.6) compared to the control group. There were no adverse events during either testing or training.

**Conclusion:** A high intensity cardiovascular/resisted exercise programme resulted in significant improvements in functional, physical and psychological measures and should be mandatory for all patients post burns.

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### Clinical outcomes after treatment in a primary care continence clinic within a tertiary hospital setting

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Jo-Lynn Tan, Royal Women's Hospital, Melbourne

**Question:** Can conservative management of female urinary incontinence within a primary care clinic in a tertiary hospital setting improve symptoms and reduce the number of women requiring gynaecological surgery?

**Design:** All new patients attending the continence management and urogynaecology clinics between March 2009 and November 2010 completed the Female Lower Urinary Tract Symptom Questionnaire at their initial and fourth appointment, or discharge if the patient was discharged prior. Symptom scores were compared for patients who attended continence management versus urogynaecology, and before and after conservative treatment for patients attending the continence management clinic. Surgical rates were obtained from hospital data.

**Results:** 144 pre- and post- treatment questionnaires were analysed. At baseline there were no differences in symptom scores between women who attended conservative management and those who had medical management, except for increased bother associated with voiding difficulty ( $p=0.03$ ) in women triaged to medical management. There were highly significant improvements on all symptom and bother scores ( $p < 0.001$ ) of the Female Lower Urinary Tract Symptom Questionnaire before and after conservative treatment. The rates of surgery were similar for women who completed conservative management compared to those who did not (14.8%:19.1%,  $p = 0.63$ ).

**Conclusions:** This audit confirms findings from previous studies supporting the use of conservative management as first line therapy for female urinary incontinence. Despite improvement in symptoms after conservative management, surgical rates were similar for those who completed treatment compared to those who did not. Further investigation of factors influencing the decision to have surgery is required.

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### The prevalence of urinary incontinence in women in Oman

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Jackie Center, Garvan Institute of Medical Research

The purpose of this cross-sectional study was to determine the prevalence of urinary incontinence (UI) in Omani women. In Oman the role of physiotherapists in relation to continence and women's health is not widely recognised despite good evidence that physiotherapy treatments are effective. Establishing the prevalence of UI among Omani women and the impact it has on their daily lives will inform and justify the development of health education and treatment programs including physiotherapy. Eight hundred urban and rural dwelling adult Muslim women were recruited door-to-door using a stratified household-based sampling method incorporating all eight regions of Oman. Data were collected by interview in English or Arabic using a valid and reliable questionnaire developed for the study. Response rate was 99%. Forty-three percent had UI; 23% stress UI; 3% urge UI and 17% mixed UI. In those affected, symptoms were moderate to severe in 25% and bothersome in 65% but only 20% sought care. Reasons for failing to seek care were lack of awareness it could be treated (53%); embarrassment (17.5%) or that it was not considered a big problem (12.5%). At present in Oman continence physiotherapy services are very limited and only available in the capital city Muscat. The scope of the problem of UI identified in this study suggests the need for more physiotherapy services specializing in this area and better health education about UI so that more women are aware that this disabling condition can be treated effectively.

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### Predictors of postoperative increase in extracellular fluid following surgery for early breast cancer

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Louise Koelmeyer, Westmead Breast Cancer Institute

Jane Beith, Sydney Cancer Centre (Royal Prince Alfred Hospital)

James French, Westmead Breast Cancer Institute

Owen Ung, Royal Brisbane and Women's Hospital

**Question:** What are the predictors of change in extracellular fluid in the postoperative period for women treated surgically for early breast cancer. Extracellular fluid is comprised, in part, of lymph. Particularly in the postoperative period, there is debate as to how much women should use their arm on the 'at risk' side due to the presence of a chest drain.

**Participants:** Women ( $n=317$ ) were recruited preoperatively and assessed prior to and following surgery for early breast cancer.

**Outcome Measure:** Our dependent variable was the absolute change in extracellular interlimb fluid ratio, assessed by bioimpedance analysis. Potential predictors included age, body mass index, pre-operative interlimb bioimpedance ratio, whether surgery occurred on the dominant side, type of breast surgery, axillary surgery and reconstruction surgery, number of axillary nodes removed, number of affected nodes, and lastly the extent to which the women protected their arm in the post-operative period. The relationship of each variable to the change in interlimb bioimpedance ratio was assessed and significant variables ( $p \leq 0.25$ ) were further examined with a multivariate linear model.

**Results:** Risk factors for increased extracellular fluid ratio in the first two weeks postoperatively were the pre-operative interlimb bioimpedance ratio, surgery on the side of the dominant upper limb and treatment by mastectomy ( $P < .001$ ).

**Conclusion:** Our data suggest that in the immediate post-operative period when a drain is present, women who have undergone a mastectomy should be somewhat cautious in use of their arm.

**Acknowledgements:** Cancer Australia and National Breast Cancer Research Foundation

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## 644

### Risk factors for arm lymphoedema secondary to early breast cancer after one year

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Judy M Simpson

MiJound Lee

**Question:** what are the risk factors for the development of arm lymphoedema at 13 months following surgery for early breast cancer.

**Participants:** One hundred and sixty women, aged  $52.5 \pm 11.7$  y, who had undergone either axillary node dissection or sentinel node biopsy in combination with mastectomy or wide local excision within the previous 6 weeks for unilateral early stage breast cancer were randomized to an 8 week exercise group or to a control group.

**Outcome measures:** The presence of lymphoedema was determined with bioimpedance spectroscopy in which the inter-limb bioimpedance ratio was determined from measurements of each arm with electrode placement using the equipotential principle. Possible predictors of lymphoedema included baseline variables of age, body mass index, measured shoulder range of motion and strength, perceived shoulder range and strength, perceived arm swelling, and physical measures indicative of lymphoedema. In addition, factors related to management of the breast cancer and group allocation were considered as possible predictors for lymphoedema.

**Results:** Twenty-one women were identified as having lymphoedema, based on previously established cut-offs. Risk factors for the development of lymphoedema at 13 months following surgery were surgery on the non-dominant side (OR: 6.42 (95%CI: 1.95 to 21.09);  $P < .001$ ) and treatment by mastectomy (OR: 2.76 (95%CI: 0.99 to 7.7)  $P < .047$ ).

**Conclusion:** We speculate that our findings reflect preferential protection of the 'at risk' limb when the 'at risk' limb is non-dominant further suggesting that limb usage protects against lymphoedema. **Acknowledgements:** The NSW Cancer Council and National Breast Cancer Research Foundation

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## 645

### Aquatic Physiotherapy for women with secondary lymphoedema: Two Australian Pilot Trials provide guidelines for clinical practice

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**Question:** Can women with secondary lymphoedema of the arm or leg perform aquatic physiotherapy without increasing the volume of the limb or experience of lymphoedema symptoms?

**Design:** randomised controlled trial with assessor blinding.

**Participants:** 16 women with unilateral secondary arm lymphoedema (trial 1) and 17 women diagnosed with secondary leg lymphoedema (trial 2).

**Intervention:** Both experimental groups participated in a one hour aquatic physiotherapy session, three times weekly over four weeks (trial 1) and twice weekly over four weeks (trial 2) while maintaining their usual lymphoedema self-management intervention. The intensity of the aquatic physiotherapy programme was graduated over the intervention period. Both control groups maintained their usual lymphoedema self-management only.

**Outcome measures:** Participants were assessed and measured on six occasions over the 12 week study period using the modified Miller Clinical Grading system, Lymphoedema Symptom Specific Questionnaire, limb measurements (Perometry, circumferential) and Bioimpedance measures.

**Results:** Subjective reporting of ache, decreased fitness and frustration with their condition of the experimental group demonstrated a trend towards improvement during the intervention period in both trials. There were no significant changes in limb measures in either trial but some trends for improvement during participation were demonstrated.

**Conclusion:** These pilot studies contribute to the growing evidence that suggests that women with secondary limb lymphoedema can safely participate in aquatic physiotherapy. However, participants' comments stated clearly that the guidance of an experienced lymphoedema trained physiotherapist was paramount in providing the confidence to explore greater exercise intensity.

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## 646

### Reliability of ultrasound imaging in the assessment of lower limb lymphoedema

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**Question:** Is ultrasound imaging reliable in the assessment of lower limb lymphoedema?

**Design:** Randomised within-participant experimental study.

**Participants:** Six females with lower limb lymphoedema.

**Intervention:** Ultrasound images taken in a random order from three sites on each lower limb by three assessors (two trained by a Radiologist).

**Outcome measures:** Ultrasound measurement of the dermis and subcutis layers at each site was made with each assessor blinded to other images.

**Results:** Using the Radiologist as the 'gold standard', correlations ( $R^2$ ) for each of the experienced Lymphoedema Therapists ranged between 0.429 to 0.974 for skin to fascia layer, 0.399 to 0.966 for the subcutis layer and 0.196 to 0.748 for the dermis over the sites on lower limbs. With all data combined from the three assessors across all sites,  $R^2$  were 0.959 (95%CI 0.94 to 0.975) and 0.948 (95% CI 0.93 to 0.965) between each of the physiotherapists and Radiologist. Correlation between the two physiotherapists was 0.949 (95% CI 0.93 to 0.965).

**Conclusion:** Variations between the Radiologist and either physiotherapist at any site were identified as possibly due to labelling error on image, movement of interstitial fluid with repeated measurement at same site, variation in pressure or positioning of device within the defined measurement site during imaging. Moderate to high reliability was achieved for most sites on the lower limb. Further research is ongoing to evaluate this technique for use in the assessment of lower limb lymphoedema. (Trial No. HREC/10/ QRBW/40)

### The breast lymphoedema severity symptom (BLYSS) questionnaire; development and validation

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Research into the effectiveness of treatment for breast lymphoedema has been constrained by the lack of a valid and reliable tool to assess the symptoms of breast lymphoedema. The development of the BLYSS questionnaire was undertaken in response to the need for a clinically useful instrument aiming to capture all dimensions of breast lymphoedema. The objective was to identify items that reflected the areas affected women considered important and incorporate them into a valid and reliable questionnaire that would be simple and convenient to administer. A sophisticated approach, designed to both maximise the chances of constructing a useful instrument and to vigorously test its validity and reliability, was chosen. Face validity of the BLYSS questionnaire was established by generating an item elicitation questionnaire based on a review of the literature, interviews with clinicians and structured interviews with affected women. Content validity was concluded after a panel of expert clinicians who diagnose and treat breast lymphoedema reviewed and determined that the items within the instrument satisfied the content domain. Reliability was determined using duplicate administration and is excellent. This questionnaire will be useful for any clinician treating breast lymphoedema. Further use could be as an outcome measure in research projects in acquiring evidence for clinical practice.

### The treatment of shoulder pain with Meridian Therapy: A comparison of 3 case studies

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Three separate case studies are discussed with emphasis on the involvement of the Yang Ming channel in meridian theory. The first case is a 40 year old bank manager who presented with increasing pain in the right shoulder, forearm and thumb/index finger over a six month period. He also had positive neural tension signs of the median and ulnar nerves. The second case is a 58 year old solicitor who presented with bilateral shoulder pain and decreasing range of movement over a period of 6 months. A diagnosis of adhesive capsulitis or "frozen shoulders" was eventually confirmed after extensive tests with a rheumatologist. The third case is a 51 year old administration clerk and part-time karate instructor, who presented with acute onset of left shoulder pain, decreased range of movement and an US scan that showed no clinical abnormalities. Presentation of signs and symptoms of each case as well as treatment protocol according to meridian therapy will be discussed.

### The effectiveness of thoracic manipulation on patients with chronic mechanical neck pain – A randomized Controlled Trial

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**Objective:** The aim of our study was to assess the effectiveness of thoracic manipulation (TM) on patients with chronic neck pain.

**Method:** 120 patients aged between 18 to 55 were randomly allocated into two groups: an experimental group which received thoracic manipulation, a control group without the manipulative procedure. Both groups received infrared radiation therapy (IRR) and a standard set of educational material. Thoracic manipulation and IRR were given twice weekly for 8 sessions. Outcome measures included craniovertebral angle (CV angle), neck pain (Numeric Pain Rating Scale; NPRS), neck disability (Northwick Park Neck Disability Questionnaire; NPQ), health related quality of life status (SF36 Questionnaire) and neck mobility. These outcome measures were assessed immediately after 8-sessions of treatment, 3-months and 6-months follow-up.

**Results:** Patients that received TM showed significantly greater improvement in pain intensity ( $p=0.043$ ), CV angle ( $p=0.049$ ), NPQ ( $p=0.018$ ), flexion ( $p=0.005$ ), and Physical Component Score (PCS) ( $p=0.002$ ) than the control group immediately post-intervention. All these improvements were able to maintain at the 6-month follow-ups.

**Conclusion:** This study shows that TM was effective in reducing neck pain, improving dysfunction and neck posture and most of the neck range of motion for patients with chronic mechanical neck pain up to half-year post treatment.

### Clinical classification and sub-grouping of patients with neck-arm pain

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**Questions:** What is the inter-examiner agreement in classifying patients with neck-arm pain, using specific classification systems? What is the diagnostic accuracy of two clinical examiners in classifying these patients?

**Design:** A cross-sectional study of patients with neck-arm pain and sub-grouped into two different neck-arm pain presentations.

**Participants:** Forty patients with unilateral neck-arm pain.

**Intervention:** Patients were examined by two clinicians and, using specific classification systems, classified into: (i) cervical radiculopathy, (ii) heightened nerve mechanosensitivity, (iii) other. The classifications were also compared to those made independently by two experts reviewing patients' clinical assessment notes and using their clinical judgement. The expert opinion was used as the reference criterion to assess the diagnostic accuracy of the clinical examiners in classifying each patient group.

**Results:** There was 80% agreement between clinical examiners, 80% between experts and 70%–80% between clinical examiners and experts in classifying patients with cervical radiculopathy (kappa between 0.41 and 0.61). Agreement was 72.5%–80% in classifying patients with heightened nerve mechanosensitivity (kappa between 0.43 and 0.52). Clinical examiners' diagnostic accuracy was high (radiculopathy: sensitivity 79%–84%; specificity 76%–81%; heightened nerve mechanosensitivity: sensitivity 78%–100%; specificity 71%–81%).

**Conclusions:** Compared to expert opinion, clinicians were able to identify patients with cervical radiculopathy and patients with heightened nerve mechanosensitivity in 80% of cases. Our data support the reliability of these classification systems.

**Acknowledgement of funding:** National Health and Medical Research Council (Grant 425560), Arthritis Australia, Physiotherapy Research Foundation.

## 651

### Movement patterning in dorsal neck muscles during dynamic neck extension in patients with neck disorders compared to healthy controls

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Movement patterns in the dorsal neck muscles are poorly examined and warrant further study. The aim of the study was to investigate tissue motions of dorsal neck muscles in persons with long standing neck disorders compared with healthy people, in a seated position during a standardized low loaded dynamic head extension 0-20-0°. Ten persons, with a neck disorder (patients) (mean age 62 years (SD 5.4)), and 10 healthy people matched for age and sex were included. Medical ultrasonography was used to in C4-C5 segmental level investigate regional tissue deformation of trapezius, splenius, semispinalis capitis (Semcap) and cervicis (Semcerv) and multifidus muscles and thus, inter-muscular movement patterning described as root mean square of deformation, velocity and acceleration. Except for a higher deformation ( $p=0.04$ ) in Semcap in healthy people than in patients, there were no significant differences between the two groups. When within-group differences among muscles were examined, there were in the patient group no significant differences among the muscles except for that multifidus had significantly higher ( $p=0.04$ ) acceleration than trapezius. In the group of healthy people, Semcap had higher deformation than trapezius ( $p=0.006$ ) and splenius ( $p=0.02$ ). Semcap ( $p=0.04$  and  $0.04$ ), Semcerv ( $p=0.01$  and  $p=0.002$ ) and multifidus ( $p=0.003$  and  $0.001$ ) had higher velocity and acceleration, respectively than trapezius. Multifidus also had higher velocity and acceleration than splenius ( $p=0.02$  and  $p=0.006$ , respectively) and Semcerv had higher acceleration than splenius ( $p=0.01$ ). One can conclude that despite large inter-individual variations, these facts indicate a difference in dorsal muscle patterning among patients and healthy people.

## 652

### Risk factors and clinical presentation of craniocervical arterial dissection: Preliminary results of a prospective study

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Christopher Levi, John Hunter Hospital

**Background:** Craniocervical arterial dissection leading to stroke is a rare complication of neck manipulation. Identification of individuals at risk may inform appropriate screening. Moreover, if dissection in progress can be more readily recognised medical intervention may be expedited.

**Aims:** To identify risk factors and describe presenting features of dissection.

**Participants:** Patients  $\leq 55$  years with dissection presenting to hospital in the Hunter region of NSW.

**Methods:** Patients were interviewed about preceding events and clinical features of their stroke. Connective tissue screening was undertaken.

**Results:** Nine patients (6 males), mean (SD) age 40.7 (7.3) years, were admitted with arterial dissection; seven vertebral artery and two internal carotid artery. Seven (78%) patients (6 vertebral) reported a history of recent minor mechanical head and neck trauma. Of these, three (43%) cases (2 vertebral) involved manual treatment of the neck. Three patients were smokers, one had hypertension; no other cardiovascular risk factors for stroke were present. Six (67%) patients reported transient warning symptoms (imbalance, speech and visual disturbances) within the preceding five weeks. Eight patients experienced unusual headache or neck pain prior to the onset of stroke, for four (44%) this was severe. Four (57%) vertebral patients reported dizziness.

**Conclusions:** Clinicians should be alert to possible symptoms of transient neurological dysfunction, particularly in patients reporting mild neck trauma.

## 653

### Are the alar ligaments effected by stress testing in the upper cervical spine? An examination using magnetic resonance imaging

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**Questions:** Can a direct measurable effect on alar ligament deformation be demonstrated upon application of the side-bending and rotation stress tests for the upper cervical spine? Is this consistent with published descriptions of the tests?

**Design:** Within-participant experimental radiological study.

**Participants:** Sixteen people between the ages of 19 and 38 with no known neck problems.

**Intervention:** Participants underwent magnetic resonance imaging performed in neutral and end-range stress test positions. Tests performed included side-bending and the rotation stress tests described for assessing alar ligament integrity. Proton density-weighted sequences were obtained using a standard head coil in a 3-Tesla system.

**Outcome measures:** Distances were measured from dens tip to inferior margin of foramen magnum and from midsubstance of the dental attachment of the ligament to its occipital insertion. Between-side differences were calculated for each measurement to account for inherent asymmetries in morphology. Differences were compared between the stress test and neutral positions using a Wilcoxon Signed-Rank test.

**Results:** Side-bending stress tests produced a mean between-side difference in ligament length of +1.22mm ( $p<0.01$ ) indicating increased measurement of the contralateral ligament. Rotation stress tests produced a mean between-side difference in ligament length of +1.88mm ( $p<0.01$ ) indicating increased measurement of the contralateral ligament.

**Conclusion:** This is the first study to demonstrate a direct effect of these clinical tests on the alar ligaments. Both the side-bending and rotation stress tests produce a consistent increase in measured length of the contralateral alar ligament. This is in accord with the rationale proposed for their use in clinical practice.

### Medical exercise therapy of dorsal neck muscles: a comparison of two exercises

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Little is known of how to best exercise the neck muscles. The aim was to compare the movement patterning of the dorsal neck muscles during two exercises. Nineteen healthy persons (mean age 28 years, SD7) were included in the study. Medical ultrasonography, was used to investigate deformation and deformation rate at C4-C5 segmental level of; trapezius, splenius, semispinalis capitis (semcap) and cervicis (semcerv) and multifidus muscles and thus, inter-muscular movement patterning described as root mean square during; upright sitting position in a pully (men 2Kg, women 1 Kg) and lie on one's stomach on a guild board (45°). During both exercises the volunteers were told to holding the neck still in line with the body and slowly from the pelvis trap the body backwards and thereafter go back to the original position. A higher deformation in splenius ( $p=0.05$ ) and higher deformation rate in all muscles but splenius ( $p=0.0006-0.05$ ) were registered for the exercise on the guild board compared with that in the pully. For both the exercises the highest mean value for deformation, and deformation rate were registered for semcap and the lowest for trapezius, with significant differences between the semispinalis muscles and trapezius ( $p=0.004-0.05$ ) in the pully. One can conclude that there is an indication for higher deformation as well as deformation rate in the dorsal neck muscles during the exercise on the guild board compared with that in the pully. However, both exercises can be used to exercise the dorsal neck muscles and especially the deeper ones.

### The incidence and severity of knee osteoarthritis (OA) ten years following anterior cruciate ligament (ACL) injury: Surgery versus conservative management

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**Question:** Does ACL surgery lead to OA?

**Design:** Prospective long-term non-randomised cohort study.

**Participants:** Eighty-four patients with completely ruptured ACLs were included.

**Intervention:** The same surgeon performed all surgery on average three years post injury. Twenty-nine patients received bone-patellar-tendon-bone (PT) grafts; 27 patients received semitendinosus-gracilis (STG) grafts; 28 patients had no surgery. All subjects received physiotherapy.

**Outcome measures:** The incidence and severity of tibiofemoral (TF) and patellofemoral (PF) OA was determined by an independent radiologist reviewing x-rays taken on all subjects 9–11 years post injury. OA was assessed as absent, mild, moderate or severe according to the Kellgren-Lawrence classification. A chi-square analysis was applied to the data.

**Results:** Sixty-two percent of patients with PT reconstructions had signs of TFOA either mild (38%) or moderate (24%) compared with 23% of those with STG reconstructions (all mild). In addition, patients with no surgery had 64% incidence of TFOA (54% mild, 10% moderate). Chi-squared analysis showed a significant difference between groups for TFOA incidence,  $\chi^2(4, N=84) = 11.92, p=.018$  but not for PFOA. Further analysis revealed that patients with STG reconstructions had significantly less TFOA than those with PT reconstructions ( $p=.012$ ) or those with no surgery ( $p=.034$ ).

**Conclusion:** This study has shown that the type of surgical reconstruction affects the incidence and severity of TFOA, but that no surgery may also lead to TFOA.

### Disruption of brain-grounded leg maps in painful knee arthritis? Evidence from a tactile acuity task

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Roberta Law, Royal North Shore Hospital, Sydney

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**Question:** Is two-point discrimination disrupted in painful knee osteoarthritis (OA)?

**Design:** Cross sectional study.

**Participants:** 20 consecutive patients (68 +/- 9.0 years; 14 F) with painful knee OA, 20 patients (64.9 +/- 7.8 years; 9 F) with arm pain, and 20 healthy and pain-free controls (37.3 +/- 15.5 years; 12 F).

**Outcome measures:** Two-point discrimination threshold (TPD) of suprathreshold but non-painful tactile stimuli, at the knees. Repeated measures ANOVA (covariate age) compared TPD between groups.

**Results:** TPD was larger in those with painful knee OA (45 +/- 13 mm) than it was in those with arm pain (35 +/- 11 mm) or in pain-free controls (26 +/- 10 mm; main effect of group  $p < 0.001$ ; LSD post-hoc  $p < 0.05$  for both).

**Conclusion:** Painful knee OA is associated with decreased tactile acuity, even when controlling for age. This result implies disruption of brain-grounded leg maps in people with painful knee OA. Whether such a disruption contributes to pain and dysfunction in knee OA is unknown. In light of studies in arm and back pain that show positive effects of training brain-grounded body maps, the current results suggest further investigation in knee OA is warranted.

### The relation between tactile acuity and motor imagery performance in patients with knee OA or back pain

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**Question:** Is tactile acuity related to motor imagery performance in patients with knee or back pain?

**Design:** Combined data from two cross-sectional studies.

**Participants:** Study A: 20 consecutive patients (68 +/- 9.0 years; 14 F) with painful knee OA, 20 patients (64.9 +/- 7.8 years; 9 F) with arm pain, and 20 healthy and pain-free controls (37.3 +/- 15.5 years; 12 F). Study B: 17 patients (41 +/- 12 years; 11 F) with back pain and 18 healthy and pain-free controls (41 +/- 11 years; 11 F).

**Outcomes measures:** Two point discrimination threshold (TPD) measured at the knees (Study A) or the back (Study B); accuracy on a left/right judgement task for foot images (Study A) or for trunk rotation (Study B). A linear regression compared the relationship between accuracy on left/right judgements and TPD. This regression was repeated separately for each group.

**Results:** After adjusting for age and group, accuracy was significantly related to TPD ( $p < 0.001$ ). For every increase in TPD by 1 mm, accuracy of motor imagery performance decreases by 0.6% for the back ( $p < 0.001$ ) and by 0.2% for the knee in healthy controls ( $p = 0.006$ ), but not for the knee in those with painful OA ( $p = 0.82$ ).

**Conclusions:** In both back pain and healthy controls, TPD is related to motor imagery performance. This suggests a relationship between the acuity of the functional receptive fields and cortical proprioceptive acuity. However, this relationship is lost in those with painful knee OA.

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## 658

### Self-management for osteoarthritis of the knee; disease specific or generic?

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The purpose of this study was to compare two 6-week self-management (SM) programs for people with OA knee. One a disease-specific self-management education program (OAKP), for people with OA of the knee designed for delivery by health professionals, the other the generic Arthritis Self-Management Program (ASMP) delivered by lay leaders. We hypothesised that the disease-specific OAKP would produce better outcomes than ASMP. In a registered RCT, 180 people (59 male; mean age 67 years) with OA knee were randomised to either OAKP or ASMP. Groups were assessed pre- and post-intervention, and six and 12 months later. Outcomes measured were WOMAC, SF36, balance, mobility and self-efficacy. Pain (VAS) was measured each week of the intervention. Differences between groups were examined using an intention to treat analysis with repeated measures ANOVA. P-values are single tail. Both groups improved significantly over time and maintained to 12 months. Improvements were significantly greater in OAKP than ASMP groups in WOMAC pain, physical function and total scores and SF-36 physical function and general health scales. During the intervention VAS pain decreased more in the OAK group: OAK mean (SE) 5.51 (0.25) to 4.57 (0.25); ASMP 5.12 (0.24) to 4.71 (0.25) (group x time  $p=0.04$ ). There were no significant differences between groups in the other outcomes. There were greater improvements in the OAKP group than the ASMP group for a number of variables, particularly in physical function and pain. These two improvements have implications for improved mortality and decreased disability for people with OA of the knee.

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## 659

### Are child bearing hips a risk factor for Greater trochanteric pain syndrome?

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Jill L Cook, Monash University

Wes Cormick, Canberra Specialist Ultrasound

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**Questions:** Does pelvis or hip width predispose women to Greater trochanteric pain syndrome?

**Design:** Prospective observational case controlled study.

**Participants:** Thirty two women with Greater trochanteric pain syndrome, 20 women having gluteal tendon reconstructions, 20 women with severe hip osteoarthritis, and 21 asymptomatic women were recruited from hospital waiting lists and the community.

**Outcome measures:** Measures from pelvic x-rays provided these ratios: anterior inferior iliac spine: lateral acetabulum; anterior inferior iliac spine: superior aspect of the greater trochanter; anterior inferior iliac spine: lateral greater trochanter; and superior greater trochanter: lateral greater trochanter. The acetabular index and the femoral neck shaft angle were measured. Anthropometric measures of BMI, waist to hip, and waist to greater trochanter ratios were calculated.

**Results:** No group difference was found for the pelvic or hip ratios. The gluteal tendon reconstruction group had a more acute femoral neck shaft angle than the other groups ( $p = 0.007$ ). Based on this result, the odds of a more acute angle are: Control: tendon reconstruction group = 3.33; control: hip osteoarthritis group = 0.85; Control: Greater trochanteric pain syndrome = 1.4. The Greater trochanteric pain syndrome and gluteal tendon reconstruction participants had larger trochanter girths than the other two groups ( $p = 0.021$ ).

**Conclusion:** The risk of GTPS associated with female anthropometry lies in the adipose distribution and femoral neck angle, not pelvic morphology.

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## 660

### Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery – a systematic review and meta-analysis

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**Question:** Are pre-operative interventions for hip and knee osteoarthritis effective in reducing pain, reducing musculoskeletal impairment, improving activity, improving quality of life, and reducing health service utilisation before and after joint replacement?

**Design:** Systematic review with meta-analysis of randomised controlled trials.

**Participants:** Participants with hip or knee osteoarthritis on waiting list for joint replacement.

**Intervention:** Any pre-operative intervention that was non surgical, non pharmacological, not single session and did not begin within one week of surgery.

**Outcome Measures:** Pain, musculoskeletal impairment, activity limitation, quality of life, and health service utilisation.

**Results:** Twenty-three randomised controlled trials involving 1461 participants awaiting hip or knee replacement surgery were identified. Meta-analysis provided moderate quality evidence that pre-operative exercise interventions for knee osteoarthritis reduced pain prior to knee replacement surgery. None of the other meta-analyses investigating pre-operative interventions for knee osteoarthritis demonstrated any effect. Meta-analyses provided low to moderate quality evidence that exercise interventions for hip osteoarthritis reduced pain and improved activity prior to hip replacement surgery. Meta-analyses provided low quality evidence that exercise with education programs improved activity after hip replacement with reduced time to reach functional milestones during hospital stay. Individual trials not included in meta-analyses due to heterogeneity provided evidence that interventions such as acupuncture, pain management programs, and self management programs improved some outcomes pre-operatively but there were no post-operative benefits.

**Conclusions:** Pre-operative interventions, particularly exercise, reduce pain for patients with hip and knee osteoarthritis prior to joint replacement and exercise with education programs may improve activity after hip replacement.

### Can gait assessment distinguish between people with hip Osteoarthritis, Greater trochanteric pain syndrome or an asymptomatic group?

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**Questions:** Does Trendelenburg gait or sign, gait speed, base of support, or quality differentiate between three distinct groups of people?

**Design:** Prospective case controlled observational study.

**Participants:** Thirty nine people with greater trochanteric pain syndrome, 20 with severe hip osteoarthritis, and 23 age and sex matched asymptomatic participants were recruited from hospital waiting lists and the community. Exclusion criteria included inflammatory and metabolic disorders. Nine blinded assessors viewed videos of gait and single leg stance.

**Outcome measures:** 10m walk, number of steps, base of support and timed single leg stance. Dichotomous assessments of antalgic gait, ipsilateral or contralateral lean, pelvic drop.

**Results:** The control group had higher self-selected gait velocity over 10m and took fewer steps than the osteoarthritis group ( $p < 0.001$ ) or GTPS groups ( $p = 0.004$  and  $0.02$  respectively), with no difference seen between the osteoarthritis and the greater trochanteric pain syndrome groups. The greater trochanteric pain syndrome participants had a shorter single leg stance time than control participants ( $p = 0.02$ ), but the osteoarthritis participants duration was not different from either of the other groups. Base of support measurement did not differentiate the groups. A higher proportion of osteoarthritis (50 %) than greater trochanteric pain syndrome participants (25 %) had an antalgic gait ( $p = 0.02$ ), but not ipsilateral or contralateral lean, or pelvic drop. Ipsilateral lean (20/59) is more frequently seen than pelvic drop (11/60), ( $p = 0.05$ ).

**Conclusion:** Gait analysis by time or quality does not differentiate between greater trochanteric pain syndrome or hip osteoarthritis.

### The utilisation of appropriate conservative management in patients with knee osteoarthritis awaiting orthopaedic consultation

Robin Haskins, Hunter New England Local Health Network

Judith Henderson, Hunter New England Local Health Network

Chris Barnett, Hunter New England Local Health Network

**Background:** Clinical practice guidelines advocate that patients with knee osteoarthritis receive timely access to conservative management, including pharmacological and non-pharmacological interventions, prior to referral for orthopaedic consultation. Anecdotal evidence and several reports in the peer-reviewed literature however suggest that appropriate conservative therapies are often under-utilised in this population. The aim of this study was to describe the utilisation of appropriate conservative non-pharmacological interventions in a group of patients with knee osteoarthritis referred for orthopaedic consultation in a large tertiary public hospital.

**Design:** Pragmatic descriptive cross-sectional study.

**Method:** All patients with knee osteoarthritis referred for orthopaedic consultation at a large tertiary public hospital were invited to attend an initial screening appointment with a physiotherapist. The prior use of non-pharmacological interventions and previous consultation with health professionals were investigated within the baseline assessment with the assistance of a standardised data collection tool.

**Results:** Sixty-six consecutive patients (65% female, mean age 64 years) with knee osteoarthritis (median 5.5 years of symptoms) comprised the included sample. Twenty-seven percent and 14% had previously consulted a physiotherapist and a dietitian respectively. Twenty-nine percent reported that they had received no previous non-pharmacological treatment, 30% had been advised about weight loss and 29% had been provided with an exercise program. Eighty-two percent reported that they had received no education about their knee complaint.

**Conclusions:** The findings of this research demonstrate an under-utilisation of appropriate conservative management in patients with knee osteoarthritis awaiting orthopaedic consultation. Barriers and facilitators of timely access to appropriate conservative treatment requires further investigation.

### A pilot investigation of an evidence-based multimodal conservative management package for patients with osteoarthritis of the knee

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Chris Barnett, Hunter New England Local Health Network

**Background:** Patients with osteoarthritis of the knee are often placed on lengthy waiting lists for orthopaedic consultation prior to the appropriate trial of evidence-based conservative management. The aim of this study was to measure the clinical effectiveness of standardising the referral process of a large tertiary public hospital to ensure that patients with knee osteoarthritis referred for orthopaedic consultation were offered timely conservative management.

**Design:** Pragmatic prospective observational pilot study.

**Method:** All patients with knee osteoarthritis referred for orthopaedic consultation at a large tertiary public hospital were invited to attend an initial screening appointment with a physiotherapist. Patients were subsequently referred for conservative management within a multidisciplinary team of treatment providers based upon their individual needs. Change in clinical status was measured at three months post-baseline using a standardised questionnaire. The primary outcome was a clinically important improvement in pain, defined as  $\geq$  two-point or 30% reduction in baseline score on a 10-point numerical rating scale.

**Results:** Forty-three consecutive patients with knee osteoarthritis (63% female, mean age 64 years) comprised the included sample with follow-up data available for 30 (70%). Fourteen patients (47%) achieved a clinically meaningful improvement in pain at 3 months. Eighty-three percent reported to be satisfied with their clinical results at the follow-up assessment, and all reported to be satisfied with the care they received.

**Conclusions:** The findings of this pilot investigation provide preliminary evidence to support the clinical effectiveness of providing timely conservative treatment to patients with knee osteoarthritis referred for orthopaedic consultation.

## 664

### The efficacy of a specific forearm brace (Go-Strap) compared to a standard counterforce brace in participants with tennis elbow

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**Background:** Physiotherapy management of tennis elbow typically incorporates a multimodal approach including application of a forearm brace. Good quality evidence comparing different braces in the management of tennis elbow is scarce.

**Question:** Does a novel forearm brace (Go-Strap brace, ThermoSkin™) improve pain-free grip, pressure pain threshold and wrist angle during a gripping task in people with tennis elbow compared with a standard counterforce brace and control condition?

**Design:** Repeated measures, crossover, double-blinded randomised control trial.

**Participants:** 35 participants with a clinical diagnosis of tennis elbow (mean age 47.8 (SD 8.5) years).

**Intervention:** All participants were measured before and after the application of a Go-Strap brace, a counterforce brace and control condition in a randomised order and a minimum of 48 hours between sessions.

**Results:** There was a significant main effect for time, with both braces significantly improving grip (Mean difference (95% CI): Go-Strap 22 N (8 to 36), counterforce 22 N (9 to 35)) and pressure (Go-Strap 48 kPa (2 to 93), counterforce 59 kPa (16 to 102)) pre- to post-application. There was no significant change with the control condition for any outcome. There was no significant difference between treatments for any outcome (grip:  $p=0.363$ ; pressure:  $p=0.480$ ; wrist angle:  $p=0.203$ ). In addition, wrist angle did not significantly change over time.

**Conclusion:** While the application of a forearm brace has an immediate positive effect on grip and pressure pain in participants with tennis elbow, the type of brace does not preferentially influence these outcomes.

## 665

### Effects of focal nerve compression on membrane excitability and symptoms in carpal tunnel syndrome

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**Question:** To investigate the effects of focal compression over the median nerve on axonal excitability and neurological symptoms in patients with carpal tunnel syndrome.

**Design:** Between-groups experimental study.

**Participants:** Eleven patients with carpal tunnel syndrome. Data were compared with control data from ten healthy subjects from a previous study. Approval was granted by relevant Hospital and University Human Ethics Committees. **Intervention:** A custom-built device simultaneously applied focal nerve compression over, and recorded sensory excitability from, the median nerve at the level of the wrist.

**Outcomes:** Concurrent recordings of: nerve excitability; magnitude of compression pressure; and symptom intensities for paraesthesia and numbness; were taken during periods of compression and subsequent recovery.

**Results:** During compression, refractoriness (a marker of voltage-gated transient  $\text{Na}^+$  channels) increased ( $62.4 \pm 3.4\%$ ;  $p < 0.001$ ), and was associated with rapid reductions in superexcitability, a marker of paranodal fast  $\text{K}^+$  conductances ( $16.9 \pm 2.8\%$ ;  $p < 0.001$ ), and compound sensory action potential amplitude ( $32.4 \pm 3.9\%$ ;  $p < 0.001$ ), consistent with axonal depolarization. Patients reported that symptoms of paresthesiae and numbness steadily increased throughout compression to greater intensities than for the control group ( $p < 0.05$  respectively). Reductions in compound sensory action potential amplitude and superexcitability developed more rapidly for patients with carpal tunnel syndrome compared to control subjects.

**Conclusions:** Axonal responses to compression are impaired in carpal tunnel syndrome and suggest a greater reliance on axonal membrane  $\text{Na}^+/\text{K}^+ \text{--ATPase}$  function. These data contribute to the understanding of mechanisms underlying symptom production in carpal tunnel syndrome.

## 666

### Intra and inter-tester reliability of physiotherapists using the Kapandji Index of Thumb Opposition for Assessment of the Injured Thumb: A Pilot Study

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Michael Steele, Bond University

**Question:** Do physiotherapists demonstrate intra and inter tester reliability when using the Kapandji Index of Thumb Opposition for assessment of the injured thumb?

**Study Design:** Test/re-test assessments were undertaken.

**Participants:** Twenty-six patients were recruited from the Hand Clinics at the Royal North Shore Hospital in Sydney. People with traumatic or degenerative conditions, or stiffness after immobilization were assessed. The ability to attempt active movements of the thumb was required.

**Outcome Measure:** The Kapandji Index of Thumb Opposition was used to assess opposition of the thumb by three physiotherapists who worked in the hand clinic but with varied experience in hand therapy. Two assessments were undertaken randomly by each physiotherapist across a 30 minute period.

**Results:** Male participants were significantly younger (mean age  $38 \pm 14.3$ ) than female participants ( $59 \pm 3.17$ ) and were more likely to present with traumatic injuries (2:1). Females presented equally across the three types of conditions. Cronbach alpha calculations determined absolute agreement between testers during assessments ( $\alpha_1 = 0.948$ , 95% CI1 = 0.900 to 0.975;  $\alpha_2 = 0.949$ , 95% CI2 = 0.901 to 0.975) demonstrating very high inter tester reliability between the physiotherapists. Paired sample correlations revealed the two scores of each assessor were highly associated (ICC = .937-.963) but the mean difference between the two measures showed trending ( $t = -1.724$ ,  $p = 0.096$ ;  $t = -1.806$ ,  $p = 0.083$ ) or significantly different scores ( $t = -2.726$ ,  $p = 0.011$ ).

**Conclusion:** Physiotherapists presented with a high level of inter and intra-tester reliability using the Kapandji Index to assess thumb opposition. Factors associated with differences in scores within one test session warrant investigation.



### Advice and exercise are the most frequently used physiotherapy interventions after distal radius fracture: an observational study

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**Question:** What interventions are used by physiotherapists during rehabilitation after distal radius fracture?

**Design:** A multi-centre prospective observational study.

**Participants:** Fourteen musculoskeletal physiotherapists employed at four outpatient physiotherapy departments in Melbourne, Victoria.

**Outcome measures:** Frequency and times spent on active and passive physiotherapy interventions during rehabilitation after distal radius fracture were collected.

**Results:** Data on 160 distal radius fracture consultations were collected during the three month study period. Thirteen different physiotherapy interventions were used. The most frequently administered active interventions were advice to patient or family (90% consultations), prescription of a home exercise program (82%) and supervised range of movement and strength exercises (74%). The most common passive interventions were passive joint mobilisation (55% of consultations), massage (38%), oedema management (28%), hot packs (10%), and ice (1%). Advice was a more frequent intervention than passive interventions (McNemar's test,  $p < .01$ ), but there was no significant difference in frequency of exercise compared to passive interventions (McNemar's test  $p = .54$ ). Typically the consultation times of initial and follow-up appointments took around 29 minutes. Within a session, the average amount of time spent providing advice (5 minutes), prescribing a home exercise program (4 minutes) and supervising exercises (5 minutes) were greater compared to all passive interventions combined (9 minutes).

**Conclusion:** After a distal radius fracture physiotherapists frequently administer advice and exercise. These active interventions are consistent with the fracture management principle of movement, and current research that suggests exercise reduces impairment and improves activity in people after some upper limb fractures.

**Outcomes measures:** The primary outcomes are activity limitation (Lower Extremity Functional Scale) and quality-adjusted life years (Assessment of Quality of Life) assessed by a blinded assessor at 1, 3 and 6 months.

**Results:** The trial started recruitment in December 2010. 14 participants (mean age = 40, SD = 17 years) have been recruited to date. Participants have high activity limitation (mean Lower Extremity Functional Scale score = 33/80, SD = 16) and reduced quality of life (mean Assessment of Quality of Life score = 10/45, SD = 5) at baseline.

**Conclusion:** This randomised controlled trial will provide evidence for the optimum rehabilitation strategy of ankle fracture.

**Trial registration:** ACTRN12610000979055.

### The relationship between isokinetic quadriceps strength and a controlled step down test

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**Question:** Can a functional test be used to measure quadriceps strength?

**Design:** Correlational study.

**Participants:** Thirteen patients with unilateral anterior cruciate ligament deficiency (ACLD) and 13 with unilateral patellofemoral pain (PFP).

**Intervention:** Quadriceps strength was measured using a Cybex II dynamometer at 60°/second. The pain-free eccentric control angle was measured on the standing index leg as the patient lowered themselves from a 26cm high step. The pelvis remained strictly horizontal, the index knee remained aligned with the foot and the spine remained vertical. The maximum pain-free flexion angle possible with postural control was measured using a goniometer. The relationship between maximum isokinetic quadriceps strength and maximum eccentric control angle was assessed using Pearson's correlation.

**Results:** The mean quadriceps strength for affected legs was 74ft lbs and 96ft lbs for unaffected legs. The mean control angle for the affected side was 59° and for the unaffected side was 79°. The relationship between strength and eccentric angle in the injured leg was significant for both patients with ACLD,  $r = .83$ ,  $p < .001$ , and patients with PFP,  $r = .81$ ,  $p = .001$ .

**Conclusion:** A high correlation exists between isokinetic quadriceps strength and the eccentric control angle, more so in patients with the ACLD than with PFP. This study has described a simple, useful functional test that correlates strongly with instrumented strength and can be used by orthopaedic surgeons and physiotherapists to assess and monitor progress. However the correlation may not apply equally to all conditions.

### EXACT: EXercise or Advice after ankle fraCTure. Design of a randomised controlled trial

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Kriti Khera, The George Institute for Global Health, The University of Sydney.

Anne M Moseley, The George Institute for Global Health, The University of Sydney.

**Question:** What is the effectiveness and cost-effectiveness of an exercise-based rehabilitation program after ankle fracture compared to advice alone?

**Design:** Pragmatic randomised trial with concealed allocation.

**Participants:** 342 adults with ankle fracture will be recruited from 4 Sydney hospitals and randomly allocated to either the Advice or Rehabilitation group.

**Intervention:** All participants receive verbal and written advice about exercise at the time of removal of immobilisation. The Rehabilitation group additionally receives a 4-week exercise program designed, monitored and progressed by physiotherapists.

## 670

### Muscle onset can be improved by therapeutic exercise: a systematic review

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Tania Pizzari, La Trobe University

David Buttifant, Collingwood Football Club

**Question:** Can therapeutic exercise improve the timing of muscle onset following musculoskeletal pathology, and what exercise prescription parameters are being used to achieve these effects?

**Design:** Systematic review.

**Participants:** People with a musculoskeletal pathology that involves an altered muscle onset pattern.

**Intervention:** Therapeutic exercise.

**Outcome measures:** Muscle onset timing as measured by electromyography.

**Results:** To ensure a thorough review of the topic single group pre-post test studies were included in addition to randomised controlled trials. 16 trials were identified containing 19 therapeutic exercise groups. Three exercise modes were identified by the review: isolated muscle training, instability training, and general strength training. Isolated muscle training was consistently shown to have a positive effect on the muscle onset timing of transversus abdominus in people with chronic low back pain. Instability training showed mixed results for changing the onset timing of the peroneus longus and tibialis anterior muscles in people with functional ankle instability. General strength training had a positive effect on the onset timing of gluteus maximus, but no effect on the muscle onset timing of transversus abdominus or the deep cervical flexors in people with chronic low back or neck pain respectively. As this review included a mix of randomised and non-randomised studies, no meta-analysis was undertaken.

**Conclusion:** It is possible to improve muscle onset timing using therapeutic exercise. Isolated muscle training appears to be the most effective exercise mode at achieving these effects, although general strength training and instability training may also be considered in certain muscle groups.

## 671

### The Western Australian Spinal Pain Model of Care: Translating evidence into public health policy and practice using Health Networks

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**Background:** In order to address the burden of spinal pain in Western Australia (WA), an inter-disciplinary working party was convened by Health Networks (Department of Health, WA) to develop a Model of Care (MoC) for Spinal Pain. A MoC describes an evidence-based policy and practice framework for health service delivery.

**Methods:** Using broad networks of key stakeholders, specific evidence-based recommendations and strategies tailored to the needs of WA were developed.

**Results:** The MoC was endorsed for implementation in 2009. To date, three State government-funded projects that implement the recommendations have been undertaken, including: 1) A novel inter-professional low back pain (LBP) education programme for General Practitioners (gPEP); 2) A "system inversion" programme within tertiary pain medicine units, creating a move away from initial individual consultations to pre-clinic inter-professional group education (STEPS); 3) Delivery of gPEP and STEPS to health professionals and consumers, respectively, in regional WA. After gPEP intervention, General Practitioners demonstrated significantly greater translation of evidence-based LBP knowledge into self-reported clinical practice, greater use of appropriate active self-management, encouraging paced activity rather than rest, timely on-referral, appropriate use of pharmacologic options, reduced referral for imaging, and appropriate use of interdisciplinary management ( $p < 0.05$ ). The STEPS programme has reduced wait list times (105.6 to 16.1 weeks at one unit and 37.3 to 15.2 weeks at the other) and cost per new patient episode (\$AUD1807 to \$AUD881) at tertiary pain medicine units in WA ( $p < 0.05$ ).

**Conclusion:** Initial results of implementation strategies have shown positive outcomes, highlighting the efficacy of a network model.

## 672

### Modifying patterns of movement in people with low back pain—does it help? A systematic review

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**Objective:** This systematic review investigated the effect of movement-based interventions on movement patterns (physical measures of muscle activation, lumbo-pelvic kinematics or postural patterns) of people with low back pain. It also examined the relationship between changes in movement patterns and concurrent changes in pain and activity limitation.

**Methods:** Two independent reviewers performed a systematic review of controlled trials of treatments designed to alter movement or postural patterns of people with low back pain. Eight databases were sourced. Intervention effects were reported as standardized mean differences with 95% confidence intervals.

**Results:** Eleven trials comparing exercise, spinal manipulative therapy and movement for LBP were included. Five trials measured effects on specific trunk muscle activities; most demonstrated little difference between intervention and comparison for measures of trunk muscle size or function, and inconsistent relationship of treatment effect to improvements in pain or activity. Four trials measured effects on the 'flexion relaxation response', producing conflicting results for the influence of therapy on this outcome. Three measured lumbo-pelvic kinematic and postural patterns but were so different with respect to intervention type and outcome measures that it was not possible to draw any firm conclusion about intervention effect on movement or posture. The relationship between changes in movement patterns and changes in pain or activity levels varied across studies without consistent pattern.

**Conclusions:** Despite the popularity of movement-based interventions, no relationship is evident between changes to muscle activity, movement or postural patterns and improvements in pain or activity limitation.

### Prognosis of patients with chronic low back pain presenting to a private functional group exercise program

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**Questions:** What is the outcome of patients with chronic low back pain presenting to a private community-based functional group exercise program?

**Design:** Prospective longitudinal cohort study.

**Participants:** 127 consecutive patients with chronic low back pain who presented to a private group exercise program incorporating a cognitive behavioural approach.

**Outcome measures:** The primary outcome was pain measured using the numerical pain rating scale (NPRS). Pain was assessed as both a change from baseline and also the proportion of patients recovered (0 or 1 on a 0 to 10 pain scale for at least 30 consecutive days). Secondary outcomes included disability (Roland Morris Disability Questionnaire), bothersomeness of pain and Tampa scale of kinesiophobia. The outcomes were collected at baseline, 3, 6 and 12 months.

**Results:** Data for the completed 3 month follow-up are presented. 115 (90.5%) participants completed the 3 month follow up. Overall, 16.5% of patients were recovered from pain after 3 months. Participants scored an average NPRS of  $4.3 \pm 2.1$  at baseline and  $3.7 \pm 2.0$  at 3 months. Disability reduced from  $7.8 \pm 4.5$  at baseline to  $5.0 \pm 4.0$  after 3 months. Bothersomeness went from  $5.5 \pm 2.5$  at baseline to  $4.1 \pm 2.2$  at 3 months and Tampa scores were  $35.8 \pm 7.6$  at baseline and  $34.9 \pm 7.5$  at 3 months.

**Conclusion:** On average participants demonstrated small improvements in pain, disability and bothersomeness by 3 months. Approximately 1 in 6 participants were recovered from pain within 3 months. Completion of 6 and 12 month follow ups will provide data on longer term outcomes.

### Patient Physical Activity Performed Outside Structured Therapy Time: An Observational Study

Claudia Dullo-Sneesby, Bond University

Nancy Low Choy, Bond University

Philip Abery, John Flynn Private Hospital

Matthew Fields, John Flynn Private Hospital

Michael Steele, Bond University

**Question:** What/how much physical activity do inpatients attending rehabilitation at John Flynn Hospital engage in outside therapy times?

**Design:** A covert observational study of patient physical activity outside structured therapy time.

**Participants:** Sixty-one patients aged over 50 years and diagnosed with a neurological disorder or ortho-geriatric problem consented to participate in our study. All patients were undergoing inpatient rehabilitation at John Flynn Private Hospital Gold Coast and attended physiotherapy twice daily for a 30 minute treatment session.

**Outcome measures:** The primary outcome was a time- sampling technique of behavioural mapping utilised to track, covertly observe and record patient's location and physical activity during non-structured therapy times. The type of physical activity, length of engagement and location were recorded over a two-week period between 7 am and 5 pm. The secondary outcome measure was completion of the ABC Scale Questionnaire at discharge or at conclusion of the observation period.

**Results:** Inpatients spent 68% of their day isolated in their rooms in sitting or lying (resting) and were passive in behaviour. Patients engaged in physical activity less than 22% with ambulation representing 7% of their time. There was no significant association between patient's confidence level and the distance ambulated during the observation period.

**Conclusion:** Consistent with other studies, findings suggest patients undertaking rehabilitation partake in relatively low levels of physical activity outside structured therapy time. This study raises questions about the causative factors for the relative lack of physical activity and current dosage levels required for optimal rehabilitation outcomes.

### Activity level of hospital medical inpatients: an observational study

Suzanne S Kuys, School of Physiotherapy and Exercise Science, Griffith University & Allied Health Research Collaborative

Urszula E Dolecka, Physiotherapy Department, Princess Alexandra Hospital, Brisbane, Australia

Amanda Guard, Physiotherapy Department, Princess Alexandra Hospital, Brisbane, Australia

**Questions:** What is the activity level undertaken by people admitted for an acute hospital medical admission upright mobilisation? Where can patients be found, what are they doing and who is with them?

**Design:** Prospective observational study.

**Participants:** One-hundred and two patients admitted to general medical wards were observed for 2 days.

**Procedure:** Patients were observed for one minute every 10 minutes during a working day from 8.30 am to 4.30 pm.

**Outcome measures:** Highest level of activity for patient, location and person/s attending the patient.

**Results:** Patients were located in their rooms an average (SD) 391 (67) minutes, 20 (20) minutes in the bathroom and were off the ward, for procedures or appointments, for 22 (52) minutes. Of the time spent in their rooms, patients were lying in bed an average (SD) 299 (114) minutes, were sitting on or out of the bed 75 (55) minutes or were standing or walking 14 (15) minutes. Patients were alone an average (SD) 280 (89) minutes and with one person 99 (64) minutes. Staff spent on average 73 minutes attending patients; nurses an average (SD) 46 (38) minutes, medical staff 10 (11) minutes and allied health staff 7 (6) minutes with patients.

**Conclusion:** Patients are inactive during hospital stay for acute hospital admission; spending the majority of the day in their rooms, in bed and alone.

## 676

### “Good for others but not for me”: Why older adults who see the value of group exercise to prevent falls choose not to participate

Terry P Haines, Monash University and Southern Health

Lesley Day, Monash University

Caroline Finch, Monash University

Keith D Hill, Latrobe University, Northern Health, National Ageing Research Institute

Lindy Clemson, University of Sydney

Margaret Thomas, Department of Health (Victoria)

Catherine Thompson, Department of Health (Victoria)

**Objective:** To understand why some older adults who see the value of exercise for preventing falls choose not to participate.

**Method:** We undertook a cross-sectional survey amongst people 70+ years from Victoria, Australia. Participants were asked: if a person about their age was to participate in a group exercise program involving strength and balance exercises, would it decrease their risk of falling? Participants were also asked whether this program would reduce their own risk of falling. Those that indicated the program would reduce the risk of falling more for others than for themselves were asked why they felt this was the case.

**Results:** The “good for others but not me” attitude was found in 102/388 participants who completed the survey. Males were more likely to have this attitude (OR=2.16 [95%CI=1.36, 3.42]  $p=0.001$ ), while those who had participated in a group exercise program involving strength and balance exercises during the past 5 years (OR=0.31 [95%CI=0.17, 0.54]  $p<0.001$ ), and those who had a fall in the past 12 months (OR=0.60 [95%CI=0.36, 0.99]  $p=0.04$ ) were less likely. The most common reason offered for having this attitude was they felt they were already physically active and that participating in group exercise would provide little additional benefit. Others reported having a health complaint they felt prevented them from exercising, a dislike of group exercise, or low self-perceived risk of falling.

**Conclusion:** Perception of benefit from group exercise appears to change with personal experience of it, indicating “introductory sessions” amongst other initiatives may enhance uptake.

## 677

### Appropriate seating for medical patients: an audit

Suzanne S Kuys, School of Physiotherapy and Exercise Science, Griffith University & Allied Health Research Collaborative

Urszula E Dolecka, Princess Alexandra Hospital

Carol Morrison, Princess Alexandra Hospital

**Questions:** How many and what types of chairs are available for medical in-patient use; what are the minimum criteria of appropriate chairs and are the available chairs suitable to seat patients admitted to medical wards?

**Design:** Audit of chairs available across medical wards of large tertiary hospital comprising 172 medical beds was conducted.

**Procedure:** All types of bedside chairs relevant to patient use were photographed and counted. An expert panel determined minimum criteria of appropriate seating for older patients from functional, occupational health and safety, ergonomic, infection control and usability view points.

**Outcome measures:** Numbers of chairs meeting the minimum criteria level was recorded and was expressed as a percentage of the number of required chairs (hospitalized patients able to be sat out of bed).

**Results:** A total of 270 chairs with 36 different types were identified. The majority, 231 (85%) chairs, did not meet the minimum criteria. Thirty-nine chairs met the minimum criteria for patients to sit in. 113 (66%) patients were unable to sit out bed due to lack of available seating.

**Conclusion:** This study identified that there were insufficient appropriate chairs available for patients to sit out of bed in this facility. The numbers of chairs needed was identified and funding of more than \$300 000 was provided to purchase an additional 400 bedside chairs and 120 stools for the entire hospital. An observational study is planned to determine the impact of the chairs on activity levels of medical patients.

## 678

### Statistics and trends in animal physical therapy in the United States

Lisa G Bedenbaugh, United States

This presentation will explore different statistical aspects of animal physical therapy in the United States, including the number and type of veterinary practices offering rehabilitation services, the backgrounds of clinicians in the field and the types of treatments being offered. In addition, some of the current issues being faced by practitioners in this field will be discussed, including legislative and practice act issues, professional liability insurance, certification programs and continuing education opportunities, and reimbursement issues.

## 679

### The effect of reflex inhibition technique on mechanical nociceptive threshold in paraspinal muscles in asymptomatic horses

Nicky J L Suckle, Royal Veterinary College, London, UK, United Kingdom

**Reason for study:** To assess the efficacy of Reflex inhibition (RIT) as a physiotherapeutic technique on mechanical nociceptive thresholds (MNTs) in equine paraspinal muscles.

**Objectives:** To objectively measure MNTs in equine paraspinal muscles in a treatment group and a control group who received no treatment. It was hypothesised that the horses, which received RIT, would result in increased MNT post treatment and that these changes would not be observed in the control horses. MNT is the minimum pressure used to induce a pain response measured by pressure algometry (PA).

**Methods:** Sixteen horses with no history of back pain were randomly assigned to a control (n=8) and a treatment group (n=8). PA readings were taken 10cm bilaterally to the spinous processes of T9, T18 and L3 before treatment, immediately after treatment, day one post-treatment and day three post-treatment. RIT involves slow and then fast stretching of the paraspinal muscles and is believed to work by eliciting a monosynaptic reflex arc causing the muscles to contract which reciprocally inhibits the contralateral muscle group.

**Results:** The linear mixed model identified a significant interaction ( $P=0.009$ ) between treatment and time. Comparison of the factor levels indicated that PA measurements in the control group before treatment were higher than those on day one ( $P<0.001$ ) or day three ( $P<0.001$ ) and PA measurements immediately after treatment were higher than those on day one ( $P<0.001$ ) or day three ( $P=0.001$ ). PA measurements before treatment were higher than those on day three ( $P<0.001$ ) in the RIT group.

**Limitations:** Non-clinical subjects were used, potential post-treatment soreness and potential post-measurement soreness.

**Conclusion and Potential relevance:** Due to variable results across both groups, the null hypothesis was accepted. However, anecdotal evidence shows this technique to be effective in the treatment of thoraco-lumbar dysfunction. Therefore, further studies are required to assess RIT's therapeutic relevance in the clinical population.

680

### Are seasonal variations in vitamin D and fall rate associated with changes in balance?

Marie-Louise Bird

Keith D Hill, Faculty of Health Sciences, La Trobe University and Northern Health, Bundoora and National Ageing Research Institute, Melbourne

Iain K Robertson, The School of Human Life Sciences, The University of Tasmania

Jane Pittaway, The School of Human Life Sciences, The University of Tasmania

Madeleine J Ball, The School of Human Life Sciences, The University of Tasmania

Andrew D Williams, The School of Human Life Sciences, The University of Tasmania

Fall incidence and fracture rates from falls in older adults increase at the end of the winter season, following the nadir in serum vitamin D levels. In individuals with suboptimal levels of vitamin D, postural sway improves after supplementation. Seasonal changes in postural sway have not previously been investigated.

**Question:** Does postural sway vary seasonally and is it related to lower levels of serum vitamin D and increased falls rates in the winter?

**Design:** Longitudinal observation study.

**Participants:** Eighty-eight independently mobile community-dwelling older adults (69.7 ± 7.6 years) were evaluated on 5 occasions over one year.

**Outcome measures:** Serum vitamin D levels, postural sway (force platform), Timed Up and Go and four square were measured. Fall incidence, cause and any adverse outcomes were recorded using a monthly prospective fall calendar. STATA 11 software used a mixed-methods poisson regression to determine associations between the data.

**Results:** Vitamin D levels varied seasonally ( $p < 0.001$ ), highest in summer; 50% of participants had suboptimal levels in summer. Incidence of falls ( $p = 0.01$ ) and injurious falls ( $p = 0.02$ ) were less in summer than in any other season. Postural sway did not vary over the year. Small changes in dynamic balance (4%) were seen over the year ( $p < 0.001$ ). No relationship between static balance measures and vitamin D or fall rate was recorded.

**Conclusion:** Vitamin D, fall rate and fall injuries vary seasonally. While postural sway remains stable, small annual variations in dynamic balance are evident.

**Funding:** CCMRT and PRF

**Ethics:** H0010561

681

### Audit of inpatient and rehabilitation in the home (RITH) service falls management for community-dwelling adults, presenting with a fall

Jacey Kraut

Roslyn Jones, Royal Perth Rehabilitation in the Home

**Question:** Does the falls prevention management provided by an inpatient and RITH service meet best practice guidelines in community falls prevention?

**Design:** A retrospective audit of complete medical records for 100 patients who presented to hospital with a fall (presenting complaint recorded on the medical discharge summary or emergency department admission indicated a fall) and were managed by the hospital and the RITH service.

**Method:** An audit tool was designed to assess compliance with 15 key recommendations from The Australian Commission on Safety & Quality in Health Care published in "Preventing Falls & Harm from Falls in Older People: Best Practice Guidelines for Australian Community Care, 2009". A guideline was considered to be 'met' if the recommendation was adhered in > 85% of cases.

**Results:** Overall, seven guidelines were 'met': record of falls history; completion of balance screen; completion of falls risk screen; record of falls risk; continence screen; completion of medication review and provision of exercise program. Four guidelines were consistently 'unmet': completion of Falls Risk Assessment tool; completion of visual screen; assessment for syncope; and screening for dizziness. Fewer guidelines were met for patients who were managed by specialties other than geriatric medicine or general medicine; had been discharged from the Emergency Department or Acute Assessment Unit; or had sustained a fracture.

**Conclusion:** Current practice may not meet best practice guidelines for falls prevention. Standard use of a Falls Risk Assessment tool would improve compliance.

682

### Falls after discharge from hospital-is there a gap between older peoples' knowledge about falls prevention strategies and the research evidence?

Anne-Marie Hill, The University of Queensland, Brisbane, University of Notre Dame Australia, Fremantle

Tammy Hoffmann, Bond University, Gold Coast

Christopher Beer, University of Western Australia, Perth

Steven McPhail, Queensland Health, Queensland University of Technology, Brisbane

Keith D Hill, Northern Health, Victoria, La Trobe University, Melbourne

David Oliver, City University London, UK, Department of Health, UK, United Kingdom

Sandra G Brauer, The University of Queensland, Brisbane

Terry P Haines, Southern Health, Victoria, Monash University, Melbourne

**Questions:** What do older people who are at the point of discharge from hospital know about falls prevention strategies to use in the post discharge period and how does this knowledge compare to current research evidence for effective falls prevention strategies?

**Design:** Prospective observational study.

**Participants:** Participants [(n=333), (mean age 79.2 ± 8.4 years)] who were at the point of discharge from hospital and were part of a prospective cohort study, nested within a larger randomised controlled trial.

**Outcome measures:** In a semi-structured interview participants were asked to suggest strategies they could use to reduce their falls risk at home after discharge. Participants' responses were coded using qualitative description and compared to current reported research evidence for falls prevention interventions for older community dwelling populations.

**Results:** Participants' strategies (n=629) were classified into seven categories; behavioral, support while mobilising, approach to movement, physical environment, visual, medical, and activities or exercise. Although exercise has been identified as an effective falls reduction strategy only 2.9% of participants suggested engaging in activity or exercises. Falls prevention was most often conceptualised by older people as requiring one (35.4%) or two (40.8%) strategies for avoiding an accidental event, rather than engaging in sustained multiple risk reduction behaviours.

**Conclusion:** Older patients have low levels of knowledge about appropriate falls prevention strategies that could be used after discharge in spite of their increased falls risk during this period. Findings suggest that health care workers should design and deliver falls prevention education programs specifically targeted to this population.

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## 683

### New evidence on the roles of threat appraisal and self-efficacy in falls prevention

Terry P Haines, Monash University and Southern Health

Lesley Day, Monash University

Caroline Finch, Monash University

Keith D Hill, Latrobe University, Northern Health, National Ageing Research Institute

Lindy Clemson, University of Sydney

Margaret Thomas, Department of Health (Victoria)

Catherine Thompson, Department of Health (Victoria)

**Objective:** To investigate and contrast factors affecting current participation and intention to participate in five evidence-based falls prevention strategies including exercise interventions.

**Method:** We undertook a cross-sectional survey amongst n=388 people from Victoria, Australia, aged 70+ years. Participants were randomly sampled from the electronic White Pages and telephone interviews were conducted. The questionnaire was expanded from an earlier hospital patient survey based upon the Health Belief Model and other theoretical frameworks. The role of significant others (such as partners and health professionals) was also considered.

**Results:** A common reason for not participating in any of the interventions was the perception that individuals were not at risk of falls, however, encouragement from a significant other increased intent to participate. Participants commonly expressed that they would be able to participate in the interventions if they wanted to. Participants also provided different reasons for participation or intent to participate for each intervention. Participants who were participating in group exercise said they did so because of enjoyment and perceived health benefits whereas people who have previously undertaken individualised home exercises commonly reported stopping when they felt their health or mobility had improved with few indicating enjoyment as a reason for participating.

**Conclusion:** These findings suggest threat appraisal is more important than self-efficacy to undertake an exercise intervention for prevention of falls and that "significant others" and important in promoting participation. This study was conducted as one component of a broader NHMRC Partnership Project in collaboration with the Victorian Department of Health.

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