
AUSTRALIAN PHYSIOTHERAPY ASSOCIATION

8th International

Physiotherapy

Congress

Improving and expanding practice/se

Adelaide Australia

15–18 May 2004

Adelaide Conventional Centre



AUSTRALIAN PHYSIOTHERAPY ASSOCIATION

Introduction

The 8th International Physiotherapy Congress presented by the Australian Physiotherapy Association was held in Adelaide 15–18 May 2004.

‘Improving and expanding practice/se’ was chosen as the theme for this congress as a means of showcasing the latest developments in monitoring and improving quality management and emerging areas of innovative physiotherapy practice. This aim was achieved admirably through the high standard of original research presented and the stimulating and entertaining presentations from a distinguished gathering of speakers. One of the most striking features that emerged over the four-day program was the readiness of our profession to critically reconsider and reframe many areas of practice in terms of physical activity and movement as a learned behaviour rather than as a result of simple biomechanical reflections of pathology.

With over 170 original research presentations representing all areas of physiotherapy management, delegates were spoiled for choice in terms of which sessions, run concurrently, to attend. The abstracts included in this supplement represent those research presentations which, following independent peer review, were accepted as being scientifically rigorous as well as having great potential to improve clinical practice. Of these, four papers warrant special mention:

- S Patman *The influence of physiotherapy on the incidence of ventilator-associated pneumonia in patients with acquired brain injury*. Award for excellence in research sponsored by the Australian Journal of Physiotherapy
- L Moseley *Unhelpful cognitions are associated with non-resolution of altered postural adjustments of abdominal muscles induced by experimental back pain*. Research in rehabilitation award
- N Tweedle *A single-blinded randomised controlled trial of an exercise intervention to reduce functional decline and health service utilisation in the elderly*. Research in acute management
- L Goff *Reliability and agreement of experienced manual physiotherapists in determining simulated sacroiliac joint motion*. New researchers award sponsored by the Physiotherapy Research Foundation

The scientific committee would like to thank and acknowledge all presenters and delegates for contributing to this successful and enjoyable congress.

Assoc. Professor Marie Williams
Scientific convenor

Tiffany Gill
Congress convenor

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Supportive devices for preventing or treating subluxation of the shoulder after stroke: A Cochrane systematic review

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The aim of this systematic review was to investigate the efficacy of supportive devices such as slings, wheelchair attachments and external shoulder orthoses in preventing or reducing subluxation of the shoulder after stroke. A computerised search of electronic databases (MEDLINE, CINAHL, AMED, EMBASE, PEDro and the Cochrane Controlled Trials Register) and a hand search of proceedings were performed. The outcome measures of interest were subluxation and pain. No randomised controlled trials investigated the effect of supportive devices in reducing subluxation and there was insufficient evidence to conclude whether supportive devices were effective in preventing subluxation. However, examination of pre/post observational studies show that the arm trough, lap tray, Harris sling and triangular sling have an immediate effect in reducing subluxation. Therefore, until further evidence from prevention trials is forthcoming it is recommended that stroke patients at risk of developing subluxation use an arm trough or lap tray when seated, and a Harris sling or triangular sling temporarily when standing or walking. Only three trials investigated the effect of strapping in preventing shoulder pain. Pooled analyses from two of these trials showed that strapping delayed the onset of pain by 14 days (weighted mean difference, 95% CI 9.7 to 17.8) compared to no strapping. However, the third trial showed no difference between strapping and no strapping after six weeks intervention. Therefore, strapping appears only to be effective in delaying the onset of shoulder pain, not preventing it.

An examination of the factors that contribute to attrition from physiotherapy

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The aims of this study were to describe the physiotherapy profession in Australia, generate a profile of the physiotherapists who have left the profession and determine the main factors that contribute to attrition from physiotherapy. This study explored the workforce data collected from the New South Wales Physiotherapists Registration Board (NSW PRB) in their annual survey summary reports over several decades. The results indicate that the demographics and working patterns of physiotherapists in New South Wales have remained stable over time. The workforce continues to grow, however the growth rate has decreased to 2.4% from June 2001 to June 2002. The proportion of males in the profession is increasing (23.5%) and the female workforce is ageing. The degree of workforce participation has not undergone significant change since 1987. This is also a landmark study in Australia providing contemporary data related to attrition from physiotherapy. The study collected data from physiotherapists who did not renew their registration with the NSW PRB between 2000 and 2003. A total of 100 valid responses were received. The three main reasons for non-renewal of registration were retirement (n = 50), change of

career (n = 20) and family commitments (n = 9). Of the physiotherapists who had not renewed their registration over the past four years 29.4% were male, over this time period males have accounted for approximately 23% of the physiotherapy workforce, therefore males appear to be leaving the profession at a higher rate than females. The majority of respondents cited negative factors related to physiotherapy as the primary influence on their decision to leave the profession. The level of pay appears to be a significant re-entry factor. There was also a strong suggestion that the current entry requirements for physiotherapy courses are too high leading to a mismatch of career expectations. Attrition does not appear to be the major contributor to the current labour force shortages. More pertinent to this shortage is the slowed growth rate and increased demand for services.

Anatomy and biomechanics of gluteus maximus at the sacroiliac joint

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The aim of this study was to determine the anatomy of the attachment of gluteus maximus (GM) to the posterior layer of lumbar fascia and quantitatively assess its ability to act on the sacroiliac joint (SIJ) using vector analysis. Eight elderly embalmed cadavers were dissected bilaterally. Fibre angles of GM attachment to the posterior layer of lumbar fascia were measured then individual fascicles sequentially removed and their length and volume recorded (using water displacement in a volumetric cylinder). The cross-sectional area of each fascicle was calculated and summed to determine the total cross-sectional area of GM that crosses and may affect the SIJ, then multiplied by a force coefficient to estimate the maximal force GM may produce on each side. Vector analysis was used to determine the component of this tension that may contribute to SIJ compression. There were no significant differences between left and right measures so results were pooled for all measures and mean values calculated. GM attachment extended across the SIJ in all specimens, with a mean fascicle orientation of 30° below the horizontal. Mean total cross-sectional area of the attachment was 2.4 cm² and the average maximum force that may be generated from this attachment was 118 N, of which 86% (100 N) could act perpendicular to the plane of the SIJ. GM may provide a substantial compressive force at the sacroiliac joint, although its significance during various activities needs to be confirmed using EMG analysis.

Balance circuit classes are both effective and efficient in a rehabilitation day therapy setting

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The Redcliffe Caboolture Day Therapy Unit provides rehabilitation to community clients. This has been provided on an individual basis. Lack of available treatment sessions was leading to increasing waiting times and lack of follow-

up sessions. The study was designed to determine whether circuit balance classes could effectively increase the number of clients managed while producing acceptable levels of balance improvements with no increase in infrastructure. A clinical intervention trial was conducted between May and September 2003. Subjects included all patients referred to the day therapy physiotherapy service for balance re-education. Thirty-three of forty-one patients completed the 10-week program. Balance outcomes were static standing, left and right step tests, functional and lateral reach, Timed Up and Go test, 10 m walk test and minute-minute walk test. Pre and post training measurements were taken. Service outcomes were the number of available physiotherapy sessions, the number of appointments attended and the utilisation of appointments. These were compared with the same period in the preceding year. Significant improvements ($p < 0.007$) were shown after intervention in all balance measures except for static standing tests. Available physiotherapy sessions increased by 80.8%. Average utilisation of appointments increased by 13.6%. The average number of treatment sessions per patient per month increased by 40.1%. These outcomes were achieved with no increase in resources or staffing. Circuit balance classes provided with stations that cater to the varied functional abilities of the participants enable greater access for patients and produced significant outcomes with no change to service provision infrastructure.

Professional Development: Barriers to access and barriers to learning — are they the same?

Bird M-L

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The aim of this study was to collect data from practising urban physiotherapists on their Continuing Professional Development (CPD) activities to determine: 1) the type of activities they engage in, 2) what makes them choose these activities, and 3) what barriers there are to the choice of activities. A mail survey was sent to 200 full-time practising metropolitan physiotherapists. Twenty-five questions using both an open ended format and a modified Likert scale (from 0–5, where 5 is used to indicate the most relevant feature) were devised. Data was collected to determine the process that members of the profession go through to assess learning needs, set goals and choose activities to meet these needs. Data was grouped in frequency tables and mean scores and percentages analysed. The self-assessment of learning needs was valued very highly (mean 4.0), and participation in group practical workshops was the preferred activity by most respondents (with 42 respondents giving priority to this format). Computer skills and access, and the implication for program development were explored. Cost and timing of PD activities (mean 3.4) influence effective access to CPD. Physiotherapists recorded that the content of the programs (mean 3.9) influences how effective the programs are in meeting their learning needs. Involvement of individuals in goal setting, identification of learning needs, and design of activities will result in a CPD program that is relevant, flexible and appropriate. The information collected provides a valuable snapshot of the culture of continuing education for physiotherapists and this information has been used to trial a new model for delivery of professional development.

A strategy towards the evaluation of student practica

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Final year physiotherapy students at the University of South Australia undertake the subject Occupational Health and Safety in Physiotherapy Practice. A large assessable component of this subject involves student placements in South Australian industry. The placements are somewhat unique as the students are often supervised by non-physiotherapists at the workplace, whereas in almost all other areas of their training they are supervised by physiotherapists. The investigator set out to develop a strategy that could be used by an independent researcher to evaluate these student practica from the host organisation's perspective. Interviews were conducted with a purposeful sample of nine industry supervisors to explore their views on hosting students. A theoretical model formed the basis of the structured interviews, covering: curriculum objectives, learning experiences, standards of performance, assessment and evaluation of the program. Two further dimensions, theory and stakeholders, were added to provide a more comprehensive overview of the practica. Results indicated that each of these seven dimensions would be useful in a future evaluation of the subject. In addition, participants indicated two further facets should be included in an evaluation. These related to the administrative aspect of the placements, and the needs of the host organisation.

Botulinum toxin A (BTX-A) combined with hip bracing delays the need for surgery in children with cerebral palsy: A controlled clinical trial

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A randomised multicentre trial to determine if BTX-A combined with a variable hip abduction orthosis, delays progression to soft tissue surgery for children with spastic hip displacement. Ninety children with bilateral spastic cerebral palsy with hips at risk (migration percentage MP > 15 < 40%) were entered. After concealed randomisation children were allocated to either BTX-A every six months with use of a variable hip abduction orthosis or observation. Children were followed six monthly for three years and where their MP > 40% and/or the Acetabular index (AI) exceeded 27° they were presented for independent analysis by a surgeon who was blinded to group allocation to determine progression to surgery (censored). Data was analysed using Kaplan Meier survivorship analysis. Using the log rank test for comparing progression to surgery between the groups there was a statistically significant treatment effect ($p = 0.004$) for the BTX-A and brace group. A three-year follow up

showed 76% of the BTX-A treated group had not progressed to surgery (95% CI 0.61 to 0.87) while in the comparator group only 52% had not progressed to surgery (95% CI 0.36 to 0.65). Children of GMFCS II, III & IV had a functional benefit but there was minimal functional benefit for GMFCS V. This is the first RCT of conservative hip management. There is a treatment effect for intramuscular BTX-A and hip bracing in the conservative management of hip displacement in children with cerebral palsy compared to standard conservative management.

Brain reorganisation demonstrated with functional MRI in children with cerebral palsy following intramuscular botulinum toxin A and upper limb training

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Case study of rapid cerebral motor transfer in a child with congenital right hemiplegia as measured by fMRI, after peripheral botulinum toxin A and upper limb training. After baseline assessment on Melbourne Unilateral Upper Limb and fMRI she received BTX-A to the spastic forearm muscles (1–4 U Botox/kg/muscle) and six weeks of upper limb training. Whole-brain fMRI studies (3 tesla) were conducted at baseline, three and 12 weeks. Two motor paradigms (finger tapping or wrist extension). After image realignment, statistical maps of unpaired t-tests, thresholded at $p < 0.001$. Region of interest analysis was undertaken on the contralateral primary motor cortex (PM1), ipsilateral PM1 and supplementary motor area (SMA). The motor tasks were performed with EMG to assess for mirror movements. At baseline for the impaired finger there was low-level activation in contralateral PM1 (4 voxels). This switched to a large increase in ipsilateral activation (102 voxels) after BTX-A and training at three weeks maintained at 12 weeks. These activations were not accompanied by mirror movements confirmed by EMG. Function improved from a baseline score of 74.6% by 11.4% at three weeks and 18.8% at 12 weeks. These unique observed activation changes suggest that the ipsilateral side has taken the role of controlling hand movement, possibly using previously underutilised or unutilised corticospinal projections. This appears to have been facilitated by the reduction in spasticity with botulinum toxin A injection to the impaired side, and the central reorganisation may have occurred due to a change in sensory feedback from the impaired side.

Randomised trial of botulinum toxin A and upper limb training in congenital hemiplegia — activity, participation and health-related quality of life

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In a single-blind randomised trial we assessed if upper limb training with or without intramuscular botulinum toxin A (BTX-A) enhances activity, participation and health related quality of life (HRQoL). Thirty children with congenital hemiplegia were matched for age (5–15 years), gender, side of hemiplegia. Outcomes were across the ICF including Resonant Frequency (RF); Activity: Melbourne Unilateral Upper Limb (MUUL); Participation: Paediatric Motor Activity log (PMAL), Canadian Occupational Performance Measure (COPM) Goal Attainment Scale (GAS) and HRQoL: Child Health Questionnaire (CHQ). Real life activity using covert monitoring of eating, drinking, dressing in Actual Amount of Use Test (AAUT). Intervention included random allocation to six weeks of upper limb training alone/with injections 1–4 U Botox/kg muscle (Allergan USA). Training used principles of motor learning, occupational performance and goal attainment. For Impairments, there was a greater reduction in spasticity ($f = 6.95, p = 0.01$) on RF at three weeks than 12 weeks in the BTX-A group. The BTX-A group had better functional outcomes ($f = 5.05, p = 0.03$); greater and better use of the impaired arm (PMAL) but no significant difference between the groups. Both groups had a clinically relevant improvement for participation on COPM and GAS. HRQoL demonstrated a treatment effect for BTX-A on the domains of physical functioning, self-esteem and family activities. There is evidence of a treatment effect for the addition of BTX-A to upper limb training to improve spasticity, functional outcomes and HRQoL. An intensive program of upper limb training improves participation both with and without BTX-A.

Assessing the functional position of undergraduate students' thumbs during mobilisation techniques

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Research has shown that thumb pain can be related to passive mobilisation techniques. Physiotherapy students at the University of South Australia (UniSA) are taught to stabilise their thumb joints in a position of slight flexion during posteroanterior (PA) mobilisations, but it is not known whether they are able to maintain this position at clinical forces. This study comprised of two experiments. Experiment one used 11 clinical educators from UniSA to establish a clinically relevant maximal force during the application of PA mobilisations to the cervical spine. A mean force of 122.86 N (SD = 0.58) was calculated and this was adopted as the target force. Experiment two determined the ability of students (n = 25) to adopt and maintain the taught position of the thumb while attempting

to reach the target force and to perform 30 oscillations around this force to simulate a treatment. Sixteen subjects could reach the target force, but only two of these were able to stabilise their joints in slight flexion. All other subjects displayed various altered positions of the thumb joints. Subjects were also tested for hypermobility. There were no cases of generalised peripheral joint hypermobility, however testing of the thumb joints revealed hypermobility of the metacarpophalangeal joints in 16 subjects. Hypermobility was not found to be related to the ability to maintain the taught position. The results of this study suggest that there is a lack of dynamic control of the thumbs among the student population tested and this may have implications for the way mobilisation techniques are taught.

The design, manufacture, and testing of equipment to measure force applied by the thumbs during central PA mobilisations

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The physiotherapy profession has been shown to have a high prevalence of work-related musculoskeletal disorders (WRMDs) and in particular, thumb pain has been related to passive mobilisation techniques. It has been postulated that the relatively high prevalence of WRMDs in young therapists is related to inadequate training with respect to workplace injury. The aim of this study was to design, manufacture and test equipment to measure force applied by the thumbs during central PA mobilisations. This was part of a larger study to evaluate the functional position of undergraduate students' thumbs during mobilisation techniques. The equipment consisted of a laptop computer, an amplifying circuit, a resistance bridge and a strain gauge attached to an aluminium bar. The subject pressed on the bar which varied the resistance of the strain gauge providing a voltage to the amplifying circuit and hence to the laptop computer. National Instruments LabVIEW (v 4) software was used to interpret the strain gauge voltage data and provide visual feedback of force data to the operator and test subject. The equipment was successfully tested for validity and reliability by measuring known weights and recording the voltage output. This equipment was relatively simple to produce and has applications in research, occupational health and safety, and education of physiotherapists at all levels. The accuracy, versatility and modular design of the system ensure that it can be adapted for different applications.

Impact of combined physiotherapy and social work group education program for parents of babies in a neonatal unit — pilot study

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Parents of babies in neonatal units experience significant stress in this critical phase of their child's life. The aim of this study was to compare the effect of an individual physiotherapy and social work education program with a group education program for parents with babies in a

neonatal unit. Semi-structured qualitative interviews were used to determine the educational requirements of parents before discharge of their child from the unit. This information was used to develop the group parental education program. Strong themes which emerged from this process included: the need to be able to share common experiences, the need to bond with their child by being able to care for them, being overwhelmed by information provided immediately prior to discharge, and the need for a range of educational experiences. Parents who had either physiotherapy or social work input while their child was in the neonatal unit were surveyed regarding physiotherapy and social work education. Comparison of the survey responses of the cohort of participants who received usual care with the cohort who received the group four week educative program suggests benefits for parents in the group educative program. Importantly, the process of interview with parents to develop an education package, provided information on which to base future physiotherapy and social work education. The unusual marriage of physiotherapy and social work may provide a unique environment for education of social and physical requirements and development of premature infants by their parents in a group setting.

Effect of Thai massage on blood chemistry

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Thai massage has been practised worldwide for decades. Most techniques used in Thai massage include muscle stretching and deep pressure on the muscles of limbs and back. However, deteriorative effects of the massage regarding damage of muscle and blood cells are unknown. This study examined whether there are any deteriorative effects of Thai massage on body tissues using blood chemistry as parameters. Venous blood samples were taken from 28 healthy males before and one hour after a 1.5-hour session of massage. Blood pressure of the subjects was also measured before and after the session. The study found no significant change in terms of blood chemistry parameters before and after the massage (CK 166.17 ± 11.01 and 170.31 ± 10.43 U/L; LD 183.93 ± 8.37 and 177.76 ± 7.39 U/l; AST 30.90 ± 1.22 and 31.66 ± 1.29 U/l; ALT 33.66 ± 3.64 and 33.59 ± 3.76 U/L; BUN 10.56 ± 0.42 and 10.38 ± 0.39 mg/dl; creatinine 1.03 ± 0.03 and 1.01 ± 0.03 mg/dl; Na 138.86 ± 0.34 and 138.95 ± 0.37 mEq/l; K 4.48 ± 0.05 and 4.52 ± 0.08 mEq/l; $p > 0.05$ respectively). The blood pressure changes were not significant either (MAP 93.78 ± 1.02 and 94.85 ± 1.50 mmHg; $p > 0.05$). The results of this study suggested there was no evidence that Thai massage may damage either muscle cells or blood cells. We recommend that applying proper Thai massage should do no harm to the body tissues.

Trends in entry level physiotherapy clinical education: A systematic review

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The aims of this systematic review were to identify the trends in entry-level physiotherapy clinical education and the effectiveness of different methods. A comprehensive search of databases was undertaken to identify all research addressing this topic. The following databases were searched for published studies: Medline, Cinahl, Current Contents, Cochrane Library, Psych Info, Embase, Australian Education Index, Digital Dissertations and Index to Theses. The search aimed to find both published and unpublished studies using a three-step search strategy described by The Joanna Briggs Institute (JBI) for Evidenced Based Nursing and Midwifery. The inclusion criteria required that all studies addressed entry-level physiotherapy education focussing on clinical education and were completed during the last 20 years. The results of the review will be presented in terms of the level of evidence (Level I-IV), determined by the JBI. Methodological quality was assessed, in experimental, observational and descriptive studies, using a checklist described previously in the literature. The first round of the three-step strategy identified 25 papers and 16 theses on clinical education. The key themes that emerged included clinical reasoning; methods used to facilitate learning in the clinical setting and student perceptions of different clinical models. Of the studies identified, many were limited by poor methodological quality. The second and third step of the search strategy should be completed by March 2004. The results of review will be discussed in light of current issues affecting the clinical education in entry-level physiotherapy, a major component of the entry-level curriculum.

Functional Capacity Evaluations: Are they considered useful by rehabilitation providers?

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Functional Capacity Evaluations (FCE) are designed to assess injured workers' physical capacities to perform work tasks. The total number of workplace injuries in 2000/2001 in NSW was 53,797, with an associated cost of \$1138 million. Returning the disabled worker to maximum productivity is a shared responsibility between the treating health practitioners and the employers, with the insurer as an overseer of the injury management plan. Although doctors are required to provide medical certification of incapacity, the worker's fitness for work and recommendations for suitable duties, evidence indicates that the basis upon which medical practitioners determine impairment and disability is unreliable and lacks scientific validation. Allied health professionals have responded to their need for standardised tools to assess work capacity by developing FCE. Literature exists outlining the limitations of FCE in injury management systems, however little is known of their uses and perceived usefulness by those performing them in NSW. This report presents data from surveys sent to accredited rehabilitation providers, targeting the occupational therapists and physiotherapists

who conduct FCE. The response rate was 26%. Responses indicate that 33% of therapists' first choice of FCE is one of their own designs. Therapists reported that FCE of their own design are more adaptable than the most commonly used commercial FCE ($p = 0.01$). Therapists report FCE as useful for clinical decision-making. Therapists do not see FCE as useful for providing objective records or for use in a medico-legal setting. Overall findings indicate that therapists are choosing FCE that can be adapted to meet the needs of individual clients.

Sonographic measurement of diaphragmatic excursion in patients with chronic obstructive pulmonary disease (COPD) in three different sitting positions

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The aim of this investigation was to quantify differences in diaphragmatic excursion between upright sitting and two forward sitting postures. Subjects diagnosed with COPD were tested in upright sitting, forward sitting with the spine in neutral and forward sitting with the spine flexed on two occasions with a one week break between testing. The order of positions was randomly assigned on the initial testing day using a Latin square design and kept constant the next testing day. Sonographic measurements of diaphragmatic excursion during inspiration were taken for tidal breaths in each position (measured in mm). All inspirations were controlled for volume using a respirometer. To date six subjects have completed the protocol and recruitment is ongoing. While statistical analysis is limited by subject numbers, at this stage preliminary results show diaphragmatic movement (mean and standard deviation) in upright sitting 22.4 mm (12.4), forward sitting with the spine in neutral 23.0 mm (11.7), and forward sitting with the spine bent 25.1 mm (12.7). Descriptive analysis suggests minimal differences in diaphragmatic excursion between positions, though a trend may exist for greater diaphragmatic excursion in forward sitting.

Reliability of hand-held dynamometry in children with cerebral palsy

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The study investigated the reliability of hand-held dynamometry when measuring isometric muscle strength in lower limbs of children with spastic cerebral palsy. The study used one-way repeated measures. Eighteen children with cerebral palsy (spastic diplegia, GMFCS levels I-III) were tested on two occasions, one week apart. Isometric strength of six muscle groups was measured using a hand-held dynamometer. A 'make' test was employed and test positions were based on those previously reported (Wiley and Damiano 1998). Muscle groups were retested in alternative positions or with stabilisation. Scores were expressed as relative strength (N/kg of body mass). Intra-class correlation coefficients and standard error of the mean (SEM) were calculated for dominant (D) and non-

dominant (ND) limbs and paired t-tests were used to analyze their differences. Within sessions, reliability was high [ICC (1,1) > 0.85] for all muscle groups, with significant difference in strength between D and ND limbs for ankle dorsiflexors ($t = 2.1098$, $p = 0.04$) at the second session only. Acceptable between sessions reliability coefficients [ICC (1,1) 0.7] were recorded for hip flexors (SEM = 0.59N/kg L and 0.37N/kg M), knee flexors (SEM = 0.32N/kg L and 0.31N/kg M) and knee extensors at 90° flexion (SEM = 0.38N/kg L and 0.45N/kg M). Controlled positioning and stabilisation increased reliability of ankle dorsi-flexor measures for ND limbs from (ICC (1,1) = 0.60 to 0.91). Between sessions reliability was poor (ICC < 0.07) for hip extensors at 30° flexion and ankle plantar-flexors. While specific muscle groups can be reliably measured by hand-held dynamometry, the tool has poor reliability for measuring hip extensors, knee extensors at 30° and ankle plantarflexor muscles in this population.

Validation of the Modified Trendelenburg Test (MTT)

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The classic Trendelenburg test was developed to diagnose congenital hip dislocation and muscular dystrophies in children. Currently, a modified form of the test, involving a sustained elevation of the pelvis on the non weight-bearing side during one legged stance, is used as a screening test in the assessment of transverse pelvic stability and hip muscle function. This modified test awaits a complete validation. Aim: To correlate performance of the MTT with measures of hip abductor muscle performance. Method: Thirty healthy subjects (15 male, 15 female) aged 18–30 with no history of lower limb or back injuries were recruited. They were fitted with body markers to allow computation of pelvic and shoulder levels and trunk angulation and were filmed while performing the MTT. Three tests on each side were collected with rests between each. Subjects also were tested while generating maximum isometric voluntary contractions (MVC) of both side hip abductor muscles and while attempting to sustain 85% MVC for 30 seconds on each side in turn. The order of side and test was randomised. Results: There were no consistent nor significant correlations between movements of the shoulders, spine or pelvis and any of the muscle test parameters. Subjects with highest levels of muscle performance did demonstrate stability during the Trendelenburg test, but so too did some subjects with low muscle strength values. Conclusions: The MTT does not appear to be specific as a measure of hip abductor muscle strength.

The Australian experience of the osseointegration program for the direct skeletal attachment of a transfemoral prosthesis

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The main source of discomfort experienced by transfemoral amputees is associated with the interface between the residual limb and the prosthetic socket. The Branemark osseointegration program alleviates this problem by attaching the prosthesis skeletally via a titanium implant that is osseointegrated into the femoral shaft. Seventy transfemoral amputees at two centres in Sweden and England have benefited from this technique. Caulfield General Medical Centre / The Alfred Hospital became the third centre in the world to offer this technique to two transfemoral amputees unable to use conventional prostheses. The program involved two surgical procedures followed by a structured rehabilitation period that took 12 months. Stage one involved insertion and ossifying of a titanium fixture into the residual limb. Stage two involved fitting a titanium abutment to the fixture via a permanent opening through the skin. The prosthesis attaches easily to the abutment via a locking mechanism. Following stage two a graduated weight bearing and gait program was undertaken on a short and then full length prosthesis. The clients were instructed about meticulous abutment hygiene. The absence of a socket allows full hip movement and thus normal function. Skeletal attachment also offers excellent control and osseoperception in the prosthetic limb. The clients are now wearing and using their prostheses for all activities over a 15-hour day, with no infections or implant complications. From the Australian experience osseointegration appears to offer vastly improved quality of life to carefully selected and committed patients who cannot be managed with conventional prostheses.

The concurrent validity and reliability of the Balance Risk Factor assessment tool in community dwelling older adults

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This study aimed to determine the intra and inter rater reliability and concurrent validity of the Balance Risk Factor (BRF). This balance screening tool takes two to five minutes to perform and is easy to administer in a variety of settings by a range of health professionals. It includes six tasks: standing with feet together (eyes open and closed), single leg stance on both sides, turning 180°, and five tandem steps. Each task accounts for one point. A score of six indicates poor performance. A score of zero indicates excellent performance. The intra rater reliability of the BRF was established using a test/retest protocol with 16 community dwelling older adults. The correlation between total scores for the two occasions was $r_s = 0.90$ with no significant difference between tests (Wilcoxon Signed-Ranks, $p > 0.05$). Inter rater reliability was established with 14 community dwelling older adults who were tested by a physiotherapist and the primary investigator on two separate occasions. A correlation of $r_s = 0.89$ was found between testers, with no significant difference (Wilcoxon

Signed Ranks, $p > 0.05$) present between testers for total scores. The BRF total scores correlated closely ($r_s = -0.871$ to $r_s = -0.918$) to the Berg Balance Scale scores, using data from both groups ($n = 30$). This study supports the use of the BRF as a quick assessment of balance in older community dwelling adults as it is highly reliable, within and between testers, and has excellent concurrent validity with the Berg Balance Scale.

A theoretical construction of conditions of the physiotherapist/patient relationship and their effect on informed consent in private practice settings

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The aim of this qualitative study was to identify and reconstruct conditions of the physiotherapist/patient relationship that enhanced the ability of therapists in private practice to obtain the informed consent of their patients. The conditions included internal circumstances between physiotherapists and their patients, as well as organisational and professionally defined aims of the treatment encounter. The research was part of a larger study examining how physiotherapists understand legal and ethical obligations to provide information and obtain the informed consent of their patients. The analysis was grounded in data obtained from audio-taped treatment sessions and follow up semi-structured interviews of 15 physiotherapists, representing a range of experience and treatment types in private practice settings. The research used thematic analysis to identify and categorise conditions and influences which contributed to the physiotherapist/patient relationship. The study identified central themes of physiotherapist control of the treatment agenda and the corresponding need for patient trust. The roles of both the physiotherapist and the patient were defined by a biomedical focus, where the physiotherapist authoritatively made treatment decisions and focused on measurable therapeutic outcomes, and the patient passively agreed without encouragement to directly contribute. The main findings included the identification of communicative strategies and conditions within the physiotherapist/patient relationship which prevented patients from contributing to the informed consent process. This provides an essential first step in enhancing and identifying more effective communicative strategies between patients and physiotherapists.

A pilot study to determine the effectiveness of functional foot orthoses on balance and running ability in children with developmental co-ordination disorder and pronated feet

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Research has shown that children with Developmental Co-ordination Disorder (DCD) can have poor proprioception and issues with hypermobility. Their balance and running activity restrictions may in part be due to these impairments. If so, it could be hypothesised that an

intervention that improves biomechanical position and the amount of sensory cues to the foot could also improve balance and running. Orthotics have been shown to increase proprioceptive and tactile input as well as improve the alignment of the foot. A pilot study ($n = 6$) was conducted to determine the effectiveness of Functional Foot Orthoses (FFOs) on balance and running ability in children with DCD and pronated feet. The subjects were tested three times over a six-week period (day 1, 14 and 42) on subtests one (running speed and agility) and two (balance) of the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP). Their parents were required to comment on their child's balance, running and overall co-ordination in a questionnaire. The first two testing periods were baseline measures and the final test period was the post-intervention measure. Non-significant results were obtained on all measures except for the subjective parent rating of running ability. Post-hoc analyses revealed that there was a significant difference between test one and two and test one and three but not between test two and three. Hence, the results indicated that there was no significant difference that could be attributed to the use of FFOs. Despite the lack of significant results, there were some positive trends on an individual level to support the theoretical constructs presented in this study. Running showed the most promising results with the introduction of FFOs even though significance was not obtained. The number of trips and stumbles experienced by most of the subjects were less than usual once FFOs had been introduced. Limitations of this study include the relative insensitivity of the measures used and subject variability. Considerations for future research should include a randomised, controlled study with a larger sample size and the utilisation of more sensitive and fatigue-inducing measures to determine changes in both balance and running.

Single event multilevel surgery: A description of stakeholder experiences

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This project used qualitative methodology under an evaluation framework (with a subset of data analysed with a phenomenological approach) of post-operative interviews to elicit key stakeholder information. The study reports the experience of all stakeholders prior to and following single event multilevel surgery (SEMLS) to identify barriers and facilitators for successful rehabilitation and enhance preparation of future children and their families for surgery. SEMLS is a correction of deformities (bony and soft tissue) performed on children with cerebral palsy. By providing a better understanding of the information currently provided by health professionals, and required by consumers of the SEMLS procedure; practical issues of undergoing the surgery, and factors to consider in the rehabilitation period can be identified. This will enhance understanding and preparation of future families for surgery, and thus potentially improve long term outcomes. Subjects were clients of CCA who had undergone SEMLS in Adelaide during an 18-month time frame and related stakeholders, including their families, CCA therapists,

orthopaedic surgeons and rehabilitation specialists. Qualitative data from stakeholder interviews were manually coded to summarise sentences or phrases, and were then synthesised for extraction of key themes. Common themes synthesised from each of the stakeholder interviews, and comparison of key themes from across the stakeholder interviews were reported. Therapists and families both identified enhanced preparation for, and management of, post-operative pain was required.

Does sensory retraining affect cutaneous sensation post-stroke?

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Sensory deficit in the lower limb is a common but poorly treated clinical presentation among stroke clients and can have an important influence on their prognosis and rehabilitation outcome. The aim of this study was to determine the effect of sensory retraining of the foot in people with stroke, by measuring their sensation before and after a period of retraining. Three males (mean age 66 years) who had suffered a stroke more than two years ago participated in this repeated measures, single blinded, single case study design. Each subject underwent baseline sensation testing, followed by a period of sensory retraining, after which sensation testing was repeated. Light touch sensation was tested using Semmes-Wensten monofilaments and proprioception was measured using the Distal Proprioception Test. Sensory retraining consisted of two weeks of intensive sessions three times per week, addressing detection, localisation, discrimination, recognition and proprioception abilities through a variety of tasks, specific to the sensory testing results obtained. The results varied between subjects. However, statistically significant evidence ($p = 0.03$, Sine test) was found to support the hypothesis that sensory retraining would increase tactile appreciation and hence influence cutaneous sensation post-stroke for two subjects. The results from this pilot study should be encouraging for neurological physiotherapists and should emphasise the importance of sensory retraining as a treatment tool for people with stroke.

Two clinical applications of the measurement of uptime in children

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The PAL 1 is a lightweight, remote activity monitor that records 'uptime' (the amount of time a subject spends in the upright position). Previous research has validated the PAL 1 as a measurement tool, explored variability in the measurement of uptime in children and established a normative data base for uptime in children. Two separate clinical studies explored the measurement of uptime in children. In both studies uptime was measured by the PAL 1.

The first study was a prospective cohort study involving 60

children undergoing an appendectomy. The PAL 1 was applied in the first 48 hours post-operatively and worn for 10 days continuously. Uptime was sensitive to the type of surgical procedure, with children who had a laproscopic appendectomy having higher levels of uptime than children who had an open surgical procedure. The second study was a randomised control trial involving 17 children with spastic diplegia. Children were randomly assigned to one of two gym groups that were conducted twice a week for six weeks. The lower limb group worked on improving functional strength and endurance in the children's lower limbs while the upper limb group focused on improving the children's manual dexterity and fine motor skills. At the end of the program children in the lower limb group had higher levels of uptime than children in the upper limb group. Uptime is a sensitive measure that can be used to demonstrate change in children undergoing a surgical procedure or following interventions designed to improve activity levels.

Functional outcome measures for patients undergoing rehabilitation post-stroke: Reliability and ability to detect change over time

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As part of a larger clinical trial comparing different types of physiotherapy for patients undergoing rehabilitation post-stroke, an independent blinded assessor assessed 61 subjects within one week of admission and one week of discharge. Mean time between admission and discharge assessments was 56.4 ± 38.1 days. Measures included the Berg Balance Scale (BBS), Motor Assessment Scale (MAS), gait speed and gait endurance. Intra-rater reliability was established from 10 assessments that were videotaped and re-scored several weeks later. Reliability was high with ICC $e' 0.97$ for BBS, gait speed and gait endurance, and percentage agreement greater than 80% for all MAS items. None of the 61 subjects scored zero on the BBS, whereas two (3.3%) and eight (13.1%) subjects scored full marks at admission and discharge respectively. The BBS appeared to be sensitive to change over time (mean change 16.9 ± 12.5 points). In contrast, there was one point difference or less for most MAS items between admission and discharge and several items showed floor or ceiling effects. The upper limb items also demonstrated a binomial distribution at both admission and discharge. The gait speed and endurance items showed some floor effect at admission (19 (31.1%) subjects unable to walk) but more than 90% of subjects demonstrated change over time. While the BBS and gait tests were able to detect change in function between admission and discharge, the MAS appeared to have limited ability to detect change over time in this sample.

Maintenance of physical gains achieved in rehabilitation at six months post-stroke

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As part of a larger clinical trial investigating the effectiveness of different types of physiotherapy treatment for patients post-stroke, 61 subjects were assessed at discharge from rehabilitation and were scheduled to attend follow-up appointments at six months post-stroke. An independent blinded assessor, with established intra-rater reliability, collected the following outcome measures: Berg Balance Scale (BBS), Motor Assessment Scale (MAS), gait speed, gait endurance and Iowa Level of Assistance Scale (ILOAS). Forty (65.6%) subjects attended the six-month follow-up appointment. The primary reason for an inability to attend was living in country areas. Discharge measures for subjects who attended and those unable to attend were not significantly different. Mean time between discharge and follow-up was 101 (\pm 52) days. There were statistically significant improvements in gait endurance ($p = 0.02$), BBS scores ($p < 0.01$) and MAS scores for the items of walking ($p < 0.01$) and upper arm function ($p < 0.01$). There was no significant change in gait speed or other MAS scores. For 34 (85%) subjects ILOAS remained unchanged, whereas five (12.5%) subjects decreased their level of physical assistance required to walk. In this study subjects maintained and in some cases increased their level of function after discharge from inpatient rehabilitation, confirming previous reports that individuals can continue to make gains in function up to at least six months post-stroke.

A prevalence study of recurrent leg pain or 'growing pains' in children aged four to six years

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In clinical practice, growing pains is a widely recognised entity which continues to be frequently reported to healthcare professionals and remains a concern to parents. While lacking in definition and diagnosed by exclusion, growing pains occurs as bilateral, intermittent leg pain which is non-articular in location and generally occurs late in the day or at night time in otherwise healthy children. There is a need to estimate the prevalence of growing pains in young children who have been reported as being most affected and yet are the least examined cohort. The aim of this study was to investigate the prevalence of growing pains in children aged four to six years in South Australia. Previous estimates have ranged from 2.6–49.4% across nine studies with disparity of sample sizes and age range. In order to survey the parents of these children a questionnaire was developed and validated following using a process of triangulation. Reliability of the resulting questionnaire was tested and confirmed by repeated administration to parents of 83 children. The reliability was good returning an average percent agreement of 82.4%. The internal validity was verified with an in-built interview and focus group checklist compared to expert identification of emergence of themes. This returned an

average percent agreement score of 93%. To enable simultaneous assessment of functional health, the questionnaire was supplemented with scales from the POSNA pediatric musculoskeletal functional health index. The questionnaire was then distributed to a randomised systematic sample of schools and childcare centres across rural and metropolitan South Australia. A sample size of 596 was calculated (95% CI \pm 4.0) to provide a prevalence estimate. Questionnaires were distributed to 2456 parents and 1445 valid returns received. Analysis of the results concluded that prevalence of growing pains in this sample was 36.9% (95% CI: 32.7 to 41.1%).

We've got the evidence: What next?

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The body of evidence pertaining to clinical practice for physiotherapists continues to grow. The challenge for physiotherapy services is to assimilate new information and its implications into clinical practice. Barwon Health has developed a model that integrates the evidence into practice. The framework developed has provided a model for the integration and application of clinical evidence. Legislative requirements, quality and risk management processes are also incorporated into this model. This paper will present the model and discuss how clinical supervisors and managers can estimate a developing clinician's perceived efficacy and tailor learning strategies to optimise the acquisition of occupational competencies.

A comparison of the effect of different expiratory pressures on volumes and peak expiratory flows using mechanical insufflation/exsufflation in subjects with neuromuscular disease

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Mechanical insufflation/exsufflation (MI-E) or as this device is more commonly known, the 'cough machine' has been demonstrated to be a useful adjunct to clearing secretions in people with neuromuscular diseases. The aim of this study was to compare the peak expiratory volumes and flows produced using the cough machine with a set insufflation pressure and a variety of exsufflation pressures in subjects with neuromuscular disease (NMD). An experimental, same subject, randomised design was used to determine the effect of altering exsufflation pressure. In a seated position the subjects were instructed to take three normal breaths (tidal breathing) and on the fourth breath take a large inspiration to full inspiratory capacity and perform a cough which was unassisted (0 cm H₂O insufflation and exsufflation: Condition 1) or assisted (+20 cm H₂O insufflation and either 0, -20 or -40 cm H₂O exsufflation: Conditions 2, 3, 4) depending on randomised allocation. The highest expiratory flow was recorded. Data collection has commenced and three subjects have been tested to date. While the sample size limits definitive parametric testing,

preliminary descriptive analysis demonstrates an increase in expiratory cough flow of approximately 19% between Condition 1 and 4. Whereas a less than 1% change exist for expiratory cough volume between Conditions 1 and 4. Data collection is continuing.

Perceived difficulty of sit-to-stand and walking after stroke rehabilitation

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Studies of handicap following stroke indicate that even individuals who regain complete independence in activities of daily living have decreased socialisation and participation in community activities. Performance of sit-to-stand (sts) and walking underlie many everyday activities. Twenty-three individuals, living in their own homes after being discharged from physiotherapy rehabilitation, rated perceived difficulty of sts and walking at discharge, then two, four and six months later. Perceived difficulty of two sts tasks (from a meals chair and from a lounge chair) and two walking tasks (inside and outside the home) were rated on a scale from 1–20, where 1 indicated no difficulty and 20 indicated the subject avoided the activity. Across all tasks, perceived difficulty decreased over the six months ($p < 0.001$) with more change in the first two months than later ($p = 0.009$). Sts tasks were perceived as more difficult than walking tasks ($p < 0.001$). Perceived difficulty of sts meals decreased significantly over time but sts lounge remained unchanged ($p = 0.02$). At discharge three subjects were avoiding sitting in a lounge chair and by six months 13 subjects were avoiding sitting in lounge chairs. Walking outside was always perceived as more difficult than walking inside however perceived difficulty of both walking tasks decreased similarly over the six months ($p < 0.001$). These findings suggest that stroke subjects still regard walking and sts tasks as difficult even six months after rehabilitation such that some individuals choose to avoid activities perceived as difficult, possibly to conserve their resources for unavoidable tasks.

Clinical physiotherapy practice for patients undergoing pelvic surgery

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The aim of this survey was to obtain information about the extent of current physiotherapy practice for patients undergoing urological, gynaecological and colo-rectal surgery in Victoria, and the guidelines used by physiotherapists to direct their service delivery. A questionnaire was posted to members of the Victorian Continence and Women's Health Physiotherapy Group (C&WHPG) and physiotherapists working metropolitan and rural hospitals ($n = 130$; $n = 90$). The response rate was 83.5%. The questionnaire comprised 22 questions relating to aspects of treatment, including how referrals are made, funding, interventions provided and how they are delivered, use of outcome measures, and suggestions for improvement. Data were summarized using descriptive

statistics. Only 29% of respondents reported their pre- or post-operative intervention was based on evidence. In 67% of cases, service delivery was initiated by surgeon request, and most commonly for gynaecological patients (85%). Individual consultations were used on 85% of occasions, and group sessions 8%. Set protocols for treatment were used by 46% of the respondents, with elements of the intervention varying between the two groups of physiotherapists. The majority of consultations with a C&WHG physiotherapist (55%) were performed between five and twelve weeks post-operatively. Eighty-seven per cent of respondents regarded their service as sub-optimal, citing the need for evidence to support the content and best timing of intervention. Further research is required to establish whether, and which elements of, pre-/post-operative physiotherapy intervention are effective.

Development and pilot validation of the Lower Limb Disability Questionnaire (LLDQ) regional outcome tool

Gabel P

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Introduction: The only currently published regional outcome measure for the lower limb is the Lower Extremity Functional Score (LEFS). It is criticised for poor clinical utility through administration, scoring and completion time and through poor methodological characteristics including item redundancy, missing data, error range and responsiveness. A new tool, the Lower Limb Disability Questionnaire, was developed to overcome these attributes. **Methods:** Both tools were investigated through direct head-to-head comparison in an outpatient-population sample of convenience from six physiotherapy clinics ($n = 80$). This provided methodological and practical characteristics with prospective repeated measure subgroups ($n = 48$) providing responsiveness and change score values. **Results:** The LLDQ demonstrated test-retest reliability and internal consistency with face, content and construct validity shown through the development methodology. The head-to-head comparison provided values for construct and criterion validity. The psychometric values for error range, using Standard Error of the Measurement ($SEM = 3.8\%$) and Minimum Detectable Change ($MDC90 = 8.9\%$) and responsiveness, through Standardized Response Mean ($SRM = 2.03$), were preferable to the LEFS without a tendency toward item redundancy. The LLDQs practical clinical characteristics demonstrated shorter completion and scoring times with lower user response error and no missing or absent data responses. **Conclusions:** This study, though small and lacking sample population diversity, demonstrated the potential for the LLDQ as a viable lower limb regional outcome measure in a clinical setting. The preferred utility, practical characteristics and sound measurement properties indicate a formal investigative study on a significant population sample is warranted.

A pilot study on a biopsychosocial screening questionnaire for early identification of high-risk compensable patient and prediction of recovery time

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Introduction: Early recognition and prediction of the potential risk of chronicity is essential to curtail spiraling compensable claims costs. This pilot study investigated the ability of an existing biopsychosocial Generic Screening Tool to identify and predict, in the acute-subacute phase, patient recovery time on a Global Assessment of Body and Limbs scale. **Method:** A new paradigm and protocol were used for prospective investigation of 61 consecutive musculo-skeletal compensable patients, 36 male, 25 female, presenting to three physiotherapy outpatient clinics. Participants were screened at initial presentation and measured concurrently, then again, twice and four-times weekly till discharge or study completion at 18 months. The outcome variable was recovery to 80% of pre-injury global status, calculated from three weighted key pooled indices: regional Self Report Outcome Measurement scores, work and life status data and Patient Specific Index values. **Results:** This pilot validation trial strongly correlated screening scores with the time required to achieve 80% of pre-injury status measured on the global scale ($r = 0.835$). Sub-categorisation to regions and compensable body were made favouring work-related back injury ($n = 36$ $r = 0.862$). The protocol also produced: stand-alone screening scores indicating chronicity risk; a regional outcome score providing quantitative and qualitative values and a graphical progression chart on a global scale with patient-specific clinical pathways indicating capacity, recovery time and cost. **Conclusions:** This study demonstrates that through pilot investigation a biopsychosocial screening questionnaire can be used for early identification of compensable patients with a high risk of chronicity, claim costs and longer than expected recovery time.

The development and pilot validation of the Spinal Disability Questionnaire (SDQ) in a cervical clinical population

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Introduction: The commonly advocated tools for self report outcome measurement of cervical disability are the NDI (Neck Disability Index) and FRI (Functional Rater Index). They have established psychometric properties but their clinical utility is criticised due to time requirements and errors in both completion and scoring. The Spinal Disability Questionnaire (SDQ) was developed to improve these characteristics. **Methods:** Subjects from a sample of convenience were recruited through four physiotherapy practices. Inclusion criteria were neck pain with or without limb pain or headache and there was no duration limit ($n = 71$). Development methodology, peer review and sample testing gave logic and content validity while head-to-head

comparison provided construct and criterion validity. Subgroups provided test-retest reliability, responsiveness and change score through prospective data analysis ($n = 46$). **Results:** Pilot data demonstrated sound psychometric properties for the SDQ with test-retest reliability ($ICC = 0.89$) and Internal Consistency ($CA = 0.89$). Error range ($MDC90 = 16.3\%$) and responsiveness ($SRM = 1.132$) were both preferable to the concurrent scores of the FRI and NDI and criterion correlation was established between all tools ($r > 0.75$). The SDQ's practical clinical utility and characteristics of completion and scoring times and reduced user error were preferable as was distribution range. **Conclusions:** The SDQ is a viable outcome tool for determination of cervical disability in a clinical setting. IT has preferred practical characteristics to both the NDI and FRI with improved clinical utility and psychometric properties. These findings indicate a further formal investigative study on a larger, significant population sample, is warranted.

Comparative performance of a new lumbar Self Report Outcome Measure (SROM) — a pilot investigation

Gabel P

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Introduction: Several Self Report Outcome Measures (SROMs), including the Roland-Morris Disability Questionnaire (RMDQ), and Modified-Oswestry or Back Disability Index (BDI), are advocated for determining Lumbo-Thoracic disability. These provide Evidence Based Practice (EBP) on the effectiveness of, and justification for intervention. However, disagreement on tool choice relates to practical and methodological characteristics, consequently a new tool is proposed. **Methods:** The Spinal Disability Questionnaire (SDQ) was developed to provide quantitative and qualitative measures in a practical, clinically friendly format. The 'Guyatt principles' determined content and face validity, with construct and criterion validity assessed via head-to-head comparison with the established tools ($n = 37$). Additional psychometric properties were also determined for error range and internal consistency. Subgroups ($n = 28$) provided pilot test-retest reliability and analysis of prospective responsiveness. Practicality was assessed through completion and scoring time and errors, length and ease of use. **Results:** The data demonstrates the SDQ possesses sound methodological characteristics including high correlation with the established tools ($r > 0.91$), high test-retest reliability ($ICC = 0.89$), error range ($SEM = 8.06\%$ and $MDC90 = 18.80\%$), responsiveness ($SRM = 1.49$) and Internal Consistency ($Chronbach \alpha = 0.89$), all exceeding recommended minimum standards. The SDQs practical clinical characteristics exceeded the Oswestry being comparable to the RMDQ but showing greater range of disability determination and distribution. **Conclusions:** The SDQ is a viable SROM tool for daily clinical use, alone or as part of a global measurement and screening package. It has sound practical and methodological characteristics exceeding those of advocated SROM tools.

In the deep end: Evidence-based practice and clinical reasoning in aquatic physiotherapy

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Following previous work to identify, appraise and collate available evidence for the effectiveness of aquatic physiotherapy, the purpose of this paper is to blend clinical reasoning with evidence-based practice. Using ten medical and allied-health databases, a systematic search of literature for aquatic physiotherapy was undertaken. Patient trials were critically appraised for research merit using recognised guidelines including the PEDro rating method. Seventeen randomised controlled trials, two case-controlled studies, 12 cohort studies and two case reports were included in the appraisal. Two trials achieved appraisal scores indicating a high quality of evidence. Fifteen studies were deemed to provide moderate quality evidence for the effectiveness of aquatic physiotherapy. The evidence supported benefit from aquatic physiotherapy on measures of pain, function, self-efficacy and affect, joint mobility, strength, and balance particularly among older adults, subjects with rheumatic conditions and chronic low back pain. However, applying this evidence to clinical practice poses a significant degree of interpretation. The research evidence generally omits comment or arguments of clinical reasoning, thereby failing to bridge the gap between clinical practice and proof of effectiveness. However, contextual influences may also exist in aquatic physiotherapy that corrupt reasoned practice. These may include confusing treatment medium for modality, unreasoned transfer of movement analysis between the pool and land milieu, zealously fitting the patient to the modality rather than selecting the modality for the patient's goals, inconsideration for cost and access, and incontinuity between referring and treating practitioners. Disclosure of clinical reasoning will enhance advanced aquatic physiotherapy practice, research and education.

A randomised trial investigating the effects of hydrotherapy, land-based exercise therapy and occupational therapy on people awaiting joint replacement surgery of the hip or knee

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The aim of this study was to examine the effectiveness of physiotherapy and occupational therapy in improving functional performance and quality of life in people awaiting joint replacement of the hip or knee. Eighty-two participants were randomly allocated to either a six-week hydrotherapy or land-based exercise program. All participants received an occupational therapy home assessment. Participants were assessed at three occasions: prior to commencing the program (baseline), immediately following the program (six weeks), and eight weeks following completion of the program (14 weeks). Assessment included both self-report and physical performance measures. Self-report measures included a patient perceived Global Assessment of Change (also included but not reported in this abstract were the WOMAC, SF-36, Risk Assessment and Predictor Tool, and

Patient Specific Functional Scale). Physical measures included the 30-second chair stand and 50-foot timed walk. A beneficial effect was found for both the land-based and hydrotherapy groups. Of the 75 participants who completed the six-week reassessment, 72% of the hydrotherapy group reported at least moderate global improvement compared to 69% of the land-based group. Seventy-one percent of these participants who reported at least moderate improvement at the six-week reassessment reported that they had not deteriorated or had improved when assessed at 14 weeks. Both groups achieved a statistically significant improvement in performance for the 30-second chair stand and 50-foot time walk at the six week reassessment. However, only the 30-second chair stand performance for the land-based group remained significantly different from baseline at the 14 week reassessment. Although preliminary results suggested an immediate beneficial effect from this program, sustaining the benefits of the program over the longer term may be a greater challenge.

Reliability and agreement of experienced manual physiotherapists in determining simulated sacroiliac joint motion

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The aim of this study was to investigate the ability of skilled manual physiotherapists in detecting small movements between palpable landmarks, using a non-biological model, which mimicked the motion of the sacroiliac joint during the Stork Test. The accuracy and inter-rater reliability of the examiners in detecting movement direction and magnitude, with and without visual occlusion, was assessed. The five examiners were skilled manual physiotherapists who regularly used the Stork Test in their clinical examinations. The model-operator produced 20 randomly selected movements, which were palpated, with and without vision, by each examiner. Intra-class correlations showed good inter-rater reliability (ICC 2,1 = 0.86). Pearson's correlation was performed to determine the accuracy of the examiners' findings against a known reference, with and without visual occlusion. Correlation to a known reference was higher with vision (mean $r = 0.99$) but even with visual occlusion, was good (mean $r = 0.86$). Skilled manual physiotherapists show good inter-rater reliability when assessing the Stork Test using a non-biological model. These examiners were accurate at detecting direction and magnitude of small movements on a model, but less accurate when assessing motion, with visual occlusion. The previously reported poor reliability for rating the Stork Test may be more related to the inability of the human subject to repeatably perform the motion, than to the ability of the physiotherapist to reliably detect the motion.

Change in cross sectional area of equine sacroiliac ligaments during application of manual pressure — a single case design pilot study

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The aim of this single case design pilot study was to measure the cross sectional area of the equine short dorsal sacroiliac ligament, using ultrasound, at resting length and during application of manual pressures to ilium and sacrum. The cross sectional area of the left and right short dorsal sacroiliac ligament was measured using an Aloka 7.5 MHz linear probe, held perpendicular to the clipped and shaved surface. The cross sectional area of the short dorsal sacroiliac ligament was measured four centimeters caudal to the cranial edge of the L6 spinous process, while a manual dorso-ventral pressure was applied to each the left and right tuber coxa and to left and right tubersacrale of the ilium. An oblique manual pressure was applied to the left and right side of the sacrum at the level of the third sacral vertebra, and the cross sectional area of the ligament again measured. The cross sectional area of the ligament measured during the application of the manual pressure was then compared to cross sectional area of the ligament at rest. The Wilcoxon's Signed Ranks Tests was applied to the data ($p = 0.05$) to reveal a significant difference between the cross sectional area of the equine short dorsal sacroiliac ligament at rest, compared to during application of manual pressures. The observed decrease in cross sectional area of the equine short dorsal sacroiliac ligament, may indicate a change in length of the ligament during application of manual pressure.

Identifying plagiarism — postgraduate versus undergraduate student's ability to recognise non-attribution

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Plagiarism is currently one of the most pressing academic issues in national and international tertiary institutions. Key strategies for addressing this issue are currently focused on effective ways of identifying incidents of plagiarism after the submission of assessable work, whereas, fewer strategies have been explored for effectively educating students prior to submission of assessable work. The aim of this study was to determine whether students could identify and recognise examples of plagiarism and to assess whether there was a difference between undergraduate and postgraduate students. Students commencing tertiary programs in physiotherapy or podiatry during 2002 were involved in this study (148 students (39 Master by coursework and 109 undergraduates (physiotherapy and podiatry)). An example essay and the three associated references were provided to all students as part of a semester one course. The essay included 17 various examples of plagiarism and students were required to identify examples of plagiarism or non-attribution (successful completion = 13/17 examples correctly identified). Overall, 68% of students identified 13 or more examples (65% postgraduate and 70% undergraduate students). Students unsuccessful in this task were provided with feedback and requested to resubmit. Following

reassessment, a number of students still were unable to pass this task (one undergraduate compared to nine (23%) postgraduate students). English as a second language (ESL) students in the postgraduate program were disproportionately represented among students unsuccessful in this task. These results of this study highlighted a number of issues which may have explicitly or tacitly influenced students' ability to recognise examples of plagiarism.

Prediction of outcome after ankle fracture: A prospective cohort study

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The aims of this prospective cohort study were to investigate four predictors of outcome after ankle fracture and to develop simple predictive models of outcome after ankle fracture. The predictors investigated were age, fracture classification, acute management (surgical or non-surgical), and passive ankle dorsiflexion measured at the time of cast removal. Sixty-two consecutive subjects aged 17 or older with ankle fractures were recruited from two Sydney hospital orthopaedic clinics. Data were collected on the day of cast removal and six weeks and six months later. Sixty-one subjects were available for the six week follow-up and 60 were available for the six month follow-up. Outcome measures included two functional questionnaires, patients' ratings of global improvement, and a measure of ankle dorsiflexion. The predictive value of the four variables was analysed using bivariate and stepwise multiple linear regression. Passive ankle dorsiflexion and fracture classification, predicted outcome six weeks and six months after cast removal for all outcome measures used. Fracture management (surgical or non-surgical) inconsistently predicted outcome at both six weeks and six months and age did not predict outcome either six weeks or six months post cast removal. The predictive models explain between 19 and 58% of the variance in outcomes six weeks after cast removal and 19 to 52% of the variance in outcomes six months after cast removal. The models estimate clinically important differences in mean values but large deviations from these estimates will occur in some patients.

Neuromagnetic treatment following acute discal lumbar injury

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This clinical case example describes the effects of neuromagnetic treatment on acute discal pain and restricted movement of the lumbar spine of a 47 year old female. This lady presented four weeks post flexion injury with severe discal pain and muscle spasm in the lumbar region following 10 day hospitalisation including catheterisation and ambulating for 10 days on an elbow walker. Physiotherapy commenced involved an adjunctive protocol of iliopsoas stretches, neuromagnetic and TNS treatment. Modalities chosen to alter the transmission of action potentials along nociceptive fibres in the peripheral and

central nervous systems, alleviate pain, muscle spasm and allow early functional movement. Evaluation following one week of neuromagnetic treatment using the Oswestry Disability Questionnaire and VAS scoring measured improvement in function and range of movement. Further evaluation at one month and a commencement of a functional rehabilitation exercise program and a 42% total improvement was measured using the Oswestry Disability Score. A reduction in pain and increase in functional activity was such that the lady was able to return to work requiring standing for long periods as a resort receptionist.

Inefficient muscular stabilisation of the glenohumeral joint in subjects with shoulder pathology: A motor control study

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Muscular control of the glenohumeral joint is essential for overhead sporting activities. Loss of this control is considered to be closely related to the presence of shoulder pathology. Knowledge of the patterning and timing of contractions in these situations will give some insight into the muscle problems present and appropriate rehabilitation techniques. A study was conducted investigating the effect of pain on the pattern of contraction of the shoulder muscles among throwers. Two groups were investigated: throwers with and without pain. Fine wire electrodes were inserted into supraspinatus, infraspinatus and subscapularis. Surface electrodes were attached to serratus anterior, upper and lower trapezius, anterior and posterior deltoid, pectoralis major and latissimus dorsi. A reaction time task of rapid external rotation was performed. The reaction time (RT) and relative latency (RL) were analysed. In the normal group, subscapularis was active significantly earlier than supraspinatus and infraspinatus ($p < 0.01$). In the pain group, the RT of subscapularis was found to be delayed in comparison to all of the other muscles ($p < 0.0001$). Its activation was also delayed in comparison to supraspinatus and infraspinatus ($p < 0.005$ RT; $p < 0.0003$ RL). In the pain group, latissimus dorsi was activated significantly earlier ($p < 0.0001$ RT; $p < 0.02$ RL). These results indicate shoulder pain is associated with changes in the pattern and onset of muscle contraction of individual shoulder muscles. These results are in line with inefficient muscular stabilisation of the glenohumeral joint by the rotator cuff, and has implications for rehabilitation protocols prescribed for overhead athletes presenting with pain.

Reproducibility, validity and responsiveness of a grocery shelving task — a measure of upper limb function for patients with COPD

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The aim of this study was to develop a measure of upper limb (UL) function, the grocery shelving task (GST), for patients with chronic obstructive pulmonary disease

(COPD). Methods: Patients with moderate-to-severe COPD were recruited from the pulmonary rehabilitation (PR) waiting list at a tertiary teaching hospital. 1) Repeated measures design was used to determine reproducibility over six weeks ($n = 12$). 2) Cardiorespiratory responses during the GST were compared with the unsupported incremental UL exercise test (UIULXT) using paired t -tests and correlations ($n = 25$). 3) Pre-post design was used to investigate the responsiveness of the GST following a six-week PR program ($n = 56$). The GST involved picking up and placing 20 items on a shelf 15 cm above shoulder height. Results: 1) Intraclass correlation coefficients showed high reproducibility for time taken to perform the GST (ICC = 0.98). 2) Moderate to strong correlations were found between the two UL tests for all peak cardiorespiratory responses ($p < 0.001$). Mean peak VO_2 was significantly higher for the GST (541 versus 481 ml/min, $p = 0.001$), whereas peak VCO_2 (489 versus 544 ml/min, $p = 0.02$) and VE (20.0 versus 22.9 L/min, $p = 0.001$) were significantly higher for the UIULXT. 3) Time taken for the GST improved following PR $7.6 \pm 9.0\%$ ($n = 33$, $p < 0.001$). The minimum clinically important difference was identified as 5% improvement. Conclusions: The GST was found to be reproducible and responsive to PR with similar peak cardiorespiratory responses to UL work as the UIULXT.

Rate of perceived exertion during supported and unsupported arm exercise

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This study examined the relationships between ratings of perceived exertion (RPE), heart rate (HR) and oxygen consumption (VO_2) during unsupported arm exercise (UAE) in healthy young adults. A second aim was to compare RPE responses during UAE with those of supported arm exercise (SAE). Twelve healthy male and female subjects aged 18–30 performed progressive SAE and UAE tests to peak exercise capacity. SAE was performed on a cycle ergometer adapted for arm exercise. Unsupported upper limb exercise capacity was measured during an incremental unsupported upper limb test which required seated subjects to lift a weighted plastic bar to increasingly higher levels of shoulder flexion at a constant cadence of 60 beats per minute. RPE was recorded each minute using the Borg CR10 scale, while VO_2 , minute ventilation (V_E) and HR were measured using the Cosmed K4b² portable metabolic unit. Maximum values for VO_2 , V_E and HR were significantly greater during SAE than for UAE (all $p < 0.001$). When RPE was plotted against HR, a linear correlation existed for both SAE ($r = 0.94$) and UAE ($r = 0.86$). When RPE was plotted against VO_2 , a linear correlation existed for both SAE ($r = 0.94$) and UAE ($r = 0.88$). There was a significant difference between SAE and UAE for the relationship between RPE and HR ($p < 0.001$) and for the relationship between RPE and VO_2 ($p < 0.001$). This study suggests that RPE may be used as an alternative to HR or VO_2 for the prescription of exercise intensity during UAE in healthy individuals.

Neonatal respiratory therapy in the new millennium: Does clinical practice reflect scientific evidence?

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Respiratory therapy (RT) has historically been considered the primary role of the physiotherapist in the Neonatal Intensive Care in Australia. In 2001 a survey was undertaken of all Level Three Neonatal Intensive Care Units (NICU) in Australia to determine the role of the physiotherapist and RT in clinical practice. It appears that RT is provided less often with the number of infants treated per month ranging from 0-10 infants in 15 of the 20 units who provide RT regardless of therapist availability. RT was carried out by physiotherapists and nurses in 54.6% of units, physiotherapists only in 36.4% of units and nurses only in the remaining 9% of units surveyed. There was also a reduction of RT's role in the extubation of premature infants. A review of the literature shows that overall the use of RT reflects current evidence based practice. The question remains whether it is possible to maintain the competency of staff and justify the cost of training in the current healthcare economic climate. It seems probable that the future role of physiotherapists in NICU may be in the facilitation of optimal neurological developmental of surviving very low birth weight infants.

Pulsatile control: A novel motor control mechanism in human posture and voluntary movement

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There are many neurophysiological models of human motor control. These form the conceptual frameworks for many physio-therapeutic interventions and hypothesis-oriented clinical practice. However, it is not widely appreciated that slow, voluntary human movements are not made smoothly but are discontinuous. This was described some years ago in the finger muscles and was named pulsatile control. We have recently demonstrated that this mode of control exists in the trigeminal motor system as well as the hand. Spectral analysis of jaw acceleration in eight normal subjects confirmed that the human mandible 'trembles' at a peak frequency around six Hz when held in its rest or postural position. This tremor increased in amplitude during very slow movements of the mandible. Finger tremor at rest and during slow voluntary movements had a mean peak frequency of about eight Hz. This frequency did not change during rhythmical finger flexion and extension movements, but the power of the tremor increased non-linearly with the speed of the movement. Coherence analysis confirmed that both the resting tremor and the discontinuities in the slow movements were the result of pulsatile motor signals sent alternately to the flexor and extensor muscles of the mandible and the finger. This suggests that the pulsatile control mechanism is part of a more general framework that includes temporal pattern coding, synchronisation and rhythmicity as integral parts of central nervous system information processing.

The effect of task accuracy on postural control and upper-limb movement in sitting in children with and without Developmental Co-ordination Disorder

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The aim of this study was to investigate the effect of increasing task accuracy on postural muscle timing and upper-limb movement in sitting in children with and without DCD. Thirty-two children with DCD and thirty-two without DCD participated. Motor abilities of all children were determined according to the Movement ABC Standardised Test. Children performed two upper-limb movements with different accuracy demands including a non-goal-directed rapid-arm-raise (RAR) and a goal-directed point (GDP) to a target. Measures included relative latency (RL) of nine postural muscles of the shoulder and trunk; and reaction time (RT), movement time (MT) and motion trajectory ratio (MTR) of arm movement. Eight trials were recorded for each task. Differences between tasks and groups were calculated using linear mixed model procedures. Results from the RAR task revealed children with DCD exhibited significantly different performance to children without DCD on all measures. Increasing accuracy requirements resulted in altered MTR and RL of some shoulder muscles in the Non-DCD group. Children in the DCD group showed exacerbation of altered MTR and timing of trunk and shoulder muscles. MT lengthened in both groups, but RT was not significantly different. On the GDP task, again children with DCD demonstrated significantly different performance on all measures. Findings suggest that compared to typically developing peers, children with DCD demonstrate altered postural muscle activity, which may impact on control of upper-limb movement. Difficulties are present in both free and goal-directed upper-limb movements. Evaluation of postural muscle activation is highlighted for therapists assessing children with DCD.

A single-blinded randomised controlled trial of an exercise intervention to reduce functional decline and health service utilisation in the elderly

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Functional decline is defined as a decrement in physical and/or cognitive functioning. It can occur within two days of hospitalisation and is experienced by up to 50% of older hospitalised patients. This study aims to examine the effectiveness of an early and sustained exercise program in older general medical inpatients for reducing functional decline and ongoing health service utilisation. A single-blinded randomised controlled trial was carried out in the acute general medical wards in a tertiary metropolitan hospital. A total of 126 patients admitted to a general

medical unit were individually randomised into the intervention or control group. In addition to usual care, the intervention group received 30 minutes twice daily, one-on-one exercise supervised by an allied health assistant. The exercise programs were standardised and enabled allocation to one of four levels of functional performance. The control group received usual hospital care. The primary outcome measure was physical function measured by the Barthel Index. Pre/post measurement was undertaken within 48 hours of admission to the ward and within 24 hours of discharge. Secondary outcome measures included Timed Up and Go, Functional Ambulation Classification, length of stay, discharge destination, post acute service utilisation, adverse events and 28 day readmission rates. Data was analysed on an 'intention to treat' basis, with change in functional status compared using paired t-tests. Similarly, between-group differences in other outcomes (discharge destination, length of stay, readmission rates) were assessed using two-sample t-tests or equivalent non-parametric tests. The results and conclusions from this trial will be presented.

Have new graduate physiotherapist employment patterns changed from 1993–2002?

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The aim of this study was to examine the change in employment patterns of new graduate physiotherapists. Graduates from 1992 and 2001 were surveyed as to their employment on 1 March in the year following completion of their degree. Response rates were high (> 66%). Most graduates were employed full time (68% in 1993 and 89% in 2002) in Western Australia and in the metropolitan area (77%). In 1993, 20% of graduates commenced work in private practice, however by 2002, 41% of new graduates worked in private practice. Less new graduates were employed in hospitals (79% in 1993; 40% in 2002). Salaries had increased in line with public sector increments from an average of \$34,000 in 1993 to \$38,000 in 2002. Job satisfaction was high with > 96% being satisfied or highly satisfied with their current position. Graduates most preferred area of work was in a musculoskeletal area (sports/manipulative therapy > 70%) while the least preferred area was intellectual disability and gerontology, and this had not changed over time. Most graduates (> 86%) agreed/strongly agreed that they were well prepared for their positions. Changes were seen in the number of graduates considering undertaking further study with a decrease from 90% in 1993 to 55% in 2002 which was due to the cost associated with further study. Changes in employment patterns have significant implications for schools of physiotherapy in determining curricular content, employers and the profession to ensure that we produce graduates who meet the needs of the community.

Effect of lumbar mobilisation on skin surface temperature in normal male subjects

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The aim of the present study was to assess the effectiveness of lumbar mobilisation on the sympathetic activity in the upper limb of normal subjects. The sympathetic activity was evaluated by skin surface temperature (SkT) of the right index finger. Forty male subjects aged between 18–20 years were randomly assigned into two groups, control and treatment (n = 20/group). Subjects in the treatment group were treated by lumbar mobilisation; central postero-anterior technique (PA) grade III on the spinous process of L2 for one minute. Subjects in the control group did not receive any treatment. SkT was detected by a Digital Thermometer Fisher Scientific using readings at zero and five minutes after the application of mobilisation. Comparing of SkT at zero and five minutes after the application between the control and the treatment groups was done by independent t-test. Statistical significant level was set at $p < 0.05$. The result indicated that there was an immediate significant percent difference of 0.49% in SkT between the two groups. That is, SkT of the treatment group was significantly lower than that of the control group ($p = 0.01$). At five minutes, there was no significant difference in SkT between the two groups ($p = 0.67$). The finding of this study indicated that lumbar mobilisation consisting of a grade III central PA technique on the spinous process of L2, could cause a short term decrease in SkT of the upper limb. Therefore, lumbar mobilisation might increase the sympathetic activity in the upper limb in normal subjects.

Effect of thoracic mobilisation on skin surface temperature in the upper limb of normal subjects

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The aim of the present study was to assess the effectiveness of thoracic mobilisation on the sympathetic activity in the upper limb of normal subjects. The sympathetic activity was evaluated by skin surface temperature of the right index finger. Forty male subjects aged 21.03 ± 0.46 years were randomly assigned into two groups, control and treatment (n = 20). Subjects in the treatment group were treated by thoracic mobilisation; central postero-anterior technique (PA) grade III on the spinous process of T6 for one minute. Subjects in the control group did not receive any treatment. The skin surface temperature was detected by a Digital Thermometer Fisher Scientific using readings at zero and five minutes after the application of mobilisation. Comparing of the skin surface temperature at zero and five minutes after the application between the control and the treatment groups was done by independent t-test. Statistical significant level was set at p -value < 0.05 . At five minutes, the skin surface temperature of the experimental group was significantly lower than that of the control group ($p = 0.07$). However, measurements taken

immediately after the experimental period showed no significant difference between the two groups ($p = 0.26$). Thus the result of this study demonstrated that thoracic mobilisation produced a delayed (after five minutes) increase in sympathetic activity in the upper limb of normal subjects

A review of criteria in critical appraisal instruments: Is a generic allied health tool possible?

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Checklists and scoring systems are purported to assist critical appraisal of published research. There are no agreed core elements for critical appraisal, and no instrument relating specifically to allied health evidence. We hypothesised that a critical appraisal instrument could be developed that was relevant to all allied health research designs. Using library database and internet resources, we systematically identified published critical appraisal instruments. Eligibility for inclusion was that the instrument components were specified. Instrument components were verified independently by two researchers and these were coded in a spreadsheet. Instruments were grouped according to study design(s) and common criteria were identified. Ninety-two critical appraisal instruments were identified. Another 23 instruments used minor variations on criteria of identified instruments, and were thus not included. Twenty-three instruments applied to systematic reviews, 44 to randomised controlled trials, 23 for clinical trials, 15 for cohort studies, 16 for case-control studies, five for surveys, four for qualitative designs, seven for diagnostic tests, one for case studies, none specifically for literature reviews and eight for general publications. Methodological quality criteria varied widely, with common elements across research designs being aspects of internal and external validity. There was no allied health-specific instrument, and less than 5% instruments sought evidence of diagnostic accuracy, descriptions of intervention or appropriateness of outcome measures. While a generic instrument seems possible, a concerted focus is required on common core elements of research design relevant to allied health literature.

Factors affecting choice of falls prevention strategies: An analysis of the Older Persons Survey

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The aim of this study is to investigate what factors are associated with the willingness to undertake falls intervention by older South Australians who consider themselves at risk of falling. A retrospective database analysis of an observational cross-sectional cohort was conducted. The Older Persons Survey is an anonymous telephone survey, carried out by the Department of Human Services (SA) in 2000. Respondents who had fallen in the

past 12 months and considered themselves at risk of a future fall ($n = 317$) were examined further. These subjects were asked if they would be prepared to undertake particular falls prevention strategies. Only 22.9% responded that they would have a regular medical check-up, 18.6% would have home modifications done, 10.3% would undertake exercise away from home 9.1% would exercise at home, 4.4% would undergo education sessions at home and 4.4% away from home and 0.4% would stop taking sleeping tablets. Over half, (57.6%) of respondents were not willing to participate in any falls intervention activities. Willingness to have a medical check-up was significantly associated with general health perception, education level with willingness to undertake exercise, marital status with willingness to undertake education and, type of accommodation with willingness to have home modifications done ($p < 0.05$). Conclusion: Older people who consider themselves at risk of falling are not willing to participate in most falls prevention strategies. There is a need to establish effective methods of encouraging older people to reduce their falls risk.

A systematic and critical review of allied health databases: Current standards and implications for future challenges

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All institutions and allied health disciplines which provide healthcare routinely collect data on their service and their providers. This data is often used for varying purposes ranging from accounting needs to benchmarking and quality assurance purposes. This study identifies current standards of databases commonly used in allied health and provides guidelines on future database management strategies. Selected databases of public and private healthcare providers in Australia were analysed for data elements, definitions, usage (with specific aim regarding items used for quality monitoring) and drawbacks identified. Data items and its definitions from individual databases were compared to identify uniformity of the data collected. Specific attention was paid to the data items, which were commonly utilised for quality evaluation and monitoring. Even though there were some structural similarities within the databases, several notable differences were identified within the data items collected and its definition. These differences were existent within and across individual disciplines in the same organisation. Furthermore, allied health disciplines were littered with definitional ambiguity about individual data definitions. The data items that were routinely used as quality monitoring tools did not adequately provide accurate information regarding the quality of service. Allied health disciplines within Australia are faced with inadequate information management systems with lack of uniformity of data items and its definitions. This huge variation causes inability to adequately benchmark and causes inefficient quality evaluation and monitoring. Structural and procedural changes are needed for efficient and appropriate use of the databases.

Key elements underpinning allied health service quality: Funders' perspectives of quality in allied health service delivery

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As evident in recent years, the issue of quality has been of great concern in the healthcare system as we continue to witness dramatic changes in the structure and delivery of care. This has been attributed to a changing healthcare environment where the purchase of service is based on high quality evidence-based practice and value for money. The aim of this study is to identify issues of quality in service delivery from the funders' perspective. Funders from different funding organisations (public, private and third party insurance providers) were interviewed in a semi-structured format. Prior to the interview, the subjects were provided with a set of core questions around which the interview was structured. The interviews were tape-recorded and later transcribed for data analyses purposes. Key themes that were identified from these interviews were: quality treatment interventions provide a demonstrable outcome; quality care and outcomes are driven by the compensable; currently there are no industry standards to measure or monitor quality; de facto quality monitoring has been set on the number of occasions of service; currently there are no incentives to improve quality (except self-fulfilment and professional satisfaction) and there are several barriers to improving quality (such as financial disincentives, time). Funders are demanding quality care provided to their consumers is up to date, evidence based and meets the outcome of the consumers. Future funding models will be based on care that is appropriate and provides a demonstrable outcome to all the stakeholders involved.

Quality in allied healthcare: Current trends in practice and an innovative patient-centred model

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While the importance of quality healthcare has been recognised in the medical arena, this issue is at its infancy in allied health disciplines. With increasing accountability in healthcare, it is imperative to possess better understanding of patients and providers perceptions of elements of quality healthcare. A grounded-theory methodology of the qualitative research paradigm was selected. Semi-structured interviews were conducted with patients and physiotherapists on constructs of quality in allied healthcare. These tape-recorded interviews were then transcribed and key themes from these data sets identified. These key themes helped formed a patient-centred model of quality care. The new model emphasises the patient as the centre of care and identifies the importance of healthcare being a two-way street. Patients expect to be active participants in their healthcare (rather than passive recipients). While patients may not be able to articulate what is considered to be 'quality' care, they have an underlying perception of what quality care is. Quality care is a continuum, which commences very early in care

delivery, and is ongoing throughout an episode. Furthermore, quality care is a package, which includes several elements of structure, process and outcome. This research provided new insight into patients' perception of quality care is and underpins any future developments in improving quality in clinical practice.

Quality in allied health service delivery: Current monitoring standards and innovative future measurement tool

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Healthcare quality has been the recent focus of many debates and concern as all the stakeholders in the healthcare system are demanding high quality practice, which is evidence-based and provides value for money. Current quality monitoring standards heavily rely on the number of occasions of service (which are pseudo-markers of quality care) and fail to capture relevant information on the other elements of quality care such as safety, effectiveness, patient centeredness and timeliness. Based on a ground theory methodology of the qualitative research paradigm, semi-structured interviews were undertaken of all the stakeholders (patients, physiotherapists and funders) to identify drivers of quality care. Based on these interviews, key themes were identified and a new measurement tool was developed which encompassed all the elements of quality while meeting the requirements of individual stakeholders. The measurement tool, in form of an 'active' checklist, can be broadly divided into five service points within an episode of care. Each individual service points have exclusive and shared elements of quality. The practical application of this checklist can be achieved via an electronic means (web-based database) or via paper-based format. Each criterion in this checklist can be utilised to provide an objective measure of quality. The features of this 'live' checklist are it represents broad perspective of quality views across individual stakeholders and allows, for the first time, objective benchmarking while being cost effective. Such an innovative measure of quality is paramount to our profession to improve current practice and monitoring standards.

The effect of low Dye taping on peak and mean plantar pressures, during gait, in subjects with excessively pronated feet

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Low Dye taping is commonly used by clinicians to support the medial longitudinal arch of the foot and reduce excessive pronation. The aim of this study was to investigate the effect of low Dye taping on peak and mean plantar pressures of subjects with excessively pronated feet. Subjects were defined as excessively pronated if they had a navicular drop of greater than 10 mm. The right foot of 60 subjects was tested using the Emed-AT system (Novel_{gmbh} Munich) to obtain plantar pressure values. Subjects performed six taped and six untaped walks over

the Emed platform. Plantar pressures under the right foot were recorded in the form of a footprint. In a specialised software program, each footprint was divided into 10 sections called masks. Peak and mean pressure (N/cm²) values of the untaped and taped walks were calculated for each mask. The average value from the six walks for peak and mean pressures in each mask were calculated for each subject. A paired t-test was used to compare the peak and mean pressures of each mask between untaped and taped walks. A significant change in peak and mean pressures ($p < 0.05$) was determined in nine of the ten masks. Low Dye taping significantly decreased pressure under the heel and forefoot, while increasing pressure under the lateral midfoot and toes. The area under the medial midfoot demonstrated no significant change in either peak or mean plantar pressure. Low Dye taping was demonstrated to alter gait pattern, possibly preventing excessive pronation.

A randomised controlled trial of the effects of splinting the hand in a functional position after brain impairment

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The aim of this study was to evaluate the effect of a four-week splinting program on the length of finger and wrist flexor muscles, hand function and pain in adults following acquired brain impairment. A randomised controlled, assessor-blinded trial of 28 subjects who had recently sustained a either a traumatic brain injury or stroke was carried out in a rehabilitation unit. Subjects in both experimental (n = 17) and control (n = 11) groups participated in routine therapy (motor training for upper-limb use and upper-limb stretches) five days a week. The experimental group also wore a hand splint in the functional position (10° wrist extension) for a maximum of 12 hours each night for the duration of the four-week intervention period. Primary outcome was torque-controlled range of wrist extension with fingers extended; secondary outcomes included functional hand use on the Motor Assessment Scale and pain intensity. Pre-, post-intervention and follow-up measurements were made. The effect of splinting plus stretching compared to stretching alone on contracture was clinically unimportant (loss of 2° (95% confidence interval, -7.2° to 3.2°)). There was no significant difference between groups for changes in secondary outcomes either. Splinting in the functional position does not produce clinically useful effects in patients who are receiving daily wrist stretches.

The ground reaction forces of patients with patellofemoral pain syndrome during the stance phase of walking

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The magnitude of the ground reaction forces is thought to be associated with increased load on the lower extremity and therefore may contribute to knee injuries. The purpose of this study was to investigate the differences in the peak

vertical, anterior posterior and medial lateral ground reaction forces (GRF) and the relative timing of peak GRFs between patellofemoral pain syndrome (PFPS) and healthy subjects. Fourteen healthy females and thirteen females with diagnosed unilateral PFPS were examined during five walking trials across a Kistler forceplate. GRF was normalised to body weight. An ANOVA showed significant differences between the control and clinical groups respectively in peak medial 0.12 ± 0.029 and 0.09 ± 0.030 ($p = 0.03$), peak mid vertical 1.42 ± 0.121 and 1.16 ± 0.352 ($p = 0.01$) and the second vertical peak 2.20 ± 0.119 and 1.82 ± 0.496 ($p = 0.01$) with no significant differences in the remaining GRFs and or time of peak GRFs. These results showed reduced load acting during the second portion of the stance phase. Insufficient activation of the muscles assisting the foot to become a rigid lever as well as any atypical foot structure may affect the value of the GRF. Abnormal foot function during walking may create insufficient propulsion by the lower extremity, as the foot may be unable to generate sustained plantar force on the ground. An analysis of the joint force and the resultant moment of the muscles may be important factors that need to be examined in addition to the GRF in patients with PFPS.

Rearfoot and tibia motion during the stance phase of walking in patients with patellofemoral pain syndrome

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Abnormal subtalar joint function during walking is thought to contribute to patellofemoral pain syndrome (PFPS). The purpose of this study was to examine if differences existed in the rearfoot and tibia motion during the stance phase of walking between healthy and PFPS subjects. Fourteen healthy females and 13 females with diagnosed unilateral PFPS were videoed during five walking trials using a four-camera three-dimensional motion analysis system. Inversion/eversion, abduction/adduction and plantarflexion/dorsiflexion motion of the rearfoot relative to the tibia and tibia internal/external rotation were investigated by attaching external markers to a tibia shell and the calcaneus. Data was time normalised for the stance phase. An ANOVA showed significant differences for the control and the clinical groups respectively in peak adduction $4.19^\circ \pm 2.95^\circ$ and $1.27^\circ \pm 4.24^\circ$ ($p = 0.047$), time of peak eversion $0.39\% \pm 0.07\%$ and $0.46\% \pm 0.65\%$ ($p = 0.021$) and time of peak dorsiflexion $0.73\% \pm 0.04\%$ and $0.66\% \pm 0.08\%$ ($p = 0.021$). The PFPS group demonstrated a delay in the peak eversion that may have affected the desirable synchronised timing between the lower extremity joints. The lower peak adduction and the earlier occurrence of peak dorsiflexion during the second half of the stance phase may indicate insufficient function of the foot during supination. Insufficient function of the foot may result of a dysfunction of the muscle responsible for supination as well as abnormal prolonged eversion. This in turn may affect the foot in becoming a rigid and efficient lever during the propulsive stage at late stance.

Rearfoot reference position for walking in patellofemoral pain syndrome

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Appropriate reference positions for investigating rearfoot motion may be affected by foot pathology in clinical populations. To enable comparison of the rearfoot kinematics across healthy and patellofemoral pain syndrome subjects (PFPS) similar reference positions should be used. The purpose of this study was to examine the relationship between the rearfoot frontal plane pattern of motion during the stance phase of walking and three reference positions: Relaxed standing posture, neutral position of the subtalar joint (STJN) and when the vertical bisection lines of the calcaneus and the lower leg are aligned or parallel to each other (Lines Parallel) in healthy and PFPS subjects. Fourteen healthy females and 13 females with diagnosed unilateral PFPS were videoed during five walking trials using a four-camera three-dimensional analysis motion. Inversion/eversion motion of the rearfoot relative to the tibia was measured by attaching external markers to a tibia shell and the calcaneus. A graphical method was used to examine the relationship between each static reference positions and the motion of the rearfoot relative to the static reference positions for both groups. An ANOVA showed significant differences between the groups for each reference positions: Relaxed Standing ($p = 0.01$), STJN ($p = 0.02$) and Lines Parallel ($p = 0.01$). For both groups, the Lines Parallel static angle intersected the rearfoot mean motion when the Lines Parallel was used as a reference position. Therefore, the Lines Parallel reference position may be an appropriate reference position for measuring rearfoot motion for PFPS and healthy individuals.

The timed up and go test: Unable to predict falls on the acute medical ward

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Prevention of falls among older people is a high priority in healthcare. The aim of this study was to evaluate the ability of the Timed Up and Go Test (TUGT) to predict those older people who will fall while admitted to an acute hospital. The medical records of 160 older patients who were admitted to the medical ward of a large rural hospital were accessed retrospectively. The predictive ability of the TUGT was determined using estimated odds ratios calculated by logistic regression. The TUGT result was included in the model as an independent variable and whether the patient fell or not as the dichotomous dependent variable. The TUGT conducted by a physiotherapist near to the time of admission, and used in isolation, was unable to identify those patients who were likely to fall (Fishers Exact Test, $p = 0.609$, $n = 141$). However in the logistic regression model, the co-morbidity of incontinence was identified as a falls risk factor ($p = 0.001$, $n = 160$). The TUGT alone does not possess predictive validity for acutely unwell older patients in this setting. It is therefore recommended that it not be used in isolation to identify those people who may fall.

To develop a clinical indicator for hydrotherapy

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A quality improvement exercise was undertaken at Canterbury Hospital which aimed to evaluate and monitor the hydrotherapy program. The measurement tools used were the two-minute walk test and the visual analogue scale (VAS). Data was collected over a four-month period. All patients referred to hydrotherapy ($n = 78$) were recruited. The two-minute walk test and the VAS scores were collected on admission and discharge by a 'blinded' assessor, so that there was no alteration to individual exercise programs. The majority of referrals were for chronic low back pain, or multiple joint pains. The aim of the hydrotherapy was to decrease pain, improve strength and improve mobility. Surprisingly, one patient with Parkinson's disease was referred to improve strength. The mean value of the two-minute walk test on admission was 119.5 m (SD = 34.6 and range of 18 to 195) and on discharge was 132.5 m (SD = 34 and range 12 to 120). The mean VAS score on admission was 4.9 (SD = 2.5 and range of 0 to 10) and on discharge was 4 (SD = 2.3 and range of 0 to 9). Student T test was used for analysis. Both tests appeared to achieve a significant difference and the coefficients of the two-minute walk test and the VAS were 0.086 ($p < 0.001$) and 0.722 ($p < 0.001$) respectively. We concluded that the two simple tests of the two-minute walk test and the VAS can be used as clinical indicators for hydrotherapy.

An experience in providing intensive physiotherapy treatment to Bali victims at Concord Hospital

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Hearing of the Bali tragedy in the news, the Burns Unit at Concord Hospital expected a high influx of patients. However, patients did not arrive until two days later. There were altogether 11 Bali victims being admitted to Concord Hospital with four of them overseas travellers and three from other states. Other than burns injury, all patients presented with perforated ear drums and shrapnel wounds. Due to delays in definitive care, two patients required intensive treatment at the Intensive Care Unit. Other than issues related to burns injury, staff had to deal with personal grieving resulting from friends or relatives being killed in the incident. This created difficulties in motivating patients in participating in the physiotherapy treatment. This highlighted the need for psychology and sociology training in the undergraduate physiotherapy curriculum. To monitor the progress of these patients, all physiotherapists working in burns units across Australia agreed to perform monitoring tests throughout the follow-up phase. These tests included the two-minute walk test, grip strength, shoulder range, the Disabilities of the Arm, Shoulder and Hand scale and the Burns Specific Health Scale questionnaire. The two-minute walk test results were 151.6 m, 187.6 m and 205 m on discharge, at one month and at three months follow-up. They showed a significant improvement ($p = 0.045$ and 0.028 respectively) using the Two-tailed T test. Results indicated that these patients made a good physical recovery from the intensive physiotherapy intervention.

The decline in balance with age is more than strength: What about somato-sensation?

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A study by our research team identified that a decline in postural stability occurred between 40 and 60 years when changes to support and visual conditions were introduced. A subsequent study of healthy women aged 20 to 80 years showed that a decline in strength of the hip abductors occurred by the 60s suggesting a need to target these muscles more specifically in exercise programs. Factors other than strength, however, need to be considered to account for the early decline in postural stability when vision is removed. This study aimed to investigate the changes in somato-sensory function with age. A cross-sectional sampling of 320 women across age decades (20–80 years) was performed. Data collected included demographic information and measures of lower limb somato-sensory function. Tactile acuity, vibration sensitivity and joint re-positioning ability were measured using reliable clinical tools. Multivariate analyses demonstrated a main effect for age on all measures. Univariate analyses with post hoc analyses of the somato-sensory measures determined a significant decline by the 40s for tactile acuity ($p < 0.05$) and joint re-positioning ability ($p < 0.01$) when an open chain test was used, but not until the 60s while using a closed chain test ($p < 0.05$). Vibration sensitivity significantly declined by the 50s ($p < 0.001$). Early changes in somato-sensory function across the 40 to 60 age group were demonstrated and may be a factor contributing to a decline in balance across this period. Targeting these elements in the delivery of exercises is indicated and programs that address these factors require implementation and evaluation.

Randomised trial of deep breathing, secretion clearance techniques and early mobilisation, versus mobilisation alone, in open abdominal surgery

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Aim: To determine if coached deep breathing exercises and sputum clearance (DB&C) improve outcomes when added to a physiotherapy program of mobilisation in high risk patients after open abdominal surgery (OAS). **Design:** Prospective single-blinded randomised clinical trial. **Subjects:** 58 subjects (mean age 65 years, SD 14) assessed as high risk for pulmonary complications (PPC) (aged > 59 years or co-morbidities such as smoking, obesity and respiratory disease) undergoing elective OAS via a midline incision. **Methods:** Subjects were randomly allocated to two groups, A and B. The 23 subjects in group A participated in a mobilisation program only. The 29 subjects in group B received DB&C, three times daily for the first two postoperative days, twice daily for days three and four then daily until symptom free for two consecutive days, in addition to the mobilisation program. All subjects were assessed at least daily for PPC. Outcomes were assessed by the researcher who was blinded to group allocation, using a standardised outcomes measurement

audit tool previously published. Statistical analyses on an intention to treat basis included student t-tests and z-tests using SPSS version 6.1.2. Results: Complete data were available for 52 subjects (90%). Dropouts were due to procedure cancellation (two) or change in incision (four). There was no significant difference between Groups A and B in age, anaesthetic time, perioperative morbidity or postoperative mobility. Overall incidence of PPC was 15% (A: 13%, B: 17%, $p = 0.68$), with no significant difference in mean PPC score between groups (A: 2.7 ± 1.8 SD, 95% CI 1.9 to 3.5; B: 3.0 ± 1.7 SD, 95% CI 2.3 to 3.7), physiotherapist time ($p = 0.76$) or number of treatments ($p = 0.34$). Conclusion: The addition of DB&C to a physiotherapy program of mobilisation confers no significant improvement in PPC incidence in high risk OAS patients.

Perception of effort can be used to regulate the intensity of arm exercise in healthy individuals

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The purpose of this study was to determine whether ratings of perceived exertion (RPE) measured during maximal graded exercise tests (mGXT) were similar to those reported, at equivalent sub-maximal workloads, during supported arm exercise (SAE) and unsupported arm exercise (UAE). Sixteen healthy volunteers completed mGXT (estimation trials) and two sub-maximal exercise tests (production trials) for both SAE and UAE. Outcome measures included oxygen consumption (VO_2), heart rate (HR) and RPE (on a 10-point scale) for each stage of the mGXT. RPE, HR and workload equivalent to 50% and 70% VO_2 peak for each exercise mode were estimated from regression plots. Subjects exercised for five minutes at each of these workloads (production trials) for both SAE and UAE. Comparisons were made of VO_2 , HR and RPE between the estimation and production trials for SAE and UAE, at each exercise intensity. RPE, VO_2 and HR did not differ in the estimation and production trials at 50% or 70% VO_2 peak during UAE and at 50% VO_2 peak during SAE. However during SAE at 70% VO_2 peak, both RPE and VO_2 were significantly higher during the production trial as compared to the estimation trial by [0.9(1.3 (SD) rating points), ($p = 0.017$) and by 0.18(0.14 (SD) l.min⁻¹) ($p < 0.001$), respectively]. Given the equivalence of RPE between estimation and production trials at same relative sub-maximal workloads, it is concluded that RPE could be used to regulate exercise intensity during UAE at both 50 and 70% VO_2 peak and SAE at 50% VO_2 peak but not SAE at 70% VO_2 peak.

Falls prevention in community dwelling people with dementia: Can it be done?

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This pilot study aimed to assess the feasibility of a falls prevention program for community-dwelling people with dementia, predominantly from an Italian background. This collaborative project between the University of South Australia, the Italian Benevolent Foundation and the Alzheimer's Association was embedded within a community respite program. Methods: Clients underwent a standardised falls risk assessment from which a falls and injury management plan was formulated. The program included a tailored exercise program by a physiotherapist, foot health delivered by a podiatrist, and referral on for medication reviews, home safety assessments, and vision testing as appropriate. Involvement from physiotherapy undergraduate students provided a cost-effective method of delivering services. Outcome measures included prospective falls data, balance (Berg Balance Scale), cognitive function (Mini Mental State Examination), and aerobic capacity (six-minute walk test). Results: From the first 63 subjects to enter the program, six month data were available for 32 subjects. Eleven subjects had moved to residential care, seven left the program, six had not completed six months on the program, and seven had died. There were no significant differences between pre and post test measures for the number of fallers, balance, cognitive function, or aerobic capacity ($p > .05$). In a group of people with a progressive disorder this may be viewed positively. Conclusion: A practical model for delivering falls prevention to people with dementia has been developed; however, the effectiveness of this model has yet to be established given there was no decline but no improvement either.

Older people's perceptions of falls prevention — implications for physiotherapists

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People's outcome expectations for any intervention have profound implications for motivation to participate in prevention activities. Little research has been undertaken to explore older people's perceptions of falls. This paper aims to discuss findings of this topic from the literature, a survey, and a focus group undertaken by *Stay On Your Feet — Adelaide West*, to inform physiotherapists about older people's perceptions of falls prevention. Older people's attitudes to falls can be entwined with such things as denial of ageing or belief that falls are inevitable, which present a challenge to physiotherapists offering treatment and advice. The results of our survey of older carers (n = 121) indicated that 26% of respondents did not believe falls were preventable. The exterior environment and balance were best identified as falls risk factors. There was less understanding that vision or psychological factors may relate to falls. A focus group of older people gave mixed responses to falls prevention materials. Some group

members saw little merit in falls prevention whereas others were enthusiastic. Despite most of this group having experienced a fall, many related the information to other older people, but not themselves. Older people's unwillingness to take action to prevent falls may reflect their self efficacy. There is a need for further research in this area to develop effective strategies to assist older people to recognize the need to take action to prevent falls. An understanding of older people's attitudes and perceptions of falls can assist physiotherapists when developing falls prevention programs.

Abnormal quantitative gait parameters in the absence of clinical motor signs in early multiple sclerosis

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The purpose of this study was to evaluate the gait performance of newly diagnosed multiple sclerosis (MS) patients who had no signs of motor impairment and no functional limitations on clinical examination, compared to age- and gender-matched control subjects. Ten MS and ten control subjects were videotaped from both sides while traversing a 10-metre walkway at a self-selected speed. Light-reflective markers were attached to the lower limbs for two-dimensional movement analysis, and footswitch recordings permitted calculation of temporal-spatial gait parameters. Surface electromyography was recorded bilaterally from tibialis anterior and gastrocnemius during gait. The results indicated that the MS subjects walked with altered temporal-spatial parameters including reduced speed and stride length ($p < 0.001$), and prolonged double limb support ($p = 0.016$), compared to the control subjects. The MS subjects demonstrated reduced ankle motion throughout the gait cycle, particularly reduced ankle dorsiflexion at initial contact ($p = 0.003$), although there was no difference in knee motion compared to the control subjects. Alterations in the timing of tibialis anterior and gastrocnemius activity, corresponding to the ankle kinematic profile, were identified in the MS subjects. The finding of a more conservative gait pattern in the MS patients, characterised by altered temporal-spatial parameters, may represent a compensatory strategy aimed at maximising stability. Gait abnormalities were evident within two years of diagnosis of MS, suggesting that mobility function may begin to deteriorate in the early stages of the disease, even in the absence of clinical signs of motor impairment.

Induction of functionally beneficial reorganisation following stroke: A case study

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This case study describes a novel intervention program designed to induce functionally-beneficial reorganisation of the motor cortex following stroke. We have shown that low-frequency, synchronous electrical stimulation of the proprioceptive afferents innervating two hand muscles (associative stimulation) induces focal increases in the excitability of the motor cortex in both normal subjects and stroke patients. The subject was a 79-year-old woman who recently suffered an ischaemic stroke in the right middle cerebral artery territory. We applied associative stimulation, followed immediately by a task-specific physiotherapy program (repetitive practice of functional tasks) three times per week for three weeks with an additional home exercise program. Upper limb function was measured by a blinded assessor using the Action Research Arm Test (ARAT) and the Fugl-Meyer Assessment (FMA), pinch and gross grip strength, pinch velocity, and dexterity were measured, and cortical excitability was assessed by transcranial magnetic stimulation (TMS). The subject showed substantial improvements in the FMA (6 points) and ARAT (11 points) with corresponding improvements in pinch velocity (135% of baseline) and pinch grip strength (141%). Responses to TMS were extremely variable and did not change significantly. Dexterity was tested with a custom-built manipulandum which revealed a significant improvement in the ability to scale grip force to load force appropriately when lifting a moderately heavy object ($p = 0.008$) with a reduced duration of the preload phase of the lift ($p = 0.01$). This case study demonstrates the beneficial effects of associative stimulation when combined with task-specific training in a stroke patient.

Predicting outcome in total hip replacement patients using the Harris Hip Score and the 36-Item Short-Form Health Survey

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Total hip replacement (THR) is a common surgical procedure for osteoarthritis of the hip. However, studies evaluating the effect of THR on quality of life in an Australian sample are rare. This study utilised a retrospective, observational cohort design to investigate the effect of THR on post-operative scores from the Harris Hip Score and 36-Item Short-Form Health Survey (SF-36). The ability to predict post-operative outcome using these tools was also investigated. A series of statistical tests were used to analyse pre-operative, and three and 12 months post-operative Harris Hip Score and SF-36 data for 115 THR patients. Harris Hip Score and SF-36 scores improved significantly following THR. The greatest amount of improvement took place in the first three months post-operatively. Age and co-morbidities had no effect on post-operative outcome. However, females and patients with

complications had significantly lower post-operative scores. Pre-operative scores were generally poor predictors of post-operative outcome. However, predictive models using three months post-operative scores were able to account for between 37.1% and 45.7% of the variance in 12 months post-operative outcome. Physical function and post-operative complications were the most significant predictors of post-operative outcome. The results of this study suggest that THR is a successful procedure for improving quality of life in Australian patients with osteoarthritis of the hip. Three months post-operative scores may be useful in predicting 12 months post-operative outcome. This may allow screening at the three months post-operative check-up for patients at risk of a poor outcome, who might benefit from additional intervention.

Lifestyle effects and changes in bone mineral density in healthy young women

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Maximising premenopausal bone mineral density (BMD) is an important strategy for the prevention of osteoporosis and resultant fractures later in life. The effects of dietary calcium intake, physical activity and other lifestyle variables (ascertained by questionnaire) on longitudinal changes in BMD over a mean 9.4 years were examined in 62 healthy young women who had previously participated in a two-year calcium supplementation study. Early decline in BMD at the neck of femur (-3.3% per decade) and trochanter (-2.7% per decade) and the converse gain in BMD at the lumbar spine (+4.3% per decade), intertrochanter (+1.9% per decade) and whole body (+14.1% per decade) suggest site specific changes in BMD in young premenopausal women. No effect of previous calcium supplementation was seen on current BMD or changes in BMD ($p > 0.10$). Lifestyle predictors of change in BMD were determined using hierarchical regression analysis after forced correction for the covariates baseline BMD and previous calcium supplementation. Parity was negatively associated with change in BMD at all sites (β coefficient $\hat{a} = -0.40$ to -0.26 , $p < 0.05$). Physical activity was positively associated with change in BMD at total hip and intertrochanter sites ($\hat{a} = 0.26$, 0.26 respectively, $p < 0.05$). Calcium intake was negatively associated with change in BMD at the lumbar spine ($\hat{a} = -0.27$, $p < 0.05$). These data demonstrate that BMD is already declining at the proximal femur in healthy young women. Physical activity assists in maintenance of BMD at some sites, and thus may contribute to lifelong fracture prevention.

Changes in bone structural geometry during young adulthood

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Section modulus is a measure of resistance of bone to failure on bending. It may be increased by increasing the mineral content of the bone or by redistributing existing bone mineral further away from the neutral axis of bending at the postulated fracture plane. The longitudinal changes in section modulus and the effects of physical activity and dietary calcium intake on these changes were examined in healthy young women. Sixty volunteers who previously participated in a placebo-controlled two-year calcium intervention study at mean (SD) age 18.5 (0.3) years were re-measured a mean 9.4 years later. Dual energy x-ray absorptiometry (Hologic QDR 1000W) was used to measure changes in section modulus of the neck, intertrochanter and shaft regions of the proximal femur. Lifestyle factors were ascertained by questionnaire. Section modulus increased a median (IQR) of 1.9 (15.6)% at the neck ($p = 0.02$), 1.5 (9.7)% at the intertrochanter ($p = 0.08$) and 4.1 (9.5)% at the shaft ($p < 0.001$). Lifestyle predictors of change in section modulus were determined using hierarchical regression analysis after forced correction for baseline section modulus. Dietary calcium intake was negatively associated with change in section modulus at the neck and shaft sites (β coefficients = -0.37 and -0.27 respectively, $p < 0.03$). Physical activity, previous lactation and previous calcium supplementation were not associated with change in section modulus at any site. Unlike hip bone mineral density that has been reported to decline during the decade following attainment of peak bone mineral density, hip section modulus (and therefore likely bone strength) appears to increase.

Exploring 'effective' verbal feedback in physiotherapy clinical education — the supervisor's perspective

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Verbal feedback exchanged between clinical supervisors and physiotherapy students is one tool used to optimise student learning in clinical education. Despite a large body of literature devoted to the supervision process, scant attention has been directed to the process of feedback, the affordances and constraints to effective feedback and its impact on learning in clinical education. The aim of this study was to explore how clinical supervisors view 'effective' and current practice in verbal feedback sessions with students. Questionnaire responses were received from 102 (88% response rate) supervising clinicians affiliated with the undergraduate physiotherapy clinical education program at The University of Melbourne. The questionnaire containing 18 items produced both quantitative and qualitative data with the aim of enhancing understanding of current practice and conceptions of effective practice. The key characteristics of effective verbal feedback were grouped and analysed under the themes of process, content, context, interpersonal

dynamics and outcomes. Supervisor stress was identified as a key constraint to effective feedback by 40% of respondents. The reasons for this stress response were the poorly performing student (50%), supervisor concern for producing an emotive reaction (48%), the high-achieving student (20%), lack of supervision experience (13%), supervisor justification of their own opinion (10%), and time constraints (15%). These identified factors which impact on our current conception of effective feedback in physiotherapy clinical education, warrant, and will receive, further investigation.

The effects of trunk flexor fatigue on the anticipatory muscle activity of the trunk muscles during arm raising

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Seven subjects performed rapid arm flexions and extensions in a simple reaction time mode prior to and after fatiguing isometric situps. Two sessions were undertaken two weeks apart. Surface electromyography characterised the muscle activity of the bilateral external and internal obliques (eol, eor, iol, ior), rectus abdomini (ral, rar) and erector spinae (esl, esr). Fatigue effects, indicated by changes in the frequency spectrum during the isometric situps, were most obvious in the rectus abdomini muscles. Feedforward postural muscle activity during arm raising demonstrated both background and anticipatory components. There were no consistent differences in muscle activity between sessions ($p = 0.19$). Anticipatory muscle activity was significantly affected by the direction of arm movement in eor, ral, rar and esl ($p < 0.001$) whereas background muscle activity was not ($p = 0.09$). Post fatigue, there were significant increases in background muscle activity in the internal and external obliques ($p = 0.002$) which diminished over the next 30 minutes. Sustained depression of anticipatory muscle activity occurred post fatigue in both the rectus abdomini muscles in extension and the left erector spinae in flexion ($p = 0.02$). The findings of this study indicate the anticipatory and background components of feedforward muscle activity have different adaptations to fatigue. In both background muscle activity and anticipatory muscle activity, there was a separation of the behaviour of the oblique muscles and the more global erector spinae and the rectus abdomini muscles. The responses to fatigue are likely to represent adaptations in motor control specifically to counteract changes in stiffness or perceived stability in response to abdominal fatigue.

Passive stretching does not enhance outcome in people with plantarflexion contracture after cast immobilisation for ankle fracture: A randomised controlled trial

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This study examined the effects of passive stretching for the treatment of plantarflexion contracture. A total of 150 people with plantarflexion contracture after cast immobilisation for ankle fracture were randomly assigned to one of three treatment groups: exercise only, exercise plus short-duration passive stretches (six minutes/day), or exercise plus long-duration passive stretches (30 minutes/day). Outcomes were assessed at baseline, four weeks and 12 weeks by a blinded assessor. Three primary outcomes (Lower Extremity Functional Scale and passive dorsiflexion motion with the knee bent and straight) and 11 secondary outcomes (ankle stiffness and pre-load coefficients, and peak dorsiflexion motion from the passive torque-displacement curve with the knee bent and straight; pain in standing and during stair descent; walking speed, step length asymmetry and stair climbing rate) were assessed. 92.7% of subjects were followed up at four weeks and 89.3% were followed up at 12 weeks. The groups were similar at baseline and all improved significantly, on average, during the trial. There were no significant between-group differences for any of the primary or secondary outcomes at four or 12 weeks. For example, the mean between-group difference (95% confidence interval) for change in the Lower Extremity Functional Scale was 0.9 (-4.3 to 6.2) for exercise only versus exercise plus short-duration stretching, 0.4 (-4.9 to 5.6) for exercise only versus exercise plus long-duration stretching, and -0.6 (-1.5 to 2.9) for the short versus long-duration stretch groups at four weeks. Adding passive stretches is not superior to exercise alone for the treatment of plantarflexion contracture after cast immobilisation for ankle fracture.

Experimental hand pain delays recognition of the contralateral hand — evidence for a perceptual bias in acute pain?

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Recognising the laterality of a pictured hand involves mentally moving one's own hand to match the picture. This depends on an intact internal body schema. Because patients with complex regional pain syndrome type 1 (CRPS1) take longer to recognise a hand's laterality when it corresponds to their affected hand, it has been proposed that online nociceptive input disrupts the body schema. If so, acute hand pain should replicate this effect. In two studies, we evaluated the effect of experimental pain induced by intramuscular injection of hypertonic saline in the hand (18 subjects) and the arm (17 subjects) on performance at a hand laterality recognition task. There was a main effect of condition on response time (RT) (*Friedman's* (5,27) = 53.3, $p < 0.01$). During hand pain but not during elbow pain, when the laterality of the pictured hand corresponded to the non-painful hand, RT increased

by ~ 380 ms (95% confidence interval 190 ms - 590 ms, $p = 0.01$). There was no effect on RT when the laterality of the pictured hand corresponded to the painful side ($p > 0.57$ for all). The results do not support the proposal that online nociceptive input disrupts the body schema but are consistent with a perceptual bias towards the body part in pain. This finding raises the possibility that CRPS1 patients have the opposite perceptual bias, towards the unaffected hand and away from the affected hand, which is consistent with proposals of a neglect-like component to CRPS1. Further work is required to verify this proposal.

Graded motor imagery is effective for chronic complex regional pain syndrome (CRPS1) — a randomised controlled trial

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CRPS1 involves cortical abnormalities similar to those observed in phantom pain and after stroke, where treatment aims to activate cortical networks that serve the affected limb. This study evaluated treatment for chronic CRPS1 that aimed to activate of cortical networks initially without any movement of the affected limb. Thirteen patients were randomised to a motor imagery program (MIP) or to ongoing management. The MIP was two weeks each of hourly performance of a hand laterality recognition task, imagined hand movements and then mirror therapy. Primary outcome variable was the Neuropathic Pain Scale (NPS), a 10-item test rating aspects of neuropathic pain from 0–10 (mean \pm SD pre-treatment score = 46 \pm 8). After 12 weeks, the control group was crossed-over to MIP. There was a main effect of treatment group ($F(1,11) = 57$, $p < 0.01$), with an effect size of ~ 25 points on the NPS and ~ 4 points on the intensity item of the NPS. The number needed to treat for a 50% reduction in NPS score was ~ 2. The effect of treatment was replicated in the crossed-over control subjects. The results uphold the hypothesis that a MIP initially not involving limb movement is effective for CRPS1 and support the involvement of cortical abnormalities in the development of this disorder. Although the mechanisms of effect of the MIP are not clear, possible explanations are sequential activation of cortical premotor and motor networks, or sustained and focused attention on the affected limb, or both.

Unhelpful cognitions are associated with non-resolution of altered postural adjustments of abdominal muscles induced by experimental back pain

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In healthy subjects given experimental back pain, postural adjustments of the abdominal muscles are rapidly altered. When the pain subsides, postural adjustments usually return to normal, although not always. The present study investigated whether unhelpful cognitions about pain and injury are associated with non-resolution of altered

postural adjustments induced by experimental back pain. Electromyographic activity of the upper (UA) and lower (LA) anterolateral abdominal muscles and posterior and anterior deltoid was recorded using surface electrodes from 17 healthy subjects. The onset of the postural response, relative to the onset of deltoid, was used for analysis. The seated subject rapidly moved their arm either forwards or backwards in response to coloured lights. There were 30 control trials, 70 trials in which forward arm movement caused a painful cutaneous stimulation to the back and a further 70 pain-free trials. Non-resolvers (3/17 subjects) were those subjects for whom postural activation of LA did not return to control values after 70 pain-free trials. Using parametric statistics, non-resolvers were compared to resolvers on a composite measure of cognitions about pain and injury, constructed from the Back beliefs questionnaire, the Survey of pain attitudes and the Pain catastrophising scale, each modified for use with healthy subjects. Mean (95% CI) composite cognition score for non-resolvers was 13.2 (11.8–14.6), which was greater than resolvers (9.4, 6.5–12.3) (*Kruskal Wallis* $p = 0.01$). The results suggest that unhelpful cognitions about pain and injury are associated with non-resolution of postural adjustments altered by pain.

Entry-level physiotherapy students' learning styles

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The aims of this study were to identify the learning styles of Australian physiotherapy students, and to investigate the differences in students' learning styles across program and year levels, and between genders. A cross-sectional comparative group study of entry-level physiotherapy students' learning styles was conducted at Curtin University of Technology. The subject sample consisted of 206 students from the first and fourth years of the Bachelor of Science (BSc) (Physiotherapy) program and first and second year students of the Master of Physiotherapy (MPhysio) program. All subjects completed a demographic information sheet and the Honey and Mumford (1992) Learning Style Questionnaire (LSQ). Subjects were classified as having one or more learning styles. The questionnaire return rate was greater than 89% for all program and year levels. There were significantly more Reflectors than Activists ($\chi^2 [1, N = 82] = 3.951, p = .047$), Theorists ($\chi^2 [1, N = 76] = 7.579, p = .006$), and Pragmatists ($\chi^2 [1, N = 59] = 28.492, p = .000$) in the sample. The most frequently preferred learning styles were Reflector (26%), followed by Reflector/Theorist (17.2%), then Activist (16.7%). There were no significant differences in the preferred learning style of subjects in the different program and year levels, or between female and male subjects. Most entry-level physiotherapy students prefer a learning style in which they combine reviewing and thinking skills, rather than experiencing or planning skills.

Falls risk and vestibular abnormalities in older fallers presenting to hospital emergency departments.

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The association between inner ear (vestibular) disorders, falls and dizziness remains unclear. The aim of this study was to compare the presence of a range of falls risk factors in fallers and non-fallers, with an emphasis on reports of dizziness and signs of vestibular dysfunction. The fallers were recruited from a local hospital emergency department (ED) in Melbourne and had presented to the ED following a fall but had subsequently been discharged directly home. The non-fallers were an age and gender matched group of healthy subjects who had not had a fall in the past 12 months. Each group consisted of 20 individuals (mean age = 78.2 (7.03) years) and each was assessed in their own homes. A small group of participants ($n = 7$ in each group) also received more specific tests of vestibular (otolith) function. The group of fallers were found to have a significantly greater number of risk factors for falling ($p < 0.001$), and demonstrated significantly poorer static (Clinical test for sensory integration in balance, condition 5: $p < 0.001$) and dynamic (step test: $p < 0.001$ and Functional Reach test: $p < 0.001$) balance than the group of non-fallers. There was, however, no significant difference between the groups in terms of their complaints of dizziness ($p = 0.68$), although vestibular function test results suggested a trend ($p = 0.09$) towards greater asymmetry in vestibular function for the group of fallers. Assessment of vestibular dysfunction in individuals at high risk of falling is recommended. Implementation of a customised program of vestibular rehabilitation, in conjunction with multidisciplinary falls prevention program, may assist in reducing the risk of future falls.

Does continence physiotherapy improve quality of life for stress incontinent women in the short and medium term?

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The aim of the study was to investigate the effect of continence physiotherapy on the quality of life (QoL) of women at the conclusion of a treatment program for stress urinary incontinence and one year later. In a pre-post treatment study design, the outcomes of 274 women undergoing continence physiotherapy were investigated for changes in QoL and again one year later. A psychometrically robust condition specific QoL questionnaire (King's Health Questionnaire) was completed by the women pre-treatment, at the completion of treatment and one year later. The results of 208 women who completed the treatment phase of the study and 160 who returned the health questionnaire one year later were compared using Wilcoxon ranked pairs test. There was a statistically significant difference ($p < 0.001$) between all the domains of the QoL questionnaire from baseline to completion of treatment and from baseline to the one year follow-up with the exception of general health which was unchanged. There was no statistical difference in the

domains for general health, incontinence impact, physical limitations, personal relations, emotions, sleep/energy and severity measures from post-treatment to one year. The results indicate that treatment provided by the continence physiotherapists was effective in improving the QoL of stress incontinent women in both the short and medium term.

Outcomes of physiotherapy for stress urinary incontinence one year after treatment

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The aim of this study was to investigate the outcomes of continence physiotherapy for stress incontinent women one year after treatment. In a multi-centre observational study, 274 consenting stress incontinent women were evaluated for their response to continence physiotherapy. Outcome measures at one year were a seven-day record of incontinent episodes, satisfaction with treatment (on a 5-point scale) and subjective assessment of outcome (on a 4-point scale). Women were also asked about adherence to their exercise program. Of the 208 women who completed treatment, 158 (76%) returned completed questionnaires at one year, with 55 (35%) reporting 'no incontinent episodes' and a further 47 (30%) reporting > 50% improvement in recorded incontinent episodes. 129 (82%) of women completing the questionnaire were 'satisfied' or 'very satisfied' with the results of their physiotherapy treatment at its conclusion, with 132 (84%) identifying that they were 'cured' or 'improved'. One year later, 114 (72%) remained 'satisfied or very satisfied' and 131 (88%) considered themselves 'cured or improved'. 139 (83%) did not want any other treatment. In the year that had elapsed, 16 (10%) had sought other treatment, most commonly surgery (in 10 women). 53% of respondents had continued with their pelvic floor exercise program 'as prescribed', 73% 'less often than prescribed' and 79% were using their pelvic floor muscles in ADL. The results demonstrate that continence physiotherapy is an effective treatment option for women with stress incontinence. Many women in this multi-centre study were satisfied with the outcome of treatment at one year even though they were not completely dry.

Physiotherapy management of Kartegener's syndrome — a case report

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Kartegener's syndrome is an autosomal recessive hereditary condition, of unknown aetiology, comprising of a triad of transposition of the viscera, abnormal frontal sinuses producing sinusitis and bronchiectasis and immotility of the cilia. Presentation often includes dyspnoea, productive cough and recurrent pneumonia. The usual aim of physiotherapy was to improve mucociliary clearance. We present here a patient with Kartegener's syndrome, whose heart was situated on the right side. He had repeated chest infections with increasing dyspnoea and exercise intolerance. The patient, a 57-year-old man (body

mass index 18.6) on long-term oxygen therapy (2 l/min), was admitted to the hospital for assessment of rehabilitation potential. On admission, peak oxygen consumption (VO₂) was 751 ml/min (41% predicted) on symptom-limited ergometry testing. Six-minute walk distance (6MWD) was 138 m. Chronic Respiratory Questionnaire (CRQ) and Medical Outcomes Trust Short-Form (SF)-36 were administered. The patient underwent aerobic exercise training (cycling and treadmill walking), upper and lower extremities strengthening and general thoracic wall flexibility exercises. He completed 18 sessions of physiotherapy in the two weeks' hospitalisation. His peak VO₂ was 831 ml/min (46% predicted; +10% improvement) and 6MWD 160 m (+16%). His CRQ score improved from 55 to 73 (+33%) and SF-36 from 119 to 205 (+72%). Improvement in CRQ was recorded in all four dimensions. Improvement in SF-36 was primarily in physical functioning, general health, vitality and mental health domains. In conclusion, this case report highlights the role of physiotherapy in improving exercise tolerance in a patient with Kartegener's syndrome, rather than focusing on mucociliary clearance.

Psychometric properties of the Tampa Scale Kinesiophobia — version chronic fatigue syndrome

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Numerous investigators and clinicians have speculated that fear of movement perpetuates the illness in patients with chronic fatigue syndrome (CFS), providing part of the rationale for incorporating graded exercise therapy and a cognitive behavioural approach into the management of CFS. An appropriate assessment tool for monitoring fear of movement in CFS patients is currently lacking. Therefore, the Tampa Scale for Kinesiophobia (TSK) was modified to make it an appropriate questionnaire for the assessment of kinesiophobia (fear of movement) in CFS patients (the TSK-CFS). The internal consistency of the individual item scores, and two aspects of the validity of the total scores obtained with the TSK-CFS were investigated. Forty patients fulfilling the 1994 Center for Disease Control and Prevention (CDCP) criteria for CFS filled out a set of questionnaires; the Utrechtse Coping List (UCL), the TSK-CFS and the Baecke Questionnaire of Habitual Physical Activity. The Cronbach A coefficient for the individual item scores on the TSK-CFS was 0.80. The total scores on the TSK-CFS showed a statistically significant correlation with both the avoidance/abide subscale of the UCL (Spearman rho = 0.35; $p = 0.029$) and the total score of the Baecke Questionnaire of Habitual Physical Activity (rho = -0.45; $p = 0.004$). In conclusion, these results provide evidence for the internal consistency, the convergent and the congruent validity of the scores obtained by use of the TSK-CFS. Before the use of this measure in clinical physiotherapy practice and research settings can be advised however, the test-retest reliability, the responsiveness, and some other forms of validity should be examined.

Kinesiophobia in chronic fatigue syndrome: Associations with exercise capacity and disability

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Numerous investigators and clinicians have speculated that fear of movement/activity perpetuates the illness in patients with chronic fatigue syndrome (CFS) and hence to cause greater disability, providing part of the rationale for incorporating graded exercise therapy and a cognitive behavioural approach into the management of CFS. Experimental evidence supporting this view is currently lacking. The aim of the present study was to examine the associations between kinesiophobia (fear of movement), exercise capacity, and activity limitations/participation restrictions in patients with CFS. Fifty-one patients fulfilling the 1994 Center for Disease Control and Prevention (CDCP) criteria for CFS filled in two questionnaires (the Chronic Fatigue Syndrome Activities and Participation Questionnaire or CFS-APQ, and the Tampa Scale Kinesiophobia — version chronic fatigue syndrome or TSK-CFS) and performed a maximal exercise stress test on a bicycle ergometer. The heart rate was monitored continuously by use of an electrocardiograph. Ventilatory and metabolic parameters were measured through spirometry. The total scores on the TSK-CFS showed a statistically significant correlation with the total scores on the CFS-APQ (Spearman rho = 0.39; $p = 0.004$). No statistically significant associations were observed between the exercise capacity parameters and the total scores on the TSK-CFS. Since kinesiophobia appears to be associated with activity limitations/participation restrictions, these results suggest that kinesiophobia is clinically important and should become the focus of physiotherapy interventions. Still, long-term follow-up studies are required to establish a causal relationship between kinesiophobia and daily functioning.

Hypermobility in patients with chronic fatigue syndrome

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This study aimed at examining: 1) the prevalence of generalised hypermobility in patients with chronic fatigue syndrome (CFS); 2) whether hypermobile CFS patients experience more pain and have more severe activity limitations/participation restrictions compared to non-hypermobile CFS patients; and 3) whether the history of widespread pain is indicative of generalised hypermobility in patients with CFS. Forty-four consecutive patients with CFS filled in the Chronic Fatigue Syndrome Activities and Participation Questionnaire (CFS-APQ; for the assessment of activity limitations/participation restrictions), rated three visual analogue scales (for pain, myalgia and arthralgia),

were screened for generalised hypermobility, and were questioned about muscle and joint aches. Eleven of the forty-four (25%) subjects met the criteria for generalised hypermobility. The Spearman Rank correlation analysis did not reveal statistically significant correlations between the Beighton et al. scores and any of the self-reported measures ($p > 0.01$). Using the Mann-Whitney U test, no statistically significant differences in pain severity and activity limitations/participation restrictions were observed between hypermobile ($n = 11$) and non-hypermobile ($n = 33$) patients with CFS ($p > 0.01$). The positive likelihood ratio for widespread pain in shifting the odds favoring the presence of generalised hypermobility was 1.24; the negative likelihood ratio was 0.749. The present report suggests that a subgroup of patients with CFS present with generalised hypermobility, but questions the clinical importance of hypermobility in patients with CFS. A history of widespread pain was not predictive of generalised hypermobility in this sample of CFS patients.

The short term effects of early aquatic physiotherapy on patients after shoulder surgery

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While previous research on aquatic physiotherapy (or hydrotherapy) indicated benefit for a variety of conditions and client groups, prospective experimental studies are required to determine whether aquatic physiotherapy is beneficial for people after shoulder surgery. The aim of this study is to examine the impact of adding twice-weekly aquatic physiotherapy for six weeks after shoulder surgery, to usual care physiotherapy in a single-blinded randomised controlled trial. Seven participants have entered the trial who have undergone shoulder procedures: sub-acromial decompression ($n = 3$); rotator cuff repair ($n = 3$), arthroplasty ($n = 1$). Upper limb function, pain, range of movement and mood were assessed pre-operatively and will be reassessed post-operatively using validated outcome measures. Pre-operatively participants demonstrated moderate difficulty with upper limb function (Disabilities of Arm Shoulder and Hand questionnaire mean = 55 +/- 21). Mean pre-operative active range of shoulder flexion = 85° (+/- 37°), mean abduction = 72° (+/- 25°) and mean external-rotation = 43° (+/- 24°). Pain pre-operatively ranged from mild to moderate (pain sub-scale of Symptoms and Function of the Shoulder questionnaire). Anxiety was present in 42% ($n = 3$) participants, and depression in 28% ($n = 2$) using the anxiety and depression sub-scores of the Hospital Anxiety and Depression Scale. To date, of the seven who underwent surgery; two were ineligible post-operatively, five were randomly allocated to either usual care or early aquatic physiotherapy and four participants have completed the three month follow-up. The challenges of planning and conducting clinical research will be discussed, and up-to-date results from six-week and three-month assessments presented.

Water-based exercise is safe for patients with chronic obstructive pulmonary disease (COPD) — a pilot study

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Few studies have considered water-based exercise as a treatment option for COPD patients. Aim: To determine if a course of water-based exercise is safe for patients with COPD and is as beneficial as land exercise. An AB/BA, single blinded, randomised design was used. Subjects: People referred to pulmonary rehabilitation at Flinders Medical Centre were invited to participate. Subjects were excluded if they had contraindications to hydrotherapy. Methods: Outcome measures were six-minute walk test (6MWT), pulmonary function (FEV₁, FVC) and St George's Respiratory Questionnaire (SGRQ). Concealed allocation was used to randomise subjects into two groups; undertaking six weeks of land (L) or water (W) exercise. Subjects were reassessed and then commenced the alternate intervention for a further six weeks followed by reassessment. Crossover t-tests were used to determine differences between exercise interventions ($p < 0.05$). Results: 12 subjects completed baseline assessment (age: 67 ± 17.5 yrs, FEV₁: 1.51 ± 0.5), 11 completing both rotations (L/W = 6, W/L = 5). No significant differences were found between groups for any outcome measure or demographic at baseline (p range 0.20–0.97). No adverse events were reported during the water exercise. Significant change was seen within SGRQ following water exercise (Impacts, $p = 0.04$). Improvement in SGRQ was also seen for the water/land group (Impacts, $p = 0.02$, Total score, $p = 0.03$). No significant differences were found for 6MWT and pulmonary function. Conclusion: Results suggest outcomes for exercise on land and water are comparable and that water-based exercise is safe for COPD patients. A larger controlled trial is warranted.

Intensive care readmission — analysis of patients returning to intensive care

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This quality project was a prospective survey of patients who were readmitted to a 22 bed tertiary level intensive care unit (ICU) within a 12-month period. Aims were to: 1. Identify factors in the physiotherapy management (level of intervention of ward management) which could be improved to prevent readmission to ICU. 2. Identify factors that could predict which patients were at high risk of readmission. Data were kept on every patient readmitted to ICU, including standard demographic data, initial admission diagnosis, co-morbidities, readmission diagnosis, mobility on discharge, respiratory pattern, secretions, airway, handover, PaCO₂, PaO₂/FiO₂, time of discharge and physiotherapy ward management. Subjects included 59 patients who had been readmitted to ICU in a 12-month period. They were compared for the same factors with a convenience sample of 59 patients who were not

readmitted to ICU. A t-test was performed for continuous variables and categorical data analysed using a Chi-Square test for equal proportions. A categorical regression analysis found which factors were independently capable of predicting readmission to ICU. The overall percentage of patients who were readmitted to ICU compared to total admissions was 7.7%. Significant factors for readmission were found to be age > 65 years ($p < 0.05$), colonisation ($p < 0.001$), prior weakness ($p < 0.001$), co-morbidities of cardiac and/or respiratory disease ($p < 0.001$) and depression ($p < 0.001$). There were no factors pertaining to physiotherapy management. A certain profile of patients has been established who are at increased risk of readmission to ICU. These patients could be provided with increased physiotherapy intervention.

Physiotherapy and non-invasive ventilation (NIV) at Royal Perth Hospital — a unique service delivery model?

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In 1998, the RPH Physiotherapy Department commenced an acute NIV service, in conjunction with the Respiratory Medicine Department, for patients external to the intensive care unit (ICU). From treating nine patients in its foundation year, the service has grown consistently to 180 episodes provided in 2002, and currently averages 13 patients per month, with many more patients assessed but NIV deemed inappropriate. The NIV service is provided within RPH Physiotherapy Department's existing rostered 24-hour, seven-day cover. The initial service delivery and subsequent growth in NIV has resulted in many challenges within physiotherapy. The NIV service has not received dedicated funding or staffing from the onset and has subsequently been provided from within existing services. Consequently the Physiotherapy Department has pursued a unique service delivery model in which the understanding and application of NIV has been considered and deemed a core element for those physiotherapists working in the medical, surgical or critical care environments, as opposed to being considered an advanced practitioner skill the domain of select senior staff. In a department that historically has a significant turn-over of staff and six-monthly rotational posts, a significant degree of ongoing education, training and support has been required to achieve this NIV service delivery model. A significant cultural shift and change to work practices, particularly among non-fulltime physiotherapy staff, has been required to enable the implementation of NIV services within current physiotherapy services. The future visions and expectations of the physiotherapy NIV service is presently tempered by the expansion of NIV services provided from the ICU and the possible commencement of a dedicated sleep unit at RPH.

The influence of physiotherapy on the incidence of ventilator-associated pneumonia in patients with acquired brain injury

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This prospective randomised controlled trial investigated the effect of respiratory physiotherapy on the incidence of ventilator-associated pneumonia (VAP) in adults with acquired brain injury (ABI). Subjects admitted with a Glasgow Coma Scale nine, requiring intracranial pressure monitoring, and invasive ventilatory support for > 24 hours, were randomly allocated to a treatment group (six respiratory physiotherapy interventions in each 24-hour period while ventilated), or a control group (routine nursing care only). Incidence of VAP, duration of ventilatory support, and length of ICU stay were the dependent variables. Consent was obtained from 128 subjects with 65 randomised to the treatment group. Twenty-seven subjects were excluded due to unstable neurological, cardiac or respiratory status, five due to early limiting of active management, and consent was declined in five patients. Results are presented as mean (SD) for the treatment vs control groups. Groups were similar with respect to demographic variables. Fifteen subjects were withdrawn from the study (five from the treatment group): seven due to cessation of active management, five became medically unstable and three received physiotherapy beyond that described in the treatment protocol. Using multivariate analysis of variance with intention to treat philosophy, there were no significant differences for VAP incidence [14/65 vs 17/63; $p = 0.47$], length of ventilation (hr) [180.9 (123.3) vs 210.2 (169.9); $p = 0.27$], or length of ICU stay (hr) [228.6 (122.7) vs 251.7 (173.2); $p = 0.38$]. Respiratory physiotherapy, in addition to routine nursing care, does not appear to prevent VAP, reduce length of ventilation or ICU stay in adult patients with ABI.

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Respiratory physiotherapy in the acute tetraplegic patient — is the use of non-invasive ventilation (NIV) a useful adjunct?

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This prospective randomised clinical trial aimed to establish if out-of-hours physiotherapy using intermittent non-invasive ventilation is more beneficial than traditional intermittent positive pressure breathing (IPPB) in maintenance of lung function and prevention of nosocomial pneumonia (NP) in acute tetraplegics, and explore if continuous nocturnal NIV is a viable and effective alternative to intermittent IPPB or NIV. Patients admitted with acute tetraplegia (involving from C5 to T1) were eligible for inclusion. Patients requiring prolonged invasive mechanical ventilation or with significant head injury requiring neurosurgical involvement were excluded. Randomisation of 23 subjects (17 male, mean age 36.8 yrs,

SD17.4) was to either Group 1 ($n = 6$) receiving standard historical physiotherapy care using IPPB, Group 2 ($n = 10$) receiving standard physiotherapy but substituting intermittent NIV for IPPB, or Group 3 receiving continuous nocturnal NIV. Ethical constraints prevented the use of a control group. Dependent variables were vital capacity (VC), arterial-to-inspired oxygen ratio ($\text{PaO}_2/\text{FiO}_2$), NP incidence, length of stay at the acute facility, and utilisation of out-of-hours physiotherapy service. Groups were similar with demographic variables. One-way analysis of variance and Chi Square tests performed, with an intention to treat philosophy, unearthed no significant differences with daily $\text{PaO}_2/\text{FiO}_2$, NP incidence, length of ICU stay ($p = 0.24$), or out-of-hours physiotherapy requirements. Significant differences with mean length of acute facility stay [502.2 hrs (SD 363.5) vs 163.3 (116.0) vs 220.6 (165.1); $p = 0.036$], VC on day 2 [1.301 (0.24) vs 1.50 (0.37) vs 0.86 (0.46); $p = 0.026$] and day 3 [0.901 (0.37) vs 1.53 (0.37) vs 0.91 (0.28); $p = 0.005$] were apparent, the clinical significance of which is unclear.

The reliability and validity of region-specific and joint-specific self-report outcome measures in patients following shoulder surgery

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The aim of this study was to establish and compare the test-retest reliability and divergent validity of the Disabilities of the Arm Shoulder and Hand (DASH), Symptoms and Function of the Shoulder (SFS), Shoulder Pain Score and Shoulder Disability Questionnaire (SDQ) self-report outcome measures in a population of post-surgical shoulder patients from the Flinders Medical Centre (FMC). A test-retest format was used to assess reliability. Divergent validity was assessed by comparing scores generated by the outcome measures to scores from each of the four Domains of the Australian World Health Organisation Quality of Life Questionnaire—Brief version (WHOQoL-Bref). Thirteen subjects who had undergone surgery on the shoulder between 3 and 36 months prior to the study were recruited. Two participants were lost to follow up. Excellent levels of test-retest reliability were found for the DASH (ICC = 0.981), SFS (ICC = 0.974), SPS (ICC = 0.84) and the SDQ (85.05% agreement). There was no statistically significant correlation between the DASH and any of the domains of the WHOQoL-Bref. Statistically significant correlations between the Physical Domain of the WHOQoL-Bref and the SFS ($r = 0.674$), the SFS ($r = -0.634$) and the SDQ ($r = -0.605$) were found. There was no statistically significant correlation between the remaining three Domains of the WHOQoL and any of the self-report outcome measures. These results indicate that a region specific self-report outcome measure may be more appropriate for use in the population of shoulder surgery patients.

Evaluating the efficacy of a program of advanced communication skills for physiotherapists in an ecologically valid setting

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The aim of this study was to determine the efficacy of an eight-hour training program specifically designed to teach physiotherapists (n = 3) skills to improve the physiotherapist-patient interaction using a patient-centred approach. The three main topics included in the educational program were: (i) Physiotherapist-patient communication, (ii) Behaviour modification techniques for use in physiotherapy and (iii) Improving the effectiveness of the physiotherapist-patient interaction. A multiple baseline single subject design across behaviours, settings and participants was used with each physiotherapist audiotaping a number of patient consultations (n = 60) pre-, post- and at three weeks after completing the intervention. To evaluate the impact of the training program the Coding of Physiotherapist Skills (COPS) system was developed to analyse each physiotherapist's verbal behaviour. In addition, each physiotherapist was interviewed at the conclusion of training and completed a post-intervention questionnaire to ascertain knowledge, importance and usefulness of the intervention. Post-intervention findings from a visual examination of data trends showed that the three physiotherapists involved in the educational program demonstrated highly variable patterns of behaviour, while a statistical evaluation showed significant changes in only a small number of behaviours within and across a limited number of phases. Nonetheless, the interview data and questionnaire feedback revealed that all physiotherapists reported favourably on the relevancy of the information and benefits of the intervention to their knowledge, confidence and competence. Furthermore, all stated that they would recommend the training program to other physiotherapists.

The effects of non-accelerated and accelerated protocols on the vertical spinal creep response

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Vertical spinal creep (VSC) is the continuous vertical deformation of spinal tissue, especially in the discs, when load is applied. Conventionally, VSC has been measured by applying an additional load to subjects in order to accelerate the magnitude and speed of the VSC response (accelerated protocol). However, to date no studies have directly compared the effect of accelerated versus non-accelerated (non-loaded) protocols on the VSC response. The aim of this study was to compare the effects of using non-accelerated (no load), accelerated (10% of body weight (BW)) and a mixed protocol (no load first five minutes, 10% BW for 10 minutes and no load for 10 minutes) on the VSC response. Twelve subjects, asymptomatic for low back pain, aged 20–39 years completed the three protocols on three consecutive days as

randomly assigned. The VSC response (changes in the height of the subjects recorded as volts) was continuously recorded over 25 minutes by using a seated stadiometer. Data was converted from volts to millimeters and reduced by calculating the mean of 150 VSC data points at zero and for the 15 seconds preceding the end of minutes 5, 6, 10, 15, 16, 20 and 25. At each time period, comparisons of the VSC response between the three protocols were calculated using a univariate analysis of variance. Significant protocol effects were found at 15 minutes ($p = 0.009$) where the loaded and mixed protocols produced greater VSC than the unloaded protocol. The greatest VSC was achieved with the loaded protocol at 25 minutes.

A comparison between ward and aquatic exercise for acute orthopaedic inpatients

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This study was undertaken to compare aquatic and land-based physiotherapy treatment in the early post-operative phase after total hip (THR) or total knee (TKR) replacement because exercise in water is physiologically different to exercise on land. The research aims were to identify whether physiological measures and the rating of perceived exertion were similar for both exercise programs and whether participants reported less pain while exercising in the pool compared to exercising in the ward. Method: Eight orthopaedic inpatients were recruited, four after THR and four after TKR. Subjects were assessed on day four to day six post-operatively while undertaking both water and land exercise sessions. Measurements taken before, during and after each treatment session were heart rate, blood pressure, oxygen saturation, temperature and pain using the numerical pain rating scale. Subjects also rated how hard they felt each session was using the Borg's perceived rate of exertion scale. Results: No difference was found between physiological measures during ward or pool treatment sessions. However ward treatment was rated significantly harder than the pool program ($p = 0.007$). Subjects reported significantly less pain during the pool exercise ($p = 0.004$). Conclusions: Doctors are often cautious about referring older people for aquatic physiotherapy early after orthopaedic surgery. This study found no greater physiological stress for patients having aquatic exercise than with the usual ward-based program. Aquatic physiotherapy may then enhance patients' ability to regain strength and function because it is less painful and perceived to be less effort to exercise in water.

Effect of PEEP on expiratory flow rate during manual hyperinflation

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Including positive end expiratory pressure (PEEP) may render manual hyperinflation (MHI) ineffective as a secretion manoeuvre technique in ventilated patients. This

study aimed to determine the effect of increased PEEP and/or decreased compliance on peak expiratory flow rate (PEF) and linear velocity (LV) during manual hyperinflation. A blinded, randomised study was done on a lung simulator in a cardiopulmonary research laboratory. Ten physiotherapists experienced in MHI and intensive care practice performed the technique of MHI on a lung simulator attached by a pneumotach to a respiratory mechanics monitor. PEEP levels of 0–15 cmH₂O, compliance levels of 0.05 and 0.02 l/cmH₂O and MRB type were randomised. The Mapleson-C MRB generated significantly higher PEF ($p < 0.01$, $d = 2.72$) and LV ($p < 0.01$, $d = 1.12$) when compared to the Laerdal MRB for all levels of PEEP. In normal compliance (0.05 l/cmH₂O) there was a significant decrease in PEF ($p < 0.01$, $d = 1.45$) and LV ($p < 0.01$, $d = 1.2$) for a PEEP greater than 10 cmH₂O in the Mapleson-C circuit. In low compliance (0.02 l/cmH₂O), there was no significant decrease at any PEEP level in either MRB. At PEEP levels of greater than 10 cmH₂O the Laerdal MRB produced a PEF less than 0.41 l/sec. The Laerdal MRB at PEEP levels of greater than 10 cmH₂O did not generate a PEF that theoretically is capable of producing two-phase gas-liquid flow and consequently mobilising pulmonary secretions. If MHI is indicated due to mucous plugging, the Mapleson-C MRB may be the most effective method of secretion mobilisation.

The effect of saline instillation on sputum yield and oxygen saturation measurement in adult intubated patients: Single subject design

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Saline instillation is commonly used by physiotherapists during the treatment of adult intubated patients with the objective of enhancing sputum yield. Research to date is nursing oriented and has not examined the effects of saline instillation in combination with chest physiotherapy techniques. The objectives of this study were to measure sputum yield following chest physiotherapy treatment of adult intubated patients with and without saline instillation; and to measure oxygen saturation levels during and one hour following treatment with and without saline instillation. A single subject design was utilised to examine the effects of saline instillation on sputum yield and oxygen saturations during chest physiotherapy. The wet weight of sputum was measured as well as the weight of the sputum pellet after centrifugation. Eight subjects were recruited, three of whom completed less than three phases. Data from all subjects was analysed. All subjects demonstrated a greater mean wet weight of sputum with saline instillation than without. Analysis of celeration lines demonstrated a greater mean weight of centrifuged sputum in five of the eight subjects. No clinically significant change in oxygen saturations was observed during or following treatment with or without saline instillation. Instillation of saline during chest physiotherapy treatment of adult intubated patients appears to result in increased wet and centrifuged weights of sputum. No adverse effects on oxygen saturations were observed. Single subject study design has limitations in inferring results. Further research should be performed as a large controlled trial.

Activity levels in an inpatient rehabilitation setting

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Patients spend most of their day in non-therapeutic activities yet clinical studies support functional outcome is related to the intensity of therapeutic treatment. The aim of this project was to investigate current activity levels in patients during their inpatient rehabilitation stay at MECRS. We performed an observational study using a behavioural mapping technique. An observation was made every 15 minutes between 8.00am and 4.30pm over two consecutive days on 36 patients. We recorded the patients' location, people present and the type of activity they were performing. Patient characteristics including diagnosis, age, FIM score, date of admission, past medical history and mobility status were also collected. Observational data was averaged. We found our patients spent 50.8% of the time alone, 10.4% with visitors, 9.1% with a physiotherapist, 6.3% with nursing staff and 4.6% with an OT. In terms of location our patients spent 56.9% of their time in the bedroom, 12.6% in the physiotherapy gym, 6.9% in the corridor and 4.4% in the bathroom. In terms of activity our patients spent on average 49.3% of their time sitting, 18.2% lying, 4.9% standing, 6% walking and 7.8% involved in self care activities. Investigating the type of activities undertaken, the location of these activities and proportion of time spent in therapeutic and non-therapeutic activity has provided clinicians with information regarding our current practice. This information has been used to make changes in our current practice to provide more opportunities for patients to participate in therapeutic activity.

The use of a small knee bend movement in the standing position performed at three levels of immersion to assist assessment in movement dysfunction

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An assessment of function in the standing position maybe restricted by pain and muscle spasm as a result of the loading placed on the neuro muscular skeletal system, loading through movement in the standing position may also result in pain and spasm. Warm water assists pain relief and relaxation. Immersion in water decreases loading on the neuro muscular skeletal system. Loading in standing is directly proportional to the depth of immersion. The percentage of lower limb loading in the standing position has been measured at the level of C7 as 10%, the xiphoid sternum 30% and the ASIS 50%. A small knee bend performed in standing is a functional movement. The therapist is positioned behind the patient with forearms and hands on the lateral aspects of the patient's trunk, with the hands at the level of the upper thorax and elbows at pelvic level. The therapist in this position monitors both the upper and lower trunk and lower limb movement. Information received is on the sequencing and symmetry of movement; lumbar pelvic and postural stability; control at initiation of

the movement; through the small range of movement and at transition of movement; imbalance in weight bearing as well as compensatory movement patterns. This functional movement performed at the three levels of loading serves three purposes; to assess quality of movement at three levels of weight bearing, identify an area requiring further assessment, reinforce findings of a prior land assessment. The testing position and movement is useful in treatment and retraining.

Transabdominal ultrasound measurement of pelvic floor and transversus abdominis muscle activity

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The aim of this study was to investigate the relationship of pelvic floor muscle (PFM) and transversus abdominis (TA) muscle activity during a PFM contraction. It was hypothesised that the PFM is activated more strongly when instructed specifically to contract the pelvic floor rather than indirectly via TA, as measured by a greater displacement of the pelvic floor imaged on ultrasound. Twenty adult female subjects who could perform PFM and TA contractions were recruited. Subjects underwent a bladder filling protocol prior to imaging with an Performer (Dornier Acoustic Imaging) ultrasound. A 3.5 MHz curved linear array transducer was placed suprapubically to image the pelvic floor through the fluid filled window of the bladder, and a 7.5 MHz linear array transducer placed on the lateral abdominal wall to image TA. Displacement of the pelvic floor was measured using the on-screen electronic calipers, following instruction to contract TA alone, the PFM alone and both muscles together. Instruction to perform a PFM contraction produced significantly greater displacement in the cranio-ventral direction than instruction to perform a TA contraction: mean 11.2 mm (95% CI 7.1 to 15.3) and mean 4.3 mm (95% CI -0.2 to 8.8) respectively, ($p = 0.002$). Displacement during TA + PFM was 8.5 mm (95% CI 5.2 to 12.0), significantly higher than TA alone ($p = 0.003$) but less than for the PFM ($p = 0.038$). Downward displacement of the pelvic floor occurred in 30% of subjects when instructed to perform a TA contraction. Indirectly training the PFM via TA contractions should be discouraged.

A new tool for visualising and measuring pelvic floor muscle function

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For feedback and measurement of pelvic floor muscle (PFM) performance an internal muscle palpation is normally required. This can be distressing for women. Yet, a requirement for motor learning is that a person has feedback from contracting muscles, and that changes in muscle function can be measured. The aim of this study was to demonstrate that transabdominal diagnostic

ultrasound provides a reliable, non-invasive method of visualising and measuring contraction of the pelvic floor muscles. Participants underwent a bladder filling protocol prior to ultrasound scanning with a Logiq Book (GE Medical Systems) ultrasound. A 2–5 MHz curved linear array transducer was placed supra-pubically, and the pelvic floor scanned in the sagittal plane through the fluid window of the bladder. Displacement of the pelvic floor was measured by two investigators blinded to each other's results, using the on-screen calipers during a single maximum voluntary contraction (MVC). Repeated brief contractions and a sustained contraction were recorded, digitised using a motion analysis system, Igor Pro software (Wavemetrics Inc) and presented graphically. Objective measurements of the maximum excursion of the pelvic floor during an MVC, length of hold of an isometric contraction, fatigue/decay of a contraction, and co-ordination of the PFM were obtained. These can be used to measure change in the PFM and do not involve invasive techniques. This is a biofeedback and measurement tool that can be used reliably to visualise and measure muscle excursion, endurance and co-ordination. It is currently being used in a randomised controlled trial investigating PFM function in older women.

The use of aquatic physiotherapy. Part A: The development of a valid and reliable questionnaire

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Aquatic physiotherapy is a very popular treatment modality and has an extensive range of physiological and therapeutic effects and benefits. However, due to an incomplete evidence base, there is a gap between the current use of aquatic physiotherapy and the researched evidence. The aim of this study was to develop a valid and reliable questionnaire to measure the current use of aquatic physiotherapy and begin the process of directing further research. A postal questionnaire design was chosen and a draft questionnaire developed. A focus group was held to assess the face and content validity of the questionnaire, and a test-retest procedure was employed to measure the reliability of the revised questionnaire over a two-week time interval. Volunteer subjects were recruited from the population of South Australian aquatic physiotherapists through advertisements, telephone calls and information packs. Five subjects attended the focus group where a revised questionnaire was developed and the validity of the questionnaire was determined. Forty-three subjects volunteered for the test-retest procedure with 39 completing and returning both copies of the questionnaire at a compliance rate of 90.1%. Two of the 13 questions were determined to be unreliable through agreements of lower than 80.0% and kappa scores lower than 0.4. Nevertheless a majority of the questionnaire had acceptable reliability. The removal of the unreliable parts and further explanations and revisions to minor sections may improve the reliability. Therefore further refinement and reliability testing is required to develop a reliable questionnaire to assess the use of aquatic physiotherapy.

Clinical education of undergraduate physiotherapy students in Australia: Models and opinions

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Introduction: Clinical education (CE) is a major component of the education of physiotherapy students. The aim of this study was to determine the models of CE used throughout Australia and to seek opinions regarding their perceived benefits and drawbacks. **Method:** Health unit and university staff involved in the CE of undergraduate physiotherapy students were invited to participate. A questionnaire determined respondents' CE experience and opinions regarding the pros and cons of different models of CE. **Results:** Questionnaires were received from 343 health unit and 15 university staff. In most health units CE is currently provided by a number of staff sharing responsibility for CE, with a minority using a designated clinical educator (DCE). Perceived advantages of the shared responsibility (SR) model included that it is cheaper to deliver than the DCE model and that it reinforces that all physiotherapists should be involved in CE. Drawbacks included that it is more stressful for staff. Perceived benefits of the DCE model included that a DCE has more time, interest and expertise in CE, and provides more consistent student supervision. Cons for the DCE model included that fewer staff are likely to develop skills in CE. Overall, health unit respondents believed the DCE model is superior, whereas university respondents believed both models are equally effective. Some health unit respondents reported insufficient support in the provision of CE. **Conclusion:** The SR model of CE is most commonly used in Australia, but the DCE model is deemed superior by health unit respondents.

Torsion and rotation of the lower limb in Japanese with knee osteoarthritis

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Japanese with osteoarthritis of the knee (knee OA) have a higher prevalence of varus deformity (90%) than other populations (50–70%). Moreover, there are differences between healthy Japanese and Australians in femoral and tibiofibular torsion, and hip and knee rotation. Biomechanical factors are recognised contributors to the development of knee OA and may contribute to the development of altered alignment. Therefore the primary aim of this study was to examine whether torsion and rotation of the lower limb were associated with femorotibial alignment among Japanese with knee OA. The secondary aim was to describe associations between severity of knee OA and multiple risk factors including obesity, age, gender, occupational stress, past history of injury, and torsion and rotation of the lower limb. Participants were 102 Japanese with knee OA, according to Altman's clinical classification criteria. Inclination and a series of questionnaires were used to measure the variables. There was a negative association between hip internal rotation and varus alignment (Pearson's $r = -0.31$, $p =$

0.001). Further, stepwise multiple regression analysis showed that age ($\beta = 0.392$, $p < 0.001$), tibiofibular torsion ($\beta = -0.248$, $p = 0.012$), and injury ($\beta = 0.195$, $p = 0.045$) were significantly correlated with the severity of knee OA. The results suggest that in Japanese with knee OA, torsion and rotation of the lower limb may be involved in the pathomechanism of knee OA. Whether or not the association exists among other populations is yet to be determined.

A systematic review of strength training for older people

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This systematic review evaluated the effects of strength training on muscle strength, bone density and activity for healthy community-dwelling people aged over 50 years of age. Electronic databases (MEDLINE, PubMed, Embase, CINAHL, Sports Discus, PsychInfo, AusportMed, Cochrane) were searched for randomised controlled trials. Trials meeting inclusion criteria were rated for quality using the PEDro scale, and meta-analyses conducted on the 50 included studies (median PEDro score 5). Strength training increased upper body strength (meta-analysis $d = 1.32$, 95%CI 0.57 to 2.08, $p < .001$) with average strength gains of 26.9%. Leg strength also showed large strength increases (meta-analysis $d = 1.20$, 95%CI 0.54 to 1.87, $p < .001$) with an average strength gain of 43.1%. Meta-analysis of the six studies that evaluated the effect of strength training on bone mineral density demonstrated a positive trend ($d = 0.46$, 95%CI -0.28 to 1.21, $p = .09$). Nineteen studies examined the effects of strength training on activity. Strength training increased maximum walking speed ($d = 0.31$, 95%CI 0.02 to 0.60, $p = .04$), the speed of stair climbing ($d = 0.39$, 95%CI 0.02 to 0.76, $p = .04$), and improved dynamic balance ($d = 0.23$, 95%CI 0.04 to 0.42, $p = .02$). Muscle weakness associated with ageing can be reversed with strength training. These gains in muscle strength can benefit older people by improving the capacity to perform everyday activities. The effect of strength training on bone mineral density in older people remains equivocal.

Strength training can have unexpected effects on the self-concept of children with cerebral palsy

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We aimed to evaluate the effect of a home-based progressive resistance strength-training program on the self-concept of young people with cerebral palsy. A single-blind randomised control trial was used to evaluate the effect of strength training on self-concept immediately after completion of the program and at follow-up 12 weeks later. Seventeen children (mean age 12.1 years (SD 2.5)) with spastic diplegia were randomly allocated to either the strength-training group ($n = 10$) or the no-intervention control group ($n = 7$). Participants in the strength-training

group completed a six-week home-based progressive resistance exercise program using three exercises to strengthen the major support muscles of the lower limbs. Self-concept was measured by the Self-Perception Profile for Children at the end of the six-week training program and at follow-up 12 weeks after the program finished. Self-concept was high at baseline, six weeks and at follow-up. Compared to controls, the strength-training group showed decreased improvement in self-perceived scholastic competence ($p = 0.02$) and a trend for reduced improvement in social acceptance ($p = 0.06$) at six weeks. At follow-up, the strength-training group had maintained less improvement in scholastic competence ($p = 0.02$), and also, showed less improvement in social acceptance ($p = 0.02$) and athletic competence ($p = 0.05$). These unexpected results suggest that participation in a strength-training program may have an inhibitory effect on the development of self-concept in children with cerebral palsy. Despite this, self-concept remained high after the intervention, suggesting that the observed psychological effects of strength training were not detrimental.

Strength training for adults with athetoid cerebral palsy

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The study aimed to evaluate the effect of a strength-training program on strength and activity for adults with athetoid cerebral palsy, using a single-case AB design. During the baseline phase, four adults over the age of 40 years with athetoid quadriplegia and with high support needs, attended a community gymnasium once a week for four weeks to become familiar with the gymnasium equipment. During the 10-week progressive resistance exercise phase, participants attended the gymnasium twice weekly, completing up to six exercises on weight machines to strengthen the arms, legs and trunk. Outcomes were weekly measurements of strength, as represented by the amount of weight that could be lifted once in a seated leg press and seated chest press, and activity, represented by a timed sit-to-stand test. Results were analysed by visual analysis, the C-statistic and the Reliable Change Score Index, with change only accepted when results were consistent. Participant 2 showed improvement in all outcomes ($p < 0.05$). The other three participants demonstrated improvement in either the leg press (Participant 4), the chest press (Participant 3), or in timed sit-to stand (Participant 1). These results show that older adults with athetoid cerebral palsy and high support needs can successfully complete a strength-training program in the community, and that gains in strength can translate into improvement in activity. The results also indicate that improvements from such a program are quite individual. Given the effort involved in strength-training the variability in response might be related to individual motivation and enjoyment.

Relationships between sleep problems, urge incontinence and falls in elderly women

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The primary purpose of this cross-sectional study was to determine whether night-time sleep disturbance, daytime sleepiness or urinary incontinence were associated with an increased risk of falling. The secondary purpose was to explore the interrelationships between daytime sleepiness, night-time sleep problems, and urge incontinence. A total of 782 ambulatory, community-dwelling women aged 75 to 86 were recruited from within the existing Calcium Intake Fracture Outcome Study. These women had previously been selected at random from the electoral roll. Daytime sleepiness, night-time sleep problems, urinary incontinence and falls data were collected via self-complete questionnaires. Thirty-five percent fell at least once in the past 12 months and 37.7% reported at least one night-time sleep problem. However, only 8.1% of the study sample experienced abnormal daytime sleepiness (Epworth Sleepiness Scale score > 10). Stress incontinence was more common (69.4%) than urge incontinence (36.3%), and 32.4% of participants had mixed incontinence. In univariate logistic regression analysis urge incontinence, abnormal daytime sleepiness, 'trouble with waking and getting up in the morning' and 'trouble with waking too early and not being able to fall asleep again' were associated with an increased risk of falling. In forward stepwise regression analysis including the potential covariates age, central nervous system drugs, cardiovascular drugs, poor standing balance and the timed up-and-go test, urge incontinence (OR 1.72, 95% CI 1.26 to 2.36) and abnormal daytime sleepiness (OR 2.1, 95% CI 1.23 to 3.62) remained significant risk factors for falling. Effective management of urge incontinence and daytime sleepiness may reduce the risk of falling in elderly women.

Research in physiotherapy: A survey of research practice

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An increasing number of physiotherapists are involved in research activities but the overall awareness and understanding of ethical research practices is unknown. The aim of this study was to describe physiotherapists' knowledge of good research practices. Content validity and test-retest validity for the survey were established. Physiotherapists who presented abstracts at APA conferences in 2003/2004 were surveyed ($n = 167$, response rate = 50%). The majority of abstracts involved humans (82.0%), with 85.4% of these having Human Research Ethics Committee (HREC) approval, 9.5% reported as quality improvement activities and 2.9% reported as human research without HREC approval. Despite the high level of

HREC approval, only 47.9% of respondents had read or referred to the Declaration of Helsinki and/or NHMRC National statement on ethical conduct in research involving humans. For guidance on ethical considerations in research, 28.9% of respondents would primarily rely on colleagues, 36.7% would utilise local HREC guidelines alone and 33.1% would use HREC guidelines and other ethical guidelines. There was an association between awareness of research guidelines and extent of prior research involvement ($p < 0.001$), attainment of academic research qualifications ($p < 0.001$) and place of employment ($p = 0.004$). Only 58% of respondents identified the correct process for providing study information for consent. Information from this survey has implications for tertiary training programs, research supervisors, clinicians and physiotherapy managers.

Physiotherapy students' sources of stress, coping strategies and implications for undergraduate education

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Although sources of stress in university students and the strategies they use to cope with them have been reported in the literature, conclusions are based mainly on medical students, and no data is available for physiotherapy students. This study was designed to determine the sources of stress for physiotherapy students and to describe the strategies they use to cope with them. A total of 272 physiotherapy students (80 males) from all years of the Bachelor of Science (BSc) and Master of Physiotherapy (Graduate Entry) (Mphysio) courses at one university participated in the study. Students were administered a questionnaire comprising the sources of stress questionnaire (designed especially for the study) and the Ways of Coping Questionnaire. Students' major stressors fell into three categories: academic, financial and personal/interpersonal. Academic concerns were rated highest, and included intellectual, physical and time demands of the course, amount to learn and uncertainty about expectations. Financial concerns included personal finances, accommodation, transport, cost of books/equipment, and university fees. Personal/interpersonal concerns, which affected the least number of students, included relationships with family members and partner, loneliness, physical and psychological health, stressful events and mood. The most common coping strategies used by students to deal with these sources of stress were playful problem-solving, seeking social support, and self-controlling. The appropriateness and effectiveness of the various coping strategies are discussed along with practical implications for tertiary educators.

Hip-spine movement during sit to stand in healthy young subjects

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Appropriate trunk alignment is regarded as having major implications for effective performance of sit to stand (STS). However, little is known about the contribution of the thoracolumbar spine during STS, and forward trunk lean prior to buttocks lift off (LO) has been attributed solely to flexion of the hip joints. This study aimed to determine the sagittal movement relationships between thoracic, lumbar spine and hip joints during STS in healthy subjects. Forty-seven healthy young adults with reflective markers attached over the mid-line thoracolumbar spine, right lateral pelvis and lower limb were videotaped (i) performing STS at their preferred speed from a chair set at 100% knee height, and (ii) undertaking tests for maximal available thoracic, lumbar and hip joint flexion. The 2D Peak Motus was used to derive sagittal thoracic, lumbar spine and hip joint angles. Forward trunk lean prior to LO was accomplished by concurrent lumbar and hip flexion; 1° lumbar flexion for every 3.1° hip flexion. As the lumbar spine flexed the thoracic spine extended resulting in a LO trunk angle of 45.7° ($\pm 5.8^\circ$). Following LO, the hip(s) and lumbar spine extended and the thoracic spine flexed, with the standing thoracic angle approximating the initial thoracic flexion posture in sitting. During STS subjects used 95.5%, 65.9%, and 57.7% of their maximal available hip, lumbar and thoracic spine flexion respectively. Improved knowledge of sagittal thoracolumbar and hip-spine movement patterns in healthy subjects will facilitate rehabilitation of dysfunctional STS.

The effect of exercise in water on limb volume in lower extremity primary lymphoedema — a pilot study

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The aim of this study was to evaluate the effect of immersive exercise on primary lower extremity lymphoedema. A controlled pilot study involving matched pairs was carried out in a rehabilitation unit. A sample of volunteers who had primary lower limb lymphoedema ($n = 9$) and matched, asymptomatic control subjects (age and gender) were used. All subjects underwent a standardised 45-minute exercise program in the hydrotherapy pool. Subjects were immersed in water to shoulder level, providing a cumulative hydrostatic pressure of 22.4 mmHg per 30 cm of water. Outcome measurement immediately and one hour post exercise included perometry, bio-impedance analysis and circumferential surface measurement to provide an indication of total limb volume and fluid distribution. Results indicated the lymphoedema group showed no significant changes in either fluid distribution ($p = 0.088$) or total limb volume ($p = 0.097$) pre- and post-exercise. In the control group, both intracellular and extracellular fluid volumes increased post-exercise, however, on post hoc testing, only intracellular fluid was significantly greater ($z = -2.67$, $p = 0.008$). Using a corrected α level of 0.017 for multiple comparisons, there

was a greater increase in intracellular fluid immediately post-exercise in the asymptomatic control group, whereas the lymphoedema group showed a slight decrease ($p = 0.001$). The results of this pilot study suggest that further research is required in order to clarify the effect of immersive exercise and/or hydrostatic pressure on fluid distribution in normal subjects, as these results may suggest the previous theory of centralisation of peripheral fluid volume may be inaccurate.

Diagnostic value of five clinical tests in patients with patellofemoral pain syndrome

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From the available literature, it is concluded that studies documenting the validity of clinical tests in the diagnosis of patellofemoral pain syndrome (PFPS) are essentially lacking. Therefore, the current study aimed at examining the validity of five clinical patellofemoral tests in the diagnosis of PFPS. Forty-five knee patients were divided into either the PFPS or the non-PFPS group, based on the fulfilment of the diagnostic criteria for PFPS: diagnosed as PFPS case by a doctor; anterior or retropatellar knee pain; at least two of the following activities exacerbated their symptoms: prolonged sitting, ascending or descending stairs, squatting, kneeling; and no clinical evidence of a current knee condition other than PFPS. An investigator, blinded to the group assignment, performed the vastus medialis co-ordination test, patellar apprehension test, Waldron's test, Clarke's test, and the eccentric step test. The positive likelihood ratio was 2.26 for both the vastus medialis co-ordination test and the patellar apprehension test. For the eccentric step test, the positive likelihood ratio was 2.31. For the remaining tests, the positive likelihood ratios were below the threshold value of 2, indicating that given a positive test result, the probability that the patient has PFPS is altered to a small, and rarely important degree. The negative likelihood ratios for all tests exceeded the threshold value of 0.5, suggestive of clinical irrelevant information. Likelihood ratios are considered the best statistics for summarising the usefulness of a diagnostic test. These data question the validity of clinical tests for the diagnosis of PFPS.

The effect of angle and oscillation on mucous simulant speed in flexible tubes

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The aim of this study was to investigate, in a tube model, how the speed of a mucous simulant was influenced by angle and different oscillation techniques. Ultrasonic gel diluted to a viscosity approximating human sputum was introduced into a flexible tube similar in diameter to the human adult trachea. The primary outcome measure was the time taken for the leading edge of the mucous simulant to travel a distance of 10 cm. The tube was subjected to

discrete angles of 0°, 30°, 60° and 90°; symmetrical oscillation in both the transverse and longitudinal directions; and asymmetrical oscillation in the longitudinal direction and up a 5° incline. The symmetrical oscillation was applied at frequencies of 0 Hz, 5 Hz, 15 Hz and 25 Hz and amplitudes of 1 mm and 2 mm peak to peak using a commercially available oscillator. The asymmetrical oscillation was applied using repeated cycles of slow acceleration and fast deceleration phases. Each 30° angle increment of the tube from 0° to 90° significantly increased mucous simulant speed ($p < 0.001$). Symmetrical oscillation did not provide an advantage over angle in terms of mucous simulant speed, however, asymmetrical oscillation increased mucous simulant speed beyond that due to angle for all angles tested ($p < 0.001$) and was able to drive mucous simulant up a small incline (5°) in this tube model. This study supports the use of gravity to assist in secretion clearance. Asymmetrical oscillation is a novel technique which warrants further investigation.

Protection from exercise-induced muscle damage following a repeated bout of eccentric exercise in the mdx mouse

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Exercise-induced muscle damage (EIMD) is a common physiological phenomenon that can occur following unaccustomed physical activity. The effects of EIMD in the Duchenne Muscular Dystrophy (DMD) population have resulted in concerns about exercise-induced weakness following exercise interventions. However, the level and type of exercise that DMD children should maintain is still debated. In normal muscle, one of the intriguing aspects of EIMD is that a bout that induces myofibre damage can result in protection from subsequent damage. It is possible that the muscles of the DMD children also demonstrate a protective effect for damage from eccentric exercise; however the presence of this effect has yet to be unequivocal. Using an exercise regime to cause skeletal muscle damage in C57Bl/ScSn (controls) and *mdx* (mouse model of DMD) mice, we investigated the extent and time course of protection afforded by one bout of eccentric exercise against damage resulting from a second bout of the same activity performed at three, six, nine or 12 days and re-examined at 10 days. We demonstrate that protection is afforded to the mouse after the first bout of activity with the optimum time course for re-exercise being three days for the C57Bl/ScSn mice and six days for the *mdx* mice. The results show that although *mdx* mice have a reduced force producing capacity ($p < 0.05$) there is evidence for protection afforded to the mouse model of muscular dystrophy against repeated bouts of the same activity.

Modifying wrist posture significantly improves therapist comfort during mobilisation

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Injury rates among manual therapists suggest that it would be beneficial to reduce the forces at the wrist and hand during therapy. Mobilisation devices have been designed, but a recent evaluation of two of these found them to be significantly less comfortable in use than the therapists' own hands. A further issue in manual therapy has been obtaining standardisation of forces applied to the spine, both by the same and different therapists. In the current project, a device with increased hand contact area and modified wrist posture was evaluated for therapist comfort and consistency of force production. A moulded handle was used to increase the hand contact surface area, and the device included a conventional hand-grip dynamometer purpose-adapted for dial visibility during application of mobilising forces. Ratings of comfort during a simulated spinal mobilisation technique were obtained, and the variability of the mobilisation forces produced was measured. Method: 30 physiotherapists were randomly allocated to apply either; (i) their own estimate of a grade III mobilisation force using a their hands in a pisiform grip or (ii) a 100 Newtons force with the manual therapy dynamometer. Comfort during the performance of the PA pressure was scored on a 100 mm visual analogue scale. Results: Repeated-measures tests showed that the mean force produced at Grade III was not significantly different from 100 Newtons, but physiotherapist comfort ratings were found to be significantly greater ($F_{1,29} = 86.1, p < .01$) when the manual therapy dynamometer was used to produce this force, compared to the hands in a pisiform grip. In addition, force variability was significantly less when the device was used with access to the dial readout. Conclusions: Using a device that modifies wrist posture and contact surface area of the hand reduces therapist discomfort during a manual therapy technique, and controls variation across grades of manually-produced mobilising force.

International low back pain guidelines: A comparison of two research based models of care for the management of acute low back pain

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Evidence-based guidelines for the management of acute low back pain (ALBP) have been formulated by numerous countries. There are discrepancies between guidelines regarding physiotherapy treatment. The aim of this study was to compare two research based models derived from international LBP guidelines. A single-blind randomised controlled trial was undertaken in a physiotherapy outpatients department. Subjects with ALBP were randomly allocated to an 'assess/advise/treat' group (n = 50) or an 'assess/advise/wait' group (n = 52). The primary outcome measure was the Roland and Morris Disability

Questionnaire (RMDQ). Secondary outcome measures of pain (VAS, usual pain intensity) depressive symptoms (MZSRDS) somatic distress (MSPQ) anxiety (STAIS) quality of life (SF36) and general health (EuroQol) were also obtained. Outcomes were assessed at six-weeks, three-months and six-months. At six-weeks subjects in the assess/advise/treat group demonstrated less LBP related disability ($p = 0.02$) and depressive symptoms ($p = 0.01$), as well as better general health ($p = 0.006, p = 0.05$), vitality ($p < 0.001$), social functioning ($p = 0.004$) and mental health ($p = 0.002$). At long-term assessment (three and six months) subjects in the assess/advise/treat group were less distressed ($p = 0.004$), anxious ($p = 0.01$) and had fewer depressive symptoms ($p = 0.001$), as well as reporting better general health ($p = 0.009, p = 0.05$), emotional role ($p = 0.03$) and mental health ($p = 0.04$). Active physiotherapy produces better short-term outcomes than advice. Delaying treatment has no long-term consequences on pain or disability, but affects the development of psychosocial features.

Blood pressure and aquatic physiotherapy during pregnancy

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While uncontrolled blood pressure (BP) is listed as a precaution to aquatic physiotherapy (AP) in the APA Aquatic Physiotherapy Guidelines (2002), the effect of AP on BP was unknown for pregnant women — a special population. A small number of studies have investigated the effect of various types of exercise in water on BP during pregnancy, but the type of activity was not comparable with AP. The current study aimed to investigate the immediate effect of AP on BP in pregnancy to fill a gap in the knowledge base and ensure the safety of such activity during healthy pregnancies, in relation to BP increases, as BP increases can be dangerous during pregnancy. An experimental, same-subject, repeated measures study was completed at the Women's and Children's Hospital, Adelaide. Forty-five sets of data were collected from 33 women, participating in existing antenatal AP classes. BP measurements were taken pre-immersion, two to three minutes after initial immersion, after the AP class in the water and eight to twelve minutes after exiting the water. Data was analysed using a repeated measures analysis of variance (ANOVA), which showed a significant difference between BP measures ($p < 0.001$) for these time intervals. BP significantly decreased on entering the water with a mean arterial pressure (MAP) mean difference of 10.29 mmHg (95% CI 8.52 to 12.06) and decreased further following the AP class with a MAP mean difference of 12.29 mmHg (95% CI 10.37 to 14.21) compared with pre-immersion values. On exiting the water there was no significant difference for MAP values compared to pre-immersion ($p > 0.05$). These results confirm the safety of AP during normotensive pregnancies for BP increases and provide baseline knowledge for further research with hypertensive pregnancies.

Gait aid use in a low care older population — the influence of balance, fear of falling and pain

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The aim of this study was to determine the relationship between balance, fear of falling and pain, and gait aid use in a low care residential older population. A cross sectional descriptive pilot study generating quantitative and qualitative data was conducted using a convenience sample from a local residential aged care facility. Thirty-one independently ambulant low care older people aged over 65 years were interviewed regarding various aspects of their gait aid use. Balance (Berg Balance Test), fear of falling (Falls Efficacy Scale) and pain (The Geriatric Pain Measure) were also measured using the valid and reliable outcome measures listed. Four discrete groups of gait aid users were identified; those who use no aid ($n = 5$), a stick only ($n = 7$), frame only ($n = 13$) or alternated between use of both a stick and frame ($n = 6$). ANOVA indicated that there was a significant relationship between balance and fear of falling and the type of gait aid used by subjects ($p < 0.05$) however, pain had no influence ($p > 0.05$). Minimising the risk of falls associated with inappropriate use and prescription of gait aids may be assisted by improved prescription guidelines. Balance and fear of falling appear to influence the type of gait aids used in this low care residential older population and their independent influence on gait aid use should be considered when prescribing gait aids. Low care older people may benefit from interventions to improve their falls confidence rather than interventions to address deteriorated physical balance abilities.

The effect of altered visual and proprioceptive cues on postural control in typical children aged six to eight years

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This study evaluated the effect of sensory manipulation on postural control in typically developing children aged six to eight years. Children aged six, seven and eight years ± 3 m ($n = 35, 42, 36$ respectively) who satisfied selection criteria were included after providing informed consent. Subjects stood on dual force plates in a standardised position for 30 sec with performance from 5–25 sec used for analysis. Using normal stance on floor or foam they were tested with eyes open or closed. In tandem stance the same visual conditions were tested on the floor, with preferred and non-preferred foot forward. Measures extracted were mean anteroposterior displacement of the centre of pressure (mAPCOP), percentage of foot length used (%FLU), velocity and distance of sway. Repeated measures analysis evaluated change on measures as sensory condition altered, showing significant changes across the 12 conditions (all $p = 0.000$). Less mature responses were seen in normal stance when eyes were closed compared with open, standing on floor ($p = 0.036$) or foam ($p = 0.000$), and in both tandem positions (all $p = 0.000$). Reduced proprioception in normal stance with eyes open caused changes in mAPCOP ($p = 0.001$) and %FLU ($p = 0.000$), and with eyes closed, in all measures (all $p = 0.000$). The

reduction in mAPCOP and %FLU may reflect use of constraint for control when conditions become more demanding due to reduced visual or proprioceptive cues. Increased demand is also reflected in less mature responses relating to sway velocity and distance travelled.

Changes to peripheral blood flow and transcutaneous oxygenation of diabetic feet after exposure to pulsed electromagnetic field

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Early management of ischaemic foot problems, common in persons with Type 2 diabetes is advocated to reduce disability. Effects of pulsed electromagnetic field (PEMF) are documented but prophylactic studies on physiological effects in diabetic feet are lacking. This study aimed to examine PEMF's effect on peripheral blood flow (PBF) and transcutaneous partial pressure of oxygen (TcPO₂) of ischaemic feet. A single-blind randomised controlled, repeated measures design study was conducted on 26 informed-consenting, 53–80 year olds (mean = 72.2 years) participants with ankle-brachial index < 0.85 . Only the treatment group ($n = 14$) received 30 minutes PEMF (5 x 10⁻⁴ Tesla, 12 Hz peak-to-peak alternating-field) but the sound initiating the identical sham procedure for the control group ($n = 12$) was engineered similarly. Doppler frequency (kHz) of PBF over the dorsalis pedis and TcPO₂ (mmHg) of the worse foot dorsum were collected every five minutes, starting 15 minutes before, during, and for 20 minutes after the treatment. There were no differences between groups in demographics e.g. age, duration of diabetes, ankle-brachial index nor in baseline measures, PBF ($p = 0.14$) and TcPO₂ ($p = 0.47$). Results revealed that PBF and TcPO₂ in the treatment group were raised, peaked at 97% and 38.5% above baseline respectively but were 44% and 19.5% at the end of 50 minutes data collection. No significant changes in PBF and TcPO₂ were observed in the sham group. PEMF enhanced local circulation and oxygenation but, before advocating its incorporation into ischaemic feet-care programs, further studies are required.

Do age, function and injury severity affect outcome after emergency orthopaedic admission?

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Introduction: Considerable resources are expended in the acute management of patients admitted to hospital with emergency orthopaedic conditions. The longer term recovery of these patients is not routinely assessed and predictors of recovery are not clear. The aim of this pilot study was to assess the recovery of functional ability and quality of life (QoL) of patients after emergency orthopaedic admission, and to investigate the effect of age, pre-injury function and injury severity on recovery. **Method:** 75 patients admitted to the Royal Adelaide

Hospital with an emergency orthopaedic condition participated in the study. Outcome measures were the human activity profile to assess functional ability, and the SF 36 health survey to assess QoL. These questionnaires were administered within one week of admission (with answers reflecting pre-admission status) and at three and six months post-admission. *Results:* 51 and 38 patients returned the three and six month questionnaires respectively. All measures of functional ability and QoL were significantly decreased at three months compared to pre-admission status ($p = 0.01$). At six months, all outcomes were still decreased, but this was only significant for physical QoL ($p < 0.01$). While moderate correlation was found between age, pre-injury function, injury severity and the outcome measures, these factors did not independently predict recovery. *Conclusion:* Functional ability and QoL were decreased three and six months after emergency orthopaedic admission. This may indicate the need for ongoing review for this patient group following discharge from hospital.

Cardiothoracic physiotherapy — levels of evidence underpinning undergraduate curricula

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The aim of this study was to identify the levels of evidence represented within the core cardiothoracic curricula in entry-level physiotherapy programs within Australia. All facilities providing entry-level physiotherapy programs were invited to participate in this study. Hard copies of course materials used during 2003 (manuals, lecture notes and handouts) provided to undergraduate students were collated and provided to the Centre for Evidence-Based Practice in Allied Health, University of South Australia. A single independent reviewer collated all references cited within the teaching materials and ranked each reference according to a hierarchy of evidence, where systematic reviews were regarded as the highest level of evidence and expert opinion / case studies at the lowest level. Five Universities submitted a total of 973 separate documents for review. The number of references per university ranged from 71 to 256. Each ranking category was calculated as a percentage of the total number of references submitted by each University. All five universities demonstrated the same pattern of reference hierarchy where the lower levels of evidence represented approximately 70% of all references. On average, 4% of references were systematic reviews (Rank 1), 7% were randomised controlled trials (RCTs) (Rank 2), 16% were non-RCT experimental studies (Rank 3), 4% were uncontrolled cause and effect studies (Rank 4), 33% were descriptive studies (Rank 5) and 37% were narrative / opinion / case studies (Rank 6). Apart from the number of references cited within course materials, no other obvious differences existed between universities.

The influence of fatigue on passive and active knee flexor stiffness

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This study investigated the fatigue-induced changes in human knee flexor muscle stiffness and explored an association between fatigue and stiffness in the context of muscular strain injuries. A four-session study design was used, with each session equally spaced by two weeks. Eighteen subjects ($n = 18$) performed two initial familiarisation sessions to establish baseline measures of strength (isometric and isokinetic) and stiffness (passive and active). The third and fourth sessions independently examined either concentric or eccentric fatigue. Sixty continuous, maximal, isokinetic efforts (active phase $180^\circ \cdot \text{sec}^{-1}$, passive phase $30^\circ \cdot \text{sec}^{-1}$) through a 90° range (zero to 90° of knee flexion), comprised the fatigue protocol with passive and active stiffness evaluations performed before and immediately after intervention. Reliability of all baseline variables was excellent (ICC's > 0.87 , $p > 0.05$). Statistical analysis of the data revealed fair to moderate positive correlations between the magnitude of fatigue and changes in active stiffness following concentric exercise ($r = 0.788$, $p < 0.001$) and eccentric exercise ($r = 0.471$, $p = 0.049$). However, no association existed between fatigue magnitude and changes in passive stiffness following concentric exercise ($r = 0.349$, $p = 0.156$) or eccentric exercise ($r = -0.150$, $p = 0.554$). It was concluded that the related increases in active stiffness following dynamic exercise were a direct result of the failure in contractile constituents of skeletal muscle associated with moderate fatigue.

Developing a model that helps physiotherapy students identify clinical risk and learn preventative measures

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Background: There is clinical risk associated with student teaching. On a daily basis, students may put themselves and their patients at risk. This paper reports the development of a risk assessment and competency training clinical teaching model to prevent or minimise adverse events, such as physical injury, falls etc. Method: We first compiled a comprehensive list of possible areas of risk within student practice. We then identified reasons why adverse events may occur. Finally, we identified preventative strategies that might be employed prior to, during and following patient contact. The model features planning for clinical practise sessions, reflection on performance, risk minimisation tutorials and self-learning guides. We instigated this new teaching model over six months and then reviewed adverse events and student views. Results and conclusion: Since its inception, there have been no episodes of adverse events, with therapists and students providing favourable feedback. This finding has prompted us to establish a formal evaluation process. We plan to closely monitor adverse events over this teaching year. Furthermore, we have planned a reflective practise

questionnaire for students that details areas of risk experienced in their placement and strategies employed to minimise risk.

Three-dimensional kinematics and inter-segmental co-ordination of arm swing and movements of the neck, trunk and pelvis during normal walking at different speeds

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The co-ordination between arm swing and movement of spinal segments during walking at different speeds has received little study with three-dimensional kinematic techniques. Very slow walking speeds of relevance to stroke patients have rarely been studied. The aims of this study were two-fold: 1) to determine the correlation between the upper limbs and trunk and pelvic segments during normal walking and 2) to assess the effect of walking speed on the correlations. A bilateral kinematic analysis was carried out using eight cameras and 52 retro-reflective markers located on the head, shoulders, thorax, lumbar spine, pelvis, elbows, wrists, thighs, legs, feet and halluces. Healthy young adults ($n = 22$) were asked to walk on a 10-metre walkway at four speeds: very slow, slow, preferred and fast. Depending on walking speed, five to twenty walking cycles were recorded from each subject. Rotations of the neck, shoulders, elbows, thorax and pelvis were calculated and analysed to describe the correlation between segments. Mean and standard deviation of walking velocity was 0.48 (± 0.05) m/s for very slow, 0.83 (± 0.06) m/s for slow, 1.28 (± 0.05) m/s for preferred and 1.86 (± 0.09) m/s for fast speeds. The amplitude of rotations of shoulder and elbow joints increased significantly with walking speed for rotations in all three planes ($p = 0.01$ and $p = 0.001$ respectively) and had no significant difference between gender. The amplitude of rotations of the neck, trunk and pelvic segments varied significantly with walking speed for rotations in all three planes.

Quality of life correlates with six-minute walk distance in patients undergoing pulmonary rehabilitation

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The aim of this study was to correlate aspects of quality of life with functional performance in patients undergoing pulmonary rehabilitation. Fifty-five patients of mean age 63.2 years (SD 11.5) with chronic respiratory diseases (chronic obstructive pulmonary disease, 56%; bronchiectasis, 9%; asthma, 9%; primary emphysema, 6%; others, 20%) participated in 18 sessions of pulmonary rehabilitation over six weeks. The program included aerobic exercise training and upper/lower extremity strengthening. Chronic Respiratory Questionnaire (CRQ) and six-minute walk distance (6MWD) testing were administered before and after the six-week rehabilitation

program. Both CRQ total scores and 6MWD were significantly correlated (start of the program, $r = 0.40$, $p = 0.004$; end of the program, $r = 0.62$, $p < 0.001$). Of the four dimensions in CRQ, dyspnoea was consistently correlated with 6MWD performance (start of the program, $r = 0.49$, $p < 0.001$; end of the program, $r = 0.48$, $p = 0.001$). Dimensions of fatigue, emotional function and mastery were only significantly correlated with 6MWD at the end of the pulmonary rehabilitation program (fatigue, $r = 0.37$, $p = 0.01$; emotional function, $r = 0.51$, $p < 0.001$; mastery, $r = 0.68$, $p < 0.001$). Both dyspnoea scores predicted almost 30% of the variance in 6MWD, with post-rehabilitation dyspnoea score accounting for about 27% of the variance ($r^2 = 0.273$, $p < 0.001$). In conclusion, although improvement in functional performance may seem to correlate with overall improvement in quality of life, dyspnoea appears to be the most important predictor of functional performance.

Suppression of intracortical inhibition during selective activation of a hand muscle is influenced by target force but not hemisphere stimulated

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GABAergic intracortical inhibition (ICI) in motor cortex (M1) is abnormal in several movement disorders, including focal dystonia. In normal subjects, we assessed: 1) operation of ICI circuits during selective activation of intrinsic hand muscles at different forces; and 2) whether this differs between hemispheres. Surface EMG was recorded bilaterally from abductor pollicis brevis (APB), first dorsal interosseous (FDI) and abductor digiti minimi (ADM) muscles in 11 right-handed subjects. A circular coil applied paired transcranial magnetic stimulation (TMS) with posteriorly directed current in the brain. Conditioning intensity was 0.8x active threshold and interstimulus interval was three ms. TMS was applied to right or left M1 while subjects were at rest or performing isometric thumb abduction at different forces (0.5N, 1N, 2N, 3N, 5N and 10N) with the contralateral hand. Conditioning TMS was less effective in suppressing the muscle evoked potential in APB during 2-10N thumb abduction ($p < 0.0001$) vs. rest, whereas its effectiveness did not change significantly from resting values for FDI or ADM during APB activation. No differences were observed between left and right hemispheres. We conclude that differential modulation of ICI in M1 promotes fractionated activation of hand muscles by selective disinhibition of corticospinal neurons supplying the muscle targeted for activation. The ICI circuit is not modulated for very weak contractions, and its operation is independent of hand preference. These studies form the basis for an investigation of these properties in focal dystonia, in which abnormal ICI is believed to contribute to unintended overflow of the excitatory commands.