



NEW ZEALAND JOURNAL OF **PHYSIOTHERAPY**

JULY 2010, VOLUME 38, NUMBER 2: 43-84

- Massage therapy: more than a modality
- Reliability of hand-held dynamometric strength testing in people with diabetes/chronic conditions
- The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: a systematic review
- Abstracts from the Physiotherapy New Zealand Biennial Conference, Auckland, May 15-16 2010



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New Zealand Journal of Physiotherapy

Official Journal of Physiotherapy New Zealand

ISSN 0303-7193

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Photograph: Kowhai. Haxby Abbott

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Size	Black & White	Size	Colour
Full Page	\$560.00	Full Page	\$1200.00
Half Page	\$420.00	Full Page Insert	\$770.00
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We would like to thank Dr Haxby Abbott for the major contribution he has made to the publication of physiotherapy research. Haxby took over as editor of the New Zealand Journal of Physiotherapy (NZJP) in 2005. He was instrumental in the NZJP becoming an open access journal, a first for journals of professional physiotherapy organisations. He was also committed to getting the journal listed on research databases. It is now listed on AMED, CINAHL and Pro Quest giving increased international exposure and recognition to authors publishing in the journal.

One of the first changes he made was the establishment of an International Editorial Advisory Board in 2006 leading to greater overseas input into our journal. He also introduced some new sections: 'In Other Journals' which alerts readers to open access articles relevant to the practice of physiotherapy, and 'Out of Aotearoa' featuring articles by New Zealand authors published overseas.

We are fortunate to have two internationally recognised schools of physiotherapy producing

world class research. The research includes critical analysis of the professional issues physiotherapists are facing set in the context of the New Zealand health environment. To ensure there is a robust vehicle for publication of articles relevant to the New Zealand population, as well as a wide range of other articles from here and overseas, it has been decided to continue with the NZJP as the official journal of Physiotherapy New Zealand.

We would also like to thank the current members of the Honorary Editorial Committee Dr Leigh Hale, Dr David Nicholls, Julie Reeve and Dr Stephanie Woodley for their ongoing support and hard work. We are currently seeking expressions of interest for a new editor.

Gill Stotter

President, Physiotherapy New Zealand

WHY PUBLISH IN THE NEW ZEALAND JOURNAL OF **PHYSIOTHERAPY?**

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Massage therapy: more than a modality

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ABSTRACT

Whilst massage therapy techniques are still used within physiotherapy, massage therapy has developed as a specific complementary and alternative medicine (CAM) health service, distinct from physiotherapy, and is one of the fastest growing areas of this sector of the health industry in the United States. New Zealand consumers are also choosing a range of complementary and alternative therapeutic approaches, including massage therapy, to satisfy their primary healthcare needs. This paper discusses the development of massage therapy in New Zealand; explores the approaches and characteristics of massage therapy as a CAM practice; outlines the evidence for massage therapy; and identifies information relevant to the physiotherapist wishing to engage in interprofessional collaboration with a massage therapist. **Smith JM, Sullivan SJ, Baxter GD (2010). Massage therapy: more than a modality. New Zealand Journal of Physiotherapy 38(2): 44-51.**

Key words: Massage, Massage therapy, Physiotherapy, Complementary & Alternative Medicine

BACKGROUND

Landmarks and influences in the development of massage therapy in New Zealand

In many countries of the ancient world, massage was considered to be a medicinal practice and was practised in many forms (Calvert 2002; Fritz 2006). Hippocrates advocated *anatripsis* which means 'to rub up' and suggested, 'the physician must be acquainted with many things and assuredly with *anatripsis*, for things that have the same name have not the same effects, for rubbing can bind a joint that is loose and loosen a joint that is too hard' (Beard 1964 cited in Tuchtan et al 2004, p.17). Within Aotearoa New Zealand, *mirimiri* (massage therapy) was part of daily life in pre-European times (Calvert 2002), and is still practised by Māori healers today (Gregg et al 2006).

Massage therapy developed differently in the East and the West during the Middle Ages. In the West, massage therapy became associated with supernatural experiences and folk medicine, but later regained some of its "respectability" in the sixteenth century (Fritz 2006). By the 1880s, massage was undergoing a revival in Britain; Swedish massage became an important feature of nursing work and a 'diverse array of variously trained massage therapists were practising throughout the country' (Nicholls and Cheek 2006, p.2340). However, the inconsistent system of education and questionable quality of some massage therapists, false advertising claims by some massage therapists (Fritz 2006), along with the implication that 'massage establishments were merely a front for brothels' (Nicholls and Cheek 2006, p.2340) during the massage scandals of 1894, eroded the legitimacy of massage therapy.

The legitimisation of massage therapy in the 20th century was enhanced through the use of

a 'biomechanical discourse' (Nicholls and Cheek 2006), and the Society of Trained Masseuses (STM) association with the medical fraternity; STM became the practising foundation of physiotherapy. Within New Zealand, the Otago Medical School established the School of Massage in 1913, and offered an 18-month Certificate in Massage; this School has since evolved into the current University of Otago School of Physiotherapy. The Physiotherapy Act of 1949 supported the right of the physiotherapist to practise therapeutic massage.

In recent years the demand for therapeutic massage services by the New Zealand public has increased and massage therapists have taken this opportunity to respond to this need. In the late 1980s and early 1990s, two voluntary associations were established in New Zealand to support massage therapists: the Massage Institute of New Zealand Incorporated (MINZI) and the New Zealand Association of Therapeutic Massage Practitioners (NZATMP). These played a role in raising the educational standards and profile of massage therapists. In 1992, the first 'formal' massage diploma (to meet the educational standards advocated by NZATMP) was delivered by a private training establishment in Auckland, and the practice of massage therapy as a stand alone therapy for health and wellness, distinct from physiotherapy, became more evident. With the adoption of the Health Professional Competency Assurance Act in 2003, the 1949 Physiotherapy Act was repealed, and the requirements of the Physiotherapy Act imposed on massage therapy educators and massage therapists to clearly identify that they were not training students in physiotherapy nor practising physiotherapy respectively was removed. The introduction of massage therapy unit standards and a National Certificate and National Diploma

by the New Zealand Qualifications Authority in 2000 also stimulated growth in the number of massage therapy training providers, especially in the Polytechnic sector. Today, the education of massage therapists commonly involves a six-month Certificate in Relaxation Massage or a one to two year Diploma in Therapeutic Massage. More recently, baccalaureate degree based education for massage practitioners was implemented at Southern Institute of Technology (SIT) in 2002 in the form of a Bachelor of Therapeutic and Sports Massage. Subsequently a second provider (private training establishment) has been approved and now also offers a three-year Bachelor's Degree in Massage Therapy.

However, the practice of massage therapy in New Zealand is unregulated (Massage New Zealand 2009a) and there is a range of educational standards and levels, including non-accredited massage education providers offering massage therapy training. In the last 20 years, a number of self-regulating bodies for massage in New Zealand have been established. Today, Massage New Zealand (MNZ) is the only voluntary national association specifically for massage therapists. Members of MNZ are bound by a code of ethics, a scope of practice, a complaints procedure, and have requirements for continuing professional development. Two levels of membership exist: the Certified Massage Therapist (CMT) who practices relaxation massage, and who holds a National (NZQA) Certificate or equivalent in Relaxation Massage (most commonly representing 600 hours of training); and the Remedial Massage Therapist (RMT) who practices remedial, deep tissue or other advanced clinical styles of massage, and who holds a National (NZQA) Diploma/Degree or equivalent in Therapeutic Massage, which can vary from 1500 – 3600 hours of training (Massage New Zealand 2009b). Whilst MNZ members are the only nationally recognised group of massage professionals, only 250 massage therapists (CMT and RMT) are members; but based on the 2006 employment data (Department of Labour 2009), over 80% of NZ massage therapists do not belong to MNZ.

MESSAGE AS A CAM PRACTICE

Massage therapy is used as an adjunct or stand-alone therapy by a number of health care providers such as nurses (Grealish et al 2000; Remington 2002), physiotherapists (Foster et al 1999; Galloway et al 2004), other complementary and alternative medicine (CAM) providers (Fellowes et al 2004; Mehling et al 2007) and massage therapists (Cherkin et al 2002a). Whilst massage therapy techniques are still used within physiotherapy (Foster et al 1999; Galloway et al 2004), massage therapy has developed as a specific CAM health service, distinct from physiotherapy, and is one of the fastest growing areas of this sector of the health industry in the United States (US) (Cherkin et al

2002b). In New Zealand, massage therapy, separate from physiotherapy, is also among the many growing CAM modalities and is considered part of the manipulative and body-based CAM therapies (Ministerial Advisory Committee on Complementary and Alternative Health 2004). This section focuses on the practice of massage therapy delivered as a stand-alone therapy by a massage therapist.

Definitions and approaches

Massage therapy may be defined as *'the use of the hands to physically manipulate the body's soft tissues for the purpose of effecting a desirable change in the individual'* (Tuchan et al 2004, p.5). Other definitions add elements such as the application of purposeful and systematic touch, a collection of skills, and a variety of styles or approaches (Yates 2004). Professional bodies such as the American Massage Therapy Association (AMTA) defines massage therapy as *'a profession in which the practitioner applies manual techniques, and may apply adjunctive therapies, with the intention of positively affecting the health and well-being of the client'* (American Massage Therapy Association 2009a), thereby, incorporating into massage therapy the scopes of health and wellbeing. Within New Zealand, MNZ does not define massage therapy but does position massage therapy within health and wellness in its mission statement, i.e. *'to promote health and wellness in New Zealand (Aotearoa) through quality massage'* (Massage New Zealand 2009c), thereby mirroring the scope advocated by AMTA. Instead, MNZ lists a number of massage therapy techniques, energy based massage techniques, and posture related treatments (Massage New Zealand 2009d). Massage therapy techniques noted by MNZ include neuromuscular therapy (NMT), therapeutic massage, trigger point therapy, sports massage, myofascial release (MFR), chair massage, and Swedish massage (relaxation massage).

Massage therapy incorporates a variety of approaches (Moyer et al 2004; Sherman et al 2006). Some massage therapists subscribe to a single approach or school of thought, while others choose from a range of available techniques and styles depending on their skill base, scope of practice, and the needs of the client (i.e., condition and principal goal of treatment). Sherman and colleagues (2006) have recently presented a classification system (goal of treatment, styles, techniques) to assist with standardising the reporting of massage application to patients with musculoskeletal pain. Four categories described the principal goal of treatment; these were relaxation massage, clinical massage, movement re-education, and energy work. A number of different styles, for example, Swedish massage, myofascial release, proprioceptive neuromuscular facilitation, could be used for each principal goal of treatment, and each style consisted of a number of specific techniques, for example, gliding, skin rolling, kneading (Sherman et al 2006).

However, the lack of consistency in the definition of massage therapy (Menard 2002), as well as the lack of consistent terminology for describing the techniques used by massage therapists are two of the challenges in conducting research in the field of massage and bodywork (Sherman et al 2006).

The practice of massage therapy is considered to be *more* than the applications of one or more massage therapy techniques. Massage therapy is aligned with the wellness paradigm, and places importance on addressing the client's physical, psychological and emotional needs to maximise the client's capacity to achieve mental and physical balance (Alexander 2006; Cassidy 2002; Yates 2004). In addition, an essential element of massage therapy is an interactive and relatively egalitarian therapeutic relationship (Smith 2009a), and massage therapy-related health outcomes (Smith 2009b) are more closely associated with the wellness paradigm of CAM (Alexander 2006; Cassidy 2002; Yates 2004) rather than those associated with biomedicine (Schuster et al 2004).

In summary, contemporary massage therapy in its simplest form equates to anatripsis (to rub) reflecting its origin; however, the range and descriptions of its associated techniques and practices are expansive, and variable, and only recently have there been attempts to illustrate the intentionality and integrity of massage therapy through systematic definitions and best practice frameworks (Grant et al 2008; Sherman et al 2006). The practice of massage therapy is more than a modality or an application of techniques – it is a dynamic, whole systems approach to care. The philosophy of massage therapy practice is holistic in nature and differs from the 'body-as-machine' approach (Nicholls and Larmer 2005) often used in contemporary physiotherapy practice.

The use of massage therapy

Massage therapy is used to treat symptoms associated with a wide range of chronic (Cherkin et al 2002b), clinical (Furlan et al 2002; Lawler 2004; Moyer et al 2004) and sporting (Ernst 1998; Moraska 2005; Weerapong et al 2005) conditions. It seems that more people recognise massage therapy as an important element in their overall health and wellness, with clients seeking benefits such as relaxation, feelings of well-being (Back et al 2009; Grant et al 2008; Sharpe et al 2007), improved circulation, and reduction in anxiety and pain (Moyer et al 2004). Although massage can be provided for a number of reasons, its general goal is to help '*the body achieve or increase health and well-being*' (Sherman et al 2006, p.1). Some contraindications for massage therapy exist, such

as, deep vein thrombosis or localised conditions such as skin injuries or burns (Sherman et al 2005). However, many conditions previously considered contraindications (e.g., metastatic cancer) are no longer considered as such (Batavia 2004); indeed, the common forms of massage, tailored appropriately, are considered very low risk (Ezzo et al 2007; Sherman et al 2005) and serious adverse events are rare (Ernst 2003).

One of the earliest surveys of massage therapy use in the general population in the US reported an increase in use of massage therapy from 6.9% in 1990 to 11.1 % in 1997; visits were primarily for back and neck problems and fatigue (Eisenberg et al 1998). A 1998-1999 survey based on patient visit data for massage therapy from two US states (Cherkin et al 2002b) reported the five primary reasons for visits were: back symptoms (20.2-20.4%), wellness (18.7-19.5%), neck symptoms (13.0-18.7%), anxiety or depression (5.2-8.8%), and shoulder symptoms (7.4-8.4%); and 71.5 % of users were not covered by insurance. Most visits were for chronic problems, and about a quarter to a third of all visits were for non-illness care (Sherman et al 2005). Since 2003, annual AMTA consumer surveys indicate that an average of 32% of adult Americans received a massage in the previous five years (American Massage Therapy Association 2009b). Similarly, a 2005 population based survey of CAM use in Australia (Xue et al 2007)

“Massage therapy is aligned with the wellness paradigm, and places importance on addressing the client’s physical, psychological and emotional needs”

reported western massage therapy as the second most popular form of CAM, with 27.2% of the population using western massage therapy, and, of

those, 73.7% visited a practitioner, with a mean of 6.3 visits per user.

Within New Zealand, consumers are now choosing a range of complementary and alternative therapeutic approaches to satisfy their primary healthcare needs, and massage therapy is a popular treatment choice: during a 12-month period in 2002/3, 9.1% of adult New Zealanders reported having visited a massage therapist (Ministerial Advisory Committee on Complementary and Alternative Health 2004). Patterns of massage use by New Zealand-based clients show similarities with other CAM and massage surveys. Massage users tended to be female, NZ European, employed in professional careers, and almost always paid for massage privately; they sought massage therapy for symptoms of 'muscle tightness / stiffness / tension' and 'pain' (Smith 2009c). Massage users employed a proactive and health conscious approach; the massage experience as well as outcomes from massage therapy were important to clients and contributed to a healthier and more productive life (Smith 2009a, Smith 2009b, Smith 2009c).

Massage therapy practice in New Zealand

Unlike physiotherapy (Reid and Larmer 2007), massage therapy is not an established part of the health care system and is not funded by the Accident Compensation Corporation. However, the Department of Labour recently reported 1272 people employed as massage therapists in 2006, a 54% growth since 2001, and a 451% growth since 1996; 85% were female, 78% were NZ European, and 10% were Māori (Department of Labour 2009). The definition used for a massage therapist for the Census survey was '*massage therapists perform therapeutic massage and administer body treatments for health, fitness and remedial purposes*' (Statistics New Zealand 2009) categorising massage therapists by their self-reported activity rather than by 'registration' or 'qualification'. This employment growth perhaps reflects the growth in awareness in massage therapy, and the growing number of educational providers and graduates. The major industries serviced by massage therapy were health services (51%) and the qualifications of massage therapists ranged from none (6%) to degree/higher degree (17%) (Department of Labour 2009). The New Zealand Government Career Services website (Career Services, 2009) reports that therapists work on average 21 hours per week, charging from between \$30 to \$80 an hour, and that job opportunities for massage therapists in New Zealand are good.

However the census data does not necessarily represent the practice of massage therapy in New Zealand by qualified massage therapists. A recent study of 66 New Zealand-based massage therapists, who were also members of MNZ, were surveyed using a random, nationwide sample. Most therapists were female (83%), NZ European (76%), and held a massage diploma (89%). Massage therapy was both a full (58%) and part time (42%) occupation, and two-thirds of therapists (66%) reported typically having between 10 and 29 client visits per week. The most frequent client fee per treatment was \$60 per hour in a clinic and \$1 per minute at a sports event or in the workplace. The majority of massage therapists practised in a 'solo practice' (58%) but used a wide and active referral network, including referral to and from physiotherapists (Smith 2009c). Commonly used techniques and most frequent issues or conditions seen by massage therapists, as well as therapist and practice characteristics were similar to that reported in US studies (Cherkin et al 2002b; Sherman et al 2005), suggesting some cross-national congruency.

THE EVIDENCE FOR MASSAGE THERAPY

The previous sections have indicated that the practice of massage therapy is very old, and massage therapy is widely used and expanding rapidly as a CAM practice. However, scientific research on massage therapy has only a short history (about twenty years) and although the quantity of massage

therapy research has increased, the research infrastructure is still developing, and massage therapy research is still in its infancy (Moyer et al 2009). In the US, the Massage Therapy Foundation and the National Center for Complementary and Alternative Medicine are major funders for massage therapy research. Although scientific research on massage therapy is limited, there is evidence that massage may benefit some patients (National Center for Complementary and Alternative Medicine 2009); a view supported by Ernst and colleagues (2007) who suggest the evidence base is getting stronger for massage therapy.

Established effects of massage therapy

Some of the early massage therapy research reviewed the effectiveness of massage therapy in treating symptoms associated with a variety of clinical conditions (e.g., pregnancy, migraine headache) and concluded that massage therapy has received '*empirical support for facilitating growth, reducing pain, increasing alertness, diminishing depression, and enhancing immune function*' (Field 1998, p.1270). Other reported changes brought about by massage include: improvements in blood and lymph flow, reduction in muscle tension and blood pressure, increase in pain threshold, improvement of mood, and relaxation of the mind (Aourell et al 2005, Coelho et al 2008, Ernst et al 2006, Frey Law et al 2008, Ouchi et al 2006, Sullivan et al 1991). A number of systematic reviews have also been conducted for massage therapy since 2004; these are summarised in Table 1. Some reviews indicate evidence for massage therapy, others conclude that more evidence is required; and conclusions cannot yet be drawn about the effectiveness for specific health conditions (Ernst et al 2007).

More recently, a well designed randomised controlled trial (RCT) (Sherman et al 2009) comparing the efficacy and safety of therapeutic neck massage with a self-care book for patients whose neck pain had persisted at least 12 weeks (n=64) showed therapeutic massage had clinically important benefits at least in the short term. Donoyama and Shibasaki (2009) in a study of massage interventions for chronic neck and shoulder stiffness (n=8) reported that the effectiveness of massage therapy for neck and shoulder muscle stiffness was dependent upon the experience of the massage practitioner. This suggestion mirrors that of Imamura and colleagues (2008) that training and experience of the massage therapist might influence outcomes; an important point when choosing a therapist.

Common gaps in massage therapy research include heterogeneous populations, non-comparable outcome measures, and poorly described treatments. For massage therapy, the situation is further complicated by the multiple professionals who use the therapy, the multimodality treatment package which may be

Table 1: Summary of systematic reviews for massage therapy: 2004-2009

Authors	Purpose for massage therapy (MT)	Number of studies	Findings	Conclusions	Problems or recommendations
(Lewis & Johnson, 2006)	Symptomatic relief of musculoskeletal pain	20	Therapeutic massage was: Superior to no treatment in 5/10 comparisons; Superior to sham (laser) treatment in 1/2 comparisons; Superior to active treatment in 7/22 comparisons; Superior to comparison groups in 6/11 studies using patients with musculoskeletal pain; 3/7 studies using patients with low back pain. Superior to comparison groups in 4/9 studies using healthy participants experiencing post-exercise pain and soreness. There were no relationships between study outcome and the TM regimen used	The available evidence is inconclusive.	Inadequate sample sizes, low methodological quality and insufficient dosing information
(Imamura et al., 2008); (Furlan, Imamura, Dryden, & Irvin, 2008)	Management of chronic low back pain	13	Strong evidence that massage is effective for nonspecific CLBP The effects of massage are improved if combined with exercise and education and if a licensed therapist delivers massage.	Supports massage therapy for management of CLBP	
(Ezzo et al., 2007); (Haraldsson et al., 2006)	Massage for mechanical neck disorders	19	Six trials examined massage as a stand-alone treatment; 14 examined massage as part of a multimodal intervention. Did not find a strong or moderate level of evidence for massage alone relative to a control Relative contribution of massage could not be determined in multimodal interventions	Results inconclusive: effectiveness of massage for neck pain remains uncertain	Describe massage intervention (frequency, duration, number of sessions, and massage technique), massage professional's credentials, or experience. Improve reporting of the adverse events.
(Wilkinson, Barnes, & Storey, 2008)	Massage for symptom relief in patients with cancer	10	Massage might reduce anxiety in patients with cancer in the short term, and May have a beneficial effect on physical symptoms of cancer, such as pain and nausea.	The lack of rigorous research evidence precludes drawing definitive conclusions.	More well-designed large trials with longer follow-up periods are needed
(Coelho et al., 2008)	Massage therapy for the treatment of depression	4	Three of these RCTs compared massage therapy with relaxation therapies, but provided insufficient data and analyses to contribute meaningfully to the evaluation; In the early stages of treatment, massage therapy is less effective than acupuncture for treating depression.	Currently a lack of evidence to support massage therapy as an effective treatment for depression	
(Ernst, 2009)	MT for cancer palliation and supportive care	14	Massage can alleviate a wide range of symptoms: pain, nausea, anxiety, depression, anger, stress and fatigue	Evidence is encouraging; warrants further investigations	Methodological quality of the included studies was poor

used, the styles of massage therapy in use, and because massage is provided in many different contexts (Sherman 2008). In addition, little is known about what constitutes 'massage therapy' or the nature of the therapeutic encounter.

Models and mechanisms underlying massage therapy

As highlighted in the research discussed, massage therapy potentially offers promise for some conditions; however, there is still uncertainty about the effectiveness and mechanisms of action of massage therapy. Some of the mechanisms

offered to explain massage therapy effects include: gate control theory of pain reduction, promotion of parasympathetic activity, influence on body chemistry, mechanical effects, promotion of restorative sleep, and interpersonal attention (Field 1998, Imamura et al 2008, Moyer et al 2004, Weerapong et al 2005). However, Weerapong and colleagues reviewed the literature to evaluate the evidence for the possible mechanisms of massage (biomechanical, physiological, neurological and psychological) and concluded that in general, studies were methodologically flawed or results were limited or inconclusive. Moyer et al (2004)

also found that the theories commonly offered to explain massage therapy (gate control theory, parasympathetic response) were the least supported by the meta-analysis they conducted. There was support for the body chemistry, mechanical effects, and the promotion of restorative sleep mechanisms.

Moyer and colleagues further suggest that in addition to the benefits of a massage therapy intervention occurring through physiological mechanisms and the physical nature of the therapy, a psychotherapeutic, common-factors model may be applicable to massage therapy (Moyer et al 2004). Taking this approach, the positive expectations for treatment, therapist factors, the client-therapist alliance, and the interpersonal contact and communication that takes place throughout the treatment session, may be more important to the effects of massage than the purely physical ingredients of treatment (Sharpe et al 2007), i.e., the active ingredient is unknown and may be a result of more than the soft tissue manipulation (Moyer et al 2004). A recent exploration of the valued elements of the massage therapy experience (Smith 2009a, Smith 2009c) has begun the process of describing the psychosocial context of massage therapy treatment, to determine some of the specific ingredients and common factors (e.g., communication, therapist and patient expectations) noted by Moyer and colleagues (2004). These findings inform researchers of the potential active ingredients of a massage therapy intervention, and may allow practitioners to enhance the placebo effects through optimising caregiver-patient interactions (Price et al 2008). The descriptions of the massage therapy encounter and clients' reasons for returning to massage therapy also suggest that massage therapists practise within a distinctive massage therapy culture, which is potentially different from other allied health practitioners (Fellowes et al 2004, Galloway et al 2004, Remington 2002) who provide massage therapy techniques.

AN OPPORTUNITY FOR AN INTEGRATED HEALTH COLLABORATION

Massage therapy as a stand-alone therapy is widely used; its growth is partially attributed to consumer demand and an increase in awareness. New Zealanders are using massage therapy for the purposes of musculoskeletal condition management and prevention, stress and relaxation, and wellness (Smith, 2009b). It is used as a treat and as a treatment. However, legitimisation is still an issue for some therapists; the unfortunate association of massage therapy with the sex industry is still influencing the credibility of massage therapy in New Zealand. There have been significant developments in formalised massage therapy training in New Zealand, but formal registration or self-regulation through

organisations such as MNZ is far from complete. In addition, research infrastructures are beginning to develop internationally (e.g., Massage Therapy Foundation sponsored case report competitions, massage specific research conferences and journals) and within New Zealand (i.e., the New Zealand Massage Therapy Research Centre at SIT), and interest and productivity in research by the massage community is growing (Moyer et al 2009). The evidence for massage therapy practice is getting stronger in some areas; however, the potential value of massage as a treatment will not be known until methodological weaknesses are addressed, and the context of treatment is sufficiently defined to enable concrete discussions and review (Grant et al 2008, Moyer et al 2009).

Whilst some physiotherapists still utilise a number of massage therapy techniques as part of their physiotherapy practice, the potential for stronger interprofessional collaboration with massage therapists exists. Some networking between massage therapists and physiotherapists is occurring for the benefit of patients. Physiotherapists choosing to adopt the integration approach (incorporating a holistic approach to health) to better position and strengthen the future for physiotherapy (Nicholls and Larmer 2005) may look to include a massage therapist into their practice ('in house' or 'outsourced').

Clients using CAM-related massage therapy value the holistic nature of the intervention, the person-centered approach taken by massage therapists, and the environmental aspects of the therapy encounter; outcomes are important to clients but so is a positive experience. The quality of massage therapy providers varies; establish the credentials of the massage therapist with whom you wish to collaborate. Useful strategies include: word of mouth, MNZ membership (relaxation therapist or remedial therapist), or qualification and qualification provider.

Key Points

- Massage therapy as a health care service, distinct from physiotherapy, is growing in popularity.
- The philosophy of massage therapy care is holistic in nature and differs from the 'body-as-machine' approach within contemporary physiotherapy practice.
- Specific massage therapy education ranges from none to Bachelor's degree level, and the practice of massage therapy is unregulated.
- Quality assurance is supported through MNZ membership or higher level qualifications – ask for the credentials of a massage therapist.
- Massage therapy research is in its infancy – but the evidence of the effectiveness of massage therapy for certain conditions is growing.
- Networking between massage therapists and physiotherapists is occurring and the potential for interprofessional collaboration is promising.

ACKNOWLEDGEMENTS

A University of Otago Postgraduate Scholarship and a University of Otago Postgraduate Publishing Bursary supported Dr Smith's research.

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Reliability of hand-held dynamometric strength testing in people with diabetes/chronic conditions

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ABSTRACT

We evaluated the intra- and intertester reliability of a newly-designed hand-held dynamometer (HHD) testing muscle strength on subjects with diabetes/chronic diseases. Thirteen adults (aged 67.15 ± 6.11 years) with diabetes/chronic conditions participating in a community exercise programme took part in the study. One registered physiotherapist and two physiotherapy students measured the maximal isometric strength of the knee extensors and elbow flexors. The registered physiotherapist retested the measurements during a second session. Intraclass correlation coefficient (ICC) and standard error of measurement (SEM) were calculated to investigate the agreement between testers and between test-retest sessions. The 95% smallest real difference (SRD_{95}) was quantified for the test-retest data. $ICC_{3,1}$ (95% CI) for test-retest agreement was 0.98 (0.95-0.99) for the knee extensors and 0.94 (0.77-0.98) for the elbow flexors. $ICC_{2,1}$ for inter-tester agreement was 0.95 for knee extensors, and 0.83 (0.56-0.94) for elbow flexors. The SEM for re-tests for knee extensors was 1.45kg and for elbow flexors 2.17 kg. SRD_{95} was 4.03kg for knee extensors and 2.85kg and for elbow flexors. The HHD demonstrates "high" to "very high" intra- and intertester reliability in people with diabetes/chronic conditions. This study provides guidelines for minimum reliable differences for muscle strength of clients with chronic conditions. **Sole G, Wright L, Wassinger C, Higgs C, Hansson M, Johansson S, Todd N (2010): Reliability of hand-held dynamometric strength testing in people with diabetes/chronic conditions. *New Zealand Journal of Physiotherapy* 38(2): 52-55.**

Keywords: dynamometry, reliability, diabetes mellitus

INTRODUCTION

Regular exercise is part of the management of many patients with type 2 diabetes mellitus (Derouich and Boutayeb 2002, Gill and Cooper 2008, Gordon et al Fraser 2009, Roumen et al 2009) often presented in the community setting as exercise classes. The pre-participation examination may include assessment of muscle strength with hand-held dynamometry (HHD) (Kolber et al 2007). These devices are portable, relatively inexpensive, and easy to use (Bohannon 1997, Knols et al 2009, Lu et al 2007, O'Shea et al 2007). The reliability of HHD has been evaluated in various populations, including healthy, young and elderly adults (Bohannon 1997) adults with neuropathic weakness (Kilmer et al 1997), and adults with chronic obstructive pulmonary disease (O'Shea et al 2007). However, to our knowledge, reliability of HHD has not yet been studied in a community setting in people with diabetes. Different clinicians, including health professional students, may be involved in the assessment of clients with chronic conditions wishing to attend community-based exercise programmes, thus, the inter-tester reliability for HHDs needs to be established. As

clients are re-assessed, the intra-tester reliability needs to be determined to establish the minimal value needed to be beyond measurement error. Therefore, the aim of this study was to determine intra- and inter-tester reliability of HHD when measuring isometric muscle strength of people with diabetes/chronic conditions.

METHODS

Participants were recruited from the Diabetes Community Exercise Programme, Dunedin, New Zealand, and inclusion criteria were passing the programme's pre-participation examination, conducted by a registered physiotherapist (CH) and a registered nurse (NT), and completion of a 12-week basic exercise programme. Participants gave written informed consent after information about the study was provided, in accordance with ethics approval granted by the Lower South Regional Ethics Committee, New Zealand. Participants were familiarised with the procedures at least one week prior to data collection. Exclusion criterion was reported pain during active movement of knee and/or elbow or during the familiarisation session.

Maximum isometric knee extensors and elbow flexors strength was assessed during the one-hour exercise class as a “station” in the circuit training offered as part of the programme. One male registered physiotherapist (CH) and two female final year physiotherapy students (MH, SJ) performed the measurements (inter-tester reliability), according to participants’ availability. The order of testers for the inter-tester measurements was randomised. To determine intra-tester reliability, the registered physiotherapist performed a retest on each participant for the knee extensors and elbow flexors a few days after the first assessment.

A novel HHD (Industrial Research Limited, Christchurch, New Zealand) was used that measures muscle force and joint range of motion simultaneously (Figure 1). Excellent instrument reliability has been documented for this dynamometer when compared to an isokinetic dynamometer (Janssen and Le-Ngoc 2009). For the knee extensor assessment, participants were seated on a high chair with back support, arms crossed over chest and the pelvis stabilised with a seat belt. The dynamometer was placed on the anterior tibia, 10 cm proximal to the medial malleolus, with a soft towel between the force pad and the leg. Using the unique angle warning function on the device, the knee was placed in 60° flexion prior to each contraction. For the measurement of elbow flexors, participants were seated on a regular chair, with the upper arm along the body, the elbow joint in 90° and forearm supinated.

Figure 1: Hand-held dynamometer*



*Industrial Research Limited, Christchurch, New Zealand, www.iril.cri.nz

Only the non-dominant side was tested. All testers performed two measurements each on the participant. The participants were encouraged to “press” or “push” as hard as they could for 3-5 seconds. A 10 second rest period was given between contractions and a 1-minute rest between each new tester. The two trials performed by each tester were averaged and used for statistical analysis.

Data analysis

Sample size was calculated using the method described by Walter et al (1998). For an expected Intraclass Correlation Coefficient (ICC) between 0.6 – 0.9, a minimum of 12 participants were required for intra-tester reliability (two observations), and a minimum of 8 participants for the inter-tester reliability (three observations).

To determine whether there were learning or fatigue effects of the participant for the inter-tester reliability, Analysis of Variance (ANOVA) tests were conducted for the three trials, irrespective of the tester. ANOVAs were also performed to determine whether significant differences existed between the findings of the three testers. Paired t-tests were used to determine whether significant differences were evident for the test-retest sessions. The level of significance was set at $P < 0.05$.

Intraclass Correlation Coefficients ($ICC_{2,1}$) for inter-tester reliability and $ICC_{3,1}$ for intra-tester reliability were calculated to determine relative reliability. The ICCs were classified as follows: 0.50 to 0.69 as “moderate”; 0.70 to 0.89 as “high” and values above 0.90 as “very high” (Munro and Visintainer 2005). Absolute reliability was determined with the standard error of measurement (SEM) and smallest real difference (SRD). SEM was calculated with the formula $SEM = SD \sqrt{1 - ICC}$ where the SD represents the mean SD of all measurements. The SEM was also expressed as a percentage of the mean (SEM%). In order to determine the minimal value needed to be 95% confident a real change had occurred on an individual patient level, SRD_{95} (computed with the formula $SRD = 1.96 \times SEM \times \sqrt{2}$) (Flansbjerg et al 2005), was calculated for the test-retest sessions. Statistical analysis was performed using SPSS 14.0 (Norusis/SPSS Inc Chicago, Illinois, USA).

RESULTS

Thirteen participants (six men, seven women, mean age 67.15 ± 6.11 years) met the inclusion criteria and volunteered for the study (Table 1). Of the thirteen available for testing of elbow flexors, eleven were available for inter-tester assessment. Eleven participants had a medical history of diabetes and two had other chronic diseases. Six of thirteen participants reported a history of knee, back, or arm operation. One participant experienced knee pain and a further participant shoulder pain following the first session, and were excluded for the assessment of these segments.

Table 1: Characteristics of participants*

	Men (n=8)	Women (n=7)	All (n=13)
Age (years)	68.17 (4.49)	66.29 (7.48)	67.15 (6.11)
Weight (kg)	93.97 (23.91)	84.35 (16.14)†	89.16 (20.09)*
Height (m)	1.70 (0.13)	1.62 (0.09)	1.65 (0.11)
BMI(kg/m ²)	32.75 (7.50)	28.34 (13.4)†	30.37 (10.93)*

* Data are mean (SD)

† One participant was unwilling to report weight.

Table 2: Muscle strength of knee extensors and elbow flexors assessed by three testers and statistical analysis of inter-tester reliability

	Tester 1 Mean (SD)	Tester 2 Mean (SD)	Tester 3 Mean (SD)	P *	ICC _{2,1} (95% CI)	SEM (kg)	SEM%†
Knee extensors (n = 11)	25.32 (11.13) kg	23.00 (10.41) kg	27.13 (10.11)	0.56	0.95 (0.86 – 0.99)	2.32 kg	9.15%
Elbow flexors (n = 13)	15.28 (6.58) kg	13.24 (4.49) kg	19.16 (0.64)	0.07	0.83 (0.56-0.94)	3.11 kg	20.34%

* Analysis of Variance (ANOVA); SD = standard deviation; ICC = intraclass correlation coefficient; SEM = standard error of measurement; †SEM% = SEM as percentage of grand mean

Table 3: Muscle strength assessed by one tester and statistical analysis of intra-tester reliability of knee extensors and elbow flexors

	Test 1 Mean (SD)	Test 2 Mean (SD)	P *	ICC _{3,1} (95% CI)	SEM (kg)	SEM%†	SRD ₉₅ (kg)
Knee extensors (n = 12)	27.13 (10.11)	26.00 (10.28)	0.161	0.98 (0.95 – 0.99)	1.45 kg	5.59	4.03 kg
Elbow flexors (n = 11)	19.16 (0.64)	21.45 (8.86)	0.177	0.94 (0.77 – 0.98)	2.17 kg	10.11	6.01 kg

* Paired t-tests; SD = standard deviation; ICC = intraclass correlation coefficient; SEM = standard error of measurement; †SEM% = SEM as percentage of grand mean; SRD₉₅ = smallest reliable difference at 95% confidence level

No statistically significant differences were found when comparing the means of the three consecutive trials, irrespective of the tester, for elbow flexor ($P = 0.441$) and knee extensor strength ($P = 0.887$) during the first sessions. Further, no statistically significant differences were found when comparing the findings of the three testers (Table 2). Similarly, no significant differences were found for the means of the test-retest session (Table 3).

Means (and 95% CI) of the strength measurements and their analyses of inter- and intra-tester reliability are depicted in Tables 2 and 3. Corresponding ICC values for inter-tester agreement were 0.97 and 0.87 for knee extensors and elbow flexors, respectively (Table 2). ICCs for intra-tester agreement were 0.97 and 0.95 for knee extensors and elbow flexors respectively (Table 3).

DISCUSSION

Overall our study showed “very high” reliability for strength measures using a HHD in a cohort of patients with chronic diseases. The lowest ICC value (0.87), found for inter-tester assessment of elbow flexors, is categorized as “high”. The SRD₉₅ calculated for the intra-tester reliability indicate that differences of more than 5kg are needed when retesting a patient to be 95% certain that a change beyond measurement error has occurred.

Our study found similar relative reliability for intra- and inter-assessments, in contrast to earlier reports in which intra-tester assessment has generally been considered to be more reliable than inter-tester assessment (Byl et al 1988, Verschuren et al 2008). Further, our results demonstrated higher relative reliability in the stronger muscle group (knee extensors) compared to the weaker muscle group (elbow flexors).

Maximal muscle strength tests are also influenced by motivation, concentration, and co-operation of the patient. In this study the setting of a community exercise class within a gymnasium was chosen to

improve construct validity for these rehabilitation programmes. The order the participants were tested was random for all measurements. The individual tests could thus be performed at any time during the class, which could result in different fatigue levels for the retest sessions. However, the analyses indicated that there was no order effect for the trials, thus fatigue or learning effects were unlikely to have affected the group findings.

Although we found no statistically significant differences for the strength measurements performed by the three testers, observations of individual participant’s measurements indicate slightly higher strength values when assessed by the registered physiotherapist (Tester 2) compared to the physiotherapy students (Table 2). It is possible that tester 3 (male) was able to generate greater force than the student physiotherapists (female). In order to keep the HHD in a fixed position, the tester must be able to apply a force meeting the participant’s strength. Earlier studies have shown that stronger testers perform more reliable measurements (Kato and Yamasaki 2009, Wikholm and Bohannon 1991). However, our study included a weaker patient population (Kilmer et al 1997) and all testers were, in a pre-test, able to get higher values than the highest value documented among the participants. Further, it was observed that the testers may not have used a consistent technique during the assessments. Two methods can be used when measuring isometric muscle strength, the “break-test” and the “make-test” (Burns and Spanier 2005). Both techniques require the tester to apply a resistance force that equals the participants’ strength in order to keep the HHD in a fixed position (Kato and Yamasaki 2009, Lu et al 2007). The “make” technique requires the participant to produce a maximal voluntary contraction (Burns and Spanier 2005, Morris et al 2008). With the “break” technique the tester applies an adequate force which initially “breaks” the participant’s resistance and thereby produces

an eccentric contraction. Both these methods show excellent reliability (ICC >0.90) (Burns and Spanier 2005).

Dealing with clients with diabetes and muscle strength testing requires special attention due to possible sensitivity of the extremities to touch therefore a soft towel was used between force pad and extremity. From the fact that two participants experienced pain after the first session, we conclude that caution must be taken with some patients with previous injuries using this device. In these cases we would recommend using the 'make'-technique to minimize the risk of pain or discomfort following the test.

This study was performed during a community exercise class, and participants were not always available due to other factors such as transport opportunities, ill health, etc. Participants formed a heterogeneous group, and thus the current study does not account for possible differences in reliability for male and female participants, or for previous experience with exercise equipment and muscle strength assessments. Despite the "high" ICC for elbow flexors, the mean differences for the three testers' findings, can be described as marginally significant ($P = 0.07$). The SEM% for this measurement was also slightly higher than the anecdotal clinically acceptable level of 10%, which implies that caution must be taken for individual assessments. Moreover, lack of standardised techniques and external stabilisation may have affected the result.

Results from our study indicate that a novel HHD is a reliable instrument for strength testing groups of people with diabetes/chronic disease. A minimum difference of 5kg is needed when retest individuals by one clinician to be 95% confident that a change beyond measurement error has occurred. To maintain high reliability in the clinical setting it is important to consider the factors that may contribute to source of error. Our results indicate that students and registered clinicians can perform reliable strength assessments using this device after familiarisation sessions when group assessments are sought for patients with diabetes or other chronic conditions.

ADDRESS FOR CORRESPONDENCE

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Conflicts of interest: The authors declare that they have no conflict of interest. The company providing the dynamometer, Industrial Research Limited, Christchurch was not involved in the data collection, analysis or preparation of the manuscript.

Funding: No external funding was received for this study.

Ethical Approval: This study was approved by the Lower South Regional Ethics Committee, Dunedin, New Zealand (LRS/09/07/025).

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This study won the annual ML Roberts prize awarded for the best 4th year undergraduate research project from AUT University in 2009. NZJP publishes the resulting paper without internal peer review.

The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: a systematic review

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ABSTRACT

Kinaesthetic taping is a new therapeutic tool, and has become increasingly popular within the sporting arena. Despite anecdotal support, there is very little evidence, within the literature, to support the use of kinaesthetic taping. A systematic review was conducted to evaluate and critique randomised controlled trials (RCTs) which have examined the therapeutic use of kinaesthetic taping, to assess its treatment efficacy for the treatment of musculoskeletal conditions. An electronic search was undertaken using the databases of Scopus, Cochrane Library, Physiotherapy Evidence Database (PEDro) and the EBSCO Health Database to identify RCTs investigating kinaesthetic tape and its effects on musculoskeletal conditions. Four studies met the inclusion criteria; however, only three studies were critiqued as the fourth was not accessible. Three independent reviewers critiqued and assessed the quality of the studies using the PEDro scale. Two of the three studies exhibited high methodological quality. One study exhibited limited methodological quality. Despite these findings, none of the three articles concluded a clinical significance for the use of kinaesthetic taping. The literature review highlights the need for more high quality RCTs to examine the use of kinaesthetic taping for the treatment of musculoskeletal disorders. **Bassett KT, Lingman SA, Ellis RF (2010): The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: a systematic review. New Zealand Journal of Physiotherapy 38(2): 56-62.**

Keywords: Kinaesthetic tape, kinesio-tape, randomised controlled trials, treatment efficacy, physiotherapy, systematic review

INTRODUCTION

Taping has become a widely used rehabilitation modality for the prevention and treatment of musculoskeletal conditions (Thelen et al 2008). Kinaesthetic tape (KT) is a new therapeutic tool, and has become increasingly popular within the sporting arena. KT was developed in 1996 by Kenzo Kase, with the intention to alleviate pain (Liu et al 2007) and improve healing in soft tissues (Kahanov 2007). The growing popularity of KT can be attributed, in some respects, to anecdotal support for its therapeutic benefit. However the research surrounding KT is still in its infancy and the scientific evidence to support its use and effects is still being established (Thelen et al 2008, Zajt-Kwiatkowska et al 2007).

KT is known by a variety of brand names for example Kinesiotape; Kinesiology Tape, Acu or Aku tape, Kinesio Tex, Kinesio Elastic Tape, Kinesio-Orthopaedic Tape, athletic Tape, elastic tape and Neuroproprioceptive tape. KT is manufactured pre-stretched by 15-25% as it is applied to the backing paper (Kase 2003). It is characterised by the ability to stretch to 120-140% of its original length and, following application, recoil back towards its unstretched length (Fu et al 2007, Halseth et al 2004, Kahanov 2007). KT purportedly mimics the physical qualities of human skin as it is believed to be approximately the same weight and thickness

of the epidermis along with its inherent elastic properties (Kahanov 2007, Murray 2000).

There are many proposed benefits of KT including proprioceptive facilitation (Halseth et al 2004, Jaraczewska and Long 2006, Riemann and Lephart 2002), muscle facilitation (Hammer 2006), reduced muscle fatigue (Canina et al 2008), reduced delayed-onset muscle soreness (Nosaka 1999), pain inhibition (Kahanov 2007, Kneeshaw 2002), enhanced healing such as reducing oedema, improvement of lymphatic drainage and blood flow (Kase and Hashimoto 1998, Kinesio Holding Corporation 2008, Lipinska et al 2007, Yasukawa et al 2006, Zajt-Kwiatkowska et al 2007).

As with many taping mechanisms, enhanced proprioception is a perceived benefit of KT (Murray 2000, Thelen et al 2008). It is proposed that cutaneous mechanoreceptors are stimulated by the stretch upon KT application which conveys information regarding joint movement and position (Riemann and Lephart 2002). A study conducted by Jaraczewska and Long (2006) concluded that KT provides proprioceptive feedback to achieve postural alignment and glenohumeral joint position in patients following stroke.

Muscle facilitation is another hypothesised benefit of KT and is dependent on the application of the tape. It is proposed that applying KT from the muscle origin to insertion will produce a

concentric pull on the fascia, stimulating increased muscle contraction (Hammer 2006). To facilitate an eccentric or diminished contraction, believed to occur from an eccentric pull on underlying fascia, application of KT from insertion to origin is recommended (Hammer 2006).

The application of KT theoretically determines the physiological benefit and desired outcome. For example if muscle is damaged the skin is stretched manually first and KT is applied unstretched (Kinesio Holding Corporation 2008). This type of application will cause the skin to form convolutions which lifts the skin (Kahanov 2007). Theories suggest that these convolutions encourage regeneration of injured tissues (Zajt-Kwiatkowska et al 2007) by increasing the interstitial space and ultimately alleviating interstitial pressures which may occur from swelling and inflammation following injury (Hammer 2006). It is also theorised that lifting the skin detaches filaments which attach the skin to endothelial cells of the lymphatic and capillary beds. This is hypothesised to create channels which allows for lymph to drain thus reducing swelling (Lipinska et al 2007) and allowing an increase in blood flow to the area (Yasukawa et al 2006). Support for an improvement in blood flow via KT came from an unpublished study conducted by Kase and Hashimoto (1998) who found that following KT application, peripheral blood flow, measured via Doppler ultrasound, increased by 20-60% in patients with chronic disorders and poor circulation.

The assumption has also been made that decreasing the interstitial pressure also decompresses subcutaneous nociceptors leading to decreased pain (Kahanov 2007). Another theory suggests that the tension KT stimulates afferent mechanoreceptor output to the central nervous system which may dampen down nociceptive input (i.e. gate control theory of pain) (Kneeshaw 2002).

Despite these claimed benefits from KT there is no substantial evidence to support them. Furthermore, the theoretical process outlining the mechanism as to how KT achieves these benefits has not been verified. At this time without specific scientific analysis, the perceived physiological benefits of KT are hypothetical (Gonzalez-Iglesias et al 2009, Thelen et al 2008).

As there is a lack of research to validate the underlying physiological effect of KT, so too is there a lack of evidence to substantiate anecdotal support for the therapeutic efficacy of KT. Therefore, the purpose of this systematic review was to identify, evaluate and critique the available randomised controlled trials which have examined the treatment efficacy of KT for use in musculoskeletal conditions.

METHODS

Literature Search Strategy

A search was conducted in September 2009 to identify clinical trials which examined the use and treatment efficacy of KT in musculoskeletal disorders. The electronic databases of Scopus, Cochrane Library, Physiotherapy Evidence Database and EBSCO Health Database were searched to locate the studies that were relevant to this review. Keywords (including truncations of relevant brand names) used to search each of the databases are as follows: kinesio* OR kinaes* OR kines*; athletic; tape OR taping; strap*; acu OR aku; tex*; physiotherap* OR physical therap* OR physio*. The reference lists of the selected articles were also searched to find other relevant articles not found during the original database search. There was no limitation in publishing dates apart from those applied by the individual databases (i.e. date of publication, language etc).

Study Selection

Articles were included if they were randomised controlled trials (RCTs) and quasi-experimental design studies which focused on the use of KT in the treatment of musculoskeletal conditions. Articles were excluded if they used non-clinical populations (i.e. healthy populations), non-English articles, traditional taping alone, university theses or conference proceedings.

Methodological Assessment

Three reviewers assessed the quality of the selected articles independently using the 11-item PEDro scale, which was developed by The Centre of Evidence-Based Physiotherapy (CEPB) (Table 1). The PEDro Scale is a checklist of yes/no questions used to examine particular aspects research methodology, including key aspects of internal validity (Hubbard et al 2004).

Studies have also found the inter-rater reliability of the PEDro Scale to be of an appropriate standard whilst assessing RCTs (Maher et al 2003, Tooth et al 2005) and when compared with the Jadad score, the PEDro Scale is more comprehensive in assessing methodological quality (Bhagal et al 2005). The PEDro Scale scoring system operates by allocating one point for every answer of "yes" and zero points are allocated for "no". The external validity of the articles is represented by criterion one of the PEDro Scale and is not included within the final quality score thus the quality of an article is scored out of ten.

Internal validity is a reflection of a study's methodological quality. Within the PEDro Scale, seven of the eleven items address internal validity. Methodological quality of an RCT is paramount as studies of low quality may exaggerate treatment efficacy of an intervention and therefore produce

“At this time without specific scientific analysis, the perceived physiological benefits of KT are hypothetical”

Table 1: PEDro Scale (Modified from Maher et al 2003)

Criteria	Score	
	Yes (1)	No (0)
1. Eligibility criteria were specified		
2. Subjects were randomly allocated to interventions (in a cross over study, subjects were randomly allocated an order in which treatments were received)		
3. Allocation was concealed		
4. The intervention groups were similar at baseline regarding the important prognostic indicators		
5 there was blinding of all subjects		
6. there was blinding of all therapists who administered the therapy		
7. there was blinding of all assessors who measured at least one key outcome		
8. measures of at least one key outcome were obtained from more than 85% of the subjects initially allocated to groups		
9. all subjects for whom outcome measures were available received the treatment of control condition as allocated or, where this was not the case, data for at least one key outcome was analysed by "intention to treat"		
10. the results of between-intervention group statistical comparisons are reported for at least one key outcome		
11. the study provides both point measures of variability for at least one key outcome		
TOTAL		

a biased result (Maher et al 2003). The internal validity of each study is assessed more selectively in this review by using an internal validity score (IVS), as used in other systematic reviews (Ellis and Hing 2008; Reid and Rivett 2005; van Tulder et al 1997). For this study the items 2, 3, 5, 6, 7, 8 and 9 of the PEDro Scale were selected to total the IVS as they are representative of internal validity (Ellis and Hing 2008). A point for each item is allocated, provided the study has fulfilled the criteria and contributes toward the final 7-item IVS (Ellis and Hing 2008; Reid and Rivett 2005). Studies with a final IVS of 6-7 are considered to have high methodological quality, an IVS of 4-5 are considered to have moderate methodological quality and an IVS of 0-3 represents a study of limited methodological quality (Ellis and Hing, 2008).

Any discrepancies in the rating between the three reviewers were resolved with discussion and reassessment of the scale criteria. If left unresolved a fourth reviewer was available, however this was not necessary as agreement was reached.

RESULTS

Selection of studies

A total of 321 articles were found using the outlined databases and search strategy. Of this total only four studies fulfilled the inclusion and

exclusion criteria. However one of these studies (Akinbo and Ojetunde 2007) was not accessible through international libraries, inter-loan facilities or online databases. As a result, this study was not included in the literature review leaving only three articles available for critique.

Methodological Quality

The methodological quality for each article is provided in Table 2. The studies conducted by Thelen et al (2008) and Gonzalez-Iglesias et al (2009) were given an IVS of six out of seven indicating high methodological quality. The remaining article conducted by Hsu et al (2008) was allocated an IVS of two out of seven indicating limited methodological quality.

Table 2: PEDro and IVS Rating for each Study

	Thelen et al (2008)	Hsu et al (2008)	Gonzalez-Iglesias et al (2009)
1*	1	1	1
(2)	1	1	1
(3)	1	0	1
4	1	1	1
(5)	1	0	1
(6)	0	0	0
(7)	1	0	1
(8)	1	0	1
(9)	1	1	1
10	1	1	1
11	1	1	1
PEDro rating	9/10	5/10	9/10
Final IVS	6/7 High	2/7 Limited	6/7 High

Notes: (n) criteria used to obtain an IVS, * Criteria excluded from the PEDro rating

A common feature amongst all three studies was the fulfilment of items 2 and 9 of the PEDro Scale indicating that participants were randomly allocated to their groups and intention-to-treat analysis was performed in at least one outcome measure. All three studies however failed to fulfil item six of the PEDro Scale highlighting that the therapists who administered the taping were not blinded to group allocation. Hsu et al (2008) failed to satisfy any further IVS items which resulted in a final IVS of two out of seven. Studies conducted by Thelen et al (2008) and Gonzalez-Iglesias et al (2009) fulfilled the remainder of the IVS items (3, 5, 7, 8) to obtain a final IVS rating of six out of seven.

Study characteristics

Table 3 provides a summary of the study characteristics for each of the RCT's included in this

Table 3: Study Characteristics

Author	Purpose of trial	Subject demographics	Intervention group (IG)	Control group (CG)	Outcome	Results
Thelen et al (2008)	To compare the short-term effects of a therapeutic KT application on reducing pain and disability in subjects with shoulder pain (rotator cuff tendinitis/impingement) as compared to sham KT application	College students with rotator cuff tendinitis or positive impingement tests and c/o difficulty in ADL n= 42 Mean age: 20years Mean duration of symptoms: 15 days Mean pain (VAS scale 100mm): IG: 44.1 CG: 43.9	N= 21 Standard therapeutic KT application using KT protocol for rotator cuff tendinitis/impingement - 5 strips of tape with 50-75% stretch applied Tape worn for 48-72 hours and subject returned 12-24 hours after removing the tape 3 day follow up for reassessment and reapplication of tape 6 day reassessment of outcome measures	N=21 Standardized neutral KT application - 2 strips of tape with no stretch Tape worn for 48-72 hours and subject returned 12-24 hours after removing the tape 3 day follow up for reassessment and reapplication of tape 6 day reassessment of outcome measures	Outcomes were measured at baseline, immediately after taping, 3 days and 6 days post-treatment 1) Shoulder Pain and Disability Index (SPADI) 2) Pain-free active ROM 3) 100mm VAS to assess pain intensity at endpoint of pain-free active ROM	No meaningful differences existed between groups at baseline. CG showed no immediate change in any outcome measures IG Day 1 pain free ROM showed improvement P=.005 Mean difference of 19.1° (99% CI) Both IG & CG showed main effect for change over time (P<.001) with significant change in all measures by day 6
Hsu et al (2008)	To investigate the effects of elastic taping on the scapular kinematics, muscle strength and electromyographic activity in baseball players with shoulder impingement problems	N=17 Amateur baseball players with positive shoulder impingement signs in two or more tests and one subacromial impingement test Mean age: 23+-2.8yrs Mean duration of symptoms: 2 months Mean pain (VAS scale 0-8): 3	N=17 Subjects asked initially to flex/ elevate into scaption 3 times @ 8secs per movement with 2kg weight, 3min rest then hold weight at 125° for 5 secs 3 times, then 3 maximal contractions, 3min rest Subjects then taped on lower trapezius muscle using KT with minimal tension	N= 7 subjects asked initially to flex/ elevate into scaption 3 times @ 8secs per movement with 2kg weight, 3min rest then hold weight at 125° for 5 secs 3 times, then 3 maximal contractions, 3min rest Subjects then taped on lower trapezius muscle using sham tape with no stretch	Outcomes were measured pre- and post-treatment 1) Muscle strength using hand-held dynamometer 2) Serratus anterior, lower and upper trapezius, EMG using 8-channel FM/FM 3) Scapular Telemetric EMG system displacement, scapular orientation & humeral elevation angle using 3D kinematic data with Liberty electromagnetic tracking system	No significant difference at baseline for all outcome variables Significant difference between groups found in scapular posterior tilt at 30° to 60° of humeral elevation/scaption (p<0.05) CG increased upper trapezius muscle activity in 90° to 120° shoulder elevation (p<0.05) IG increased lower trapezius activity when lowering during 60° to 30° (p<0.05) Strength of lower trapezius increased after KT application (P=0.05)
Gonzalez-Iglesias et al (2009)	Determine the short-term effects of KT on neck pain and cervical range of motion in individuals with acute whiplash-associated disorders (WADs).	N= 41 Patients reporting neck pain as a result of a motor vehicle accident within 40 days of the injury Mean age: 33 +-7 yrs Mean duration of symptoms: 24+- 8 days Mean pain: 4.3 +- 0.9	N=21 Standardized therapeutic Kinesio Tape application a) Y-strip placed over posterior cervical extensor muscles applied from insertion (T1-T2) to origin (C1-C2) with off-paper tension on either side of neck b) Applied in a position of cervical contralateral side-bending and rotation c) Overlying strip placed over C3-C6 with the cervical spine in flexion to apply tension to the posterior neck	N=20 Placebo Kinesio Tape application a) I-strip applied with no tension b) Applied over the spinous processes of the cervical & thoracic spine c) Applied in a neutral cervical spine position d) Overlying strip placed over the mid-cervical region with no tension	Outcomes were measured at baseline, immediately following taping and 24hours post-treatment 1) Level of neck pain using the Numerical Pain Rating Scale (NPRS) 2) Cervical range of motion using CROM device	Statistical significance in group by time in KT reducing neck pain immediately post application & 24 hrs post (p<.001) Statistical significance for all directions of cervical ROM in KT group (p<.001) Experimental group improved cervical ROM vs. control group (p<.001) Minimal clinical difference not reached

Note: KT= Kinesiotape; N= Number; EMG= Electromyography; c/o= complaining of; kg= kilogram; VAS= Visual Analogue Scale; ADL= Activities of daily living; CG = Control group; IG = Intervention group

review. All three studies addressed the short term effects of kinaesthetic taping on a range of outcome measures such as pain relief, muscle strength, muscular activity and range of motion. The focus on the short term effects of KT was a similarity between all three studies critiqued within the literature review. In addition all three studies had similar treatment and control groups consisting of a standardised KT application and a sham tape application.

DISCUSSION

All three of the studies that were examined in this review were heterogeneous, in terms of participant population, outcome variables assessed and methods of KT application. This makes direct quantitative comparison of the therapeutic efficacy of KT difficult. The studies conducted by Hsu et al (2008) and Thelen et al (2008) both focus on the effects of KT on shoulder impingement. Hsu et al (2008) focused on the efficacy of KT on muscle performance and scapular kinematics of the shoulder whereas Thelen et al (2008) focused on the efficacy of KT on the relief of shoulder pain.

Gonzalez-Iglesias et al (2009) and Thelen et al (2008) both measured the effect KT has on pain relief in the neck and the shoulder respectively. Gonzalez-Iglesias et al (2009) also investigated the use of KT in altering cervical range of motion. Although both studies addressed potential pain relief from the use of KT, different anatomical regions were examined and therefore are not comparable.

The findings of these studies support the short term use of KT in assisting with immediate pain relief, which may persist for an estimated 24 hour period post-treatment ($p < 0.01$) (Gonzalez-Iglesias et al 2009). Thelen et al (2008) found a statistically significant difference in pain relief at day one following the removal of KT in participants with shoulder impingement or rotator cuff tendonitis ($p = 0.05$). However by day three the difference no longer existed. This suggests that KT is effective when applied and persists for a short period post-application (Thelen et al 2008). The use of KT also increased cervical range of motion in patients with whip lash disorder ($p < 0.01$) (Gonzalez-Iglesias et al 2009) and improved muscle activity and scapular kinematics in participants with shoulder impingement ($p < 0.05$) (Hsu et al 2008).

Although the results of all three studies were statistically significant, indicating therapeutic benefit, the clinical significance of the intervention was not established. Questions must therefore be raised as to whether the results of these studies, in support of the use of KT, suggests a level of efficacy to change clinical practice for patients presenting with symptoms of pain, decreased ROM, muscle activity and muscular kinematics of the neck and shoulder.

The results of the review found that two of the studies (Gonzalez-Iglesias et al 2009, Thelen et al 2008) were robust demonstrating high methodological quality and one of the studies (Hsu et al 2008) demonstrated limited methodological quality. The studies conducted by Gonzalez-Iglesias et al (2009) and Thelen et al (2008) fulfilled six of the seven items of the IVS. However both studies failed to control for the blinding of therapists who administered the treatment in both the control and intervention groups. A different taping technique was used between groups therefore the practitioner who administered the taping was aware of what group each of the participants belonged to.

The remaining study, conducted by Hsu et al (2008) demonstrated limited methodological quality with an IVS of two out of seven. The study only fulfilled items 2 (random allocation) and 9 (inclusion of 'intention to treat' analysis). The study failed to address the remaining criteria, namely, all forms of blinding (therapist, assessor and subject), obtaining outcome measures from at least 85% of participants and concealment of allocation. As a consequence, the methodological quality of this study was limited and therefore the results must be questioned. The study also failed to include the initial participant numbers. In addition there were drop outs due to unexpected injury. This was not apparent within the results and was only mentioned within the discussion of the study. Failure to be clear on these two details compromises the reliability of the results obtained from the study.

The blinding of therapists who administered the KT application was a key methodological deficit amongst all three studies. Devising a mechanism to blind therapists to participant group allocation is difficult. This is because the nature of KT application is dependant largely on the desired effect. To achieve a specific action, for example muscle force or pain relief, the therapist must know what method of KT application is required to facilitate the effect.

“the accumulation of anecdotal evidence has prevailed over a lack of substantial scientific evidence”

Currently the research surrounding KT is limited. However, the widespread use of KT amongst athletes internationally has contributed to

its extensive popularity within the sporting arena. Despite a lack of establishing the clinical significance to support KT, as demonstrated by all three studies, the accumulation of anecdotal evidence has prevailed over a lack of substantial scientific evidence.

Areas for future research can be identified through the gaps found in the current research. All three articles failed to produce adequate power within their studies as a result of small sample sizes. Recruitment of sufficient participant numbers is paramount to rule out the null hypothesis or reveal the effect of an independent variable,

particularly when intending to highlight clinical and statistical significance. Another commonality of all three studies was the focus on short term effects of KT only. Further research to determine the long term effects of KT may be worthwhile to assist with rehabilitation of musculoskeletal conditions.

Recruitment of a more generalised population is another recommendation for further research as the studies included within the review used young active participants or samples of convenience. Therefore the results of current research cannot be generalised to other populations who may also benefit from kinaesthetic taping.

The use of KT with active exercise is another area that has not been addressed in the studies as the articles did not consider active intervention with KT application. Kase and Wallis (2002) suggest that KT is more effective when coupled with physical activity therefore the true benefits of KT may be more pronounced with adequate exercise. This is yet to be proven.

The lack of a true control group was another limitation amongst all three studies. Although all studies used a sham tape group it is unclear if the pure application of tape alone caused participants to report a therapeutic effect, especially in regards to a subjective outcome measure such as pain. Incorporating a true control group would be useful to eliminate a placebo effect.

The use of non steroidal anti-inflammatory drugs (NSAIDs) may have been a confounding factor for improving pain levels for participants within the two studies of high methodological quality. In the study conducted by Gonzalez-Iglesias et al (2009) participants were instructed to withdraw the use of analgesics 72 hours prior to testing. It is unclear if this time period was sufficient to eliminate the effects of NSAIDs on pain levels (Gonzalez-Iglesias et al 2009). Thelen et al (2008) allowed participants to continue using analgesia throughout the study. Therefore it is unclear if analgesics contributed to the improvement in pain within the two studies. Many common non-steroidal anti-inflammatory drugs are reported to have a maximum half life of 100 hours (Walker and Edwards 2003). Therefore, a wash out phase of 4 to 5 days may be a more acceptable time period to consider in future research.

A total of four RCTs fulfilled the inclusion criteria for this systematic review. Unfortunately one of these RCTs was unable to be included due to its unavailability. Due to the small number of RCTs fulfilling the inclusion criteria, the results of this particular study may have influenced the final results of the review, therefore potentially limiting the scope of this review.

It should be noted that, although 321 studies were found using the search strategy, fifty four of the studies were KT specific. This is because 'tape' and 'taping' were used as keywords and produced a large number of articles unrelated to KT. Of the fifty four articles, ten were conference proceedings

indicating that scientific exploration of KT is actively being pursued. However these were excluded from the review in accordance with the exclusion criteria.

Including the studies conducted by Kenzo Kase, the creator of KT, would have been beneficial for the review. However the use of non-English studies was an exclusion criterion. Therefore the pioneering evidence surrounding KT, which was published in Japanese, was not critiqued. To date we are unaware of any publications or systematic reviews, published in English, which have analysed the quality of the Kase articles, or other KT studies, thus the methodological quality of this evidence is uncertain.

CONCLUSION

KT is therapeutic tool used with increasing frequency within musculoskeletal rehabilitation. The anecdotal benefits of KT are based on proposed theories which are yet to be validated with adequate evidence. The current systematic review has identified three accessible RCTs to evaluate and analyse the use and treatment efficacy of KT for musculoskeletal conditions. Despite two of the studies demonstrating high methodological quality, the lack of demonstration of clinical significance of the results highlights the need for more research. At present there is no substantial evidence to support the use and treatment efficacy of KT within a clinical musculoskeletal population.

Future research requires an adequate and generalised sample size and sample population, investigation surrounding the potential long term benefits of KT, control for the use of NSAIDs, incorporation of a true control group and integration of activity with KT application.

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Keynote Speakers

Physical Therapists as Leaders in the 21st Century: Exploiting the Magic Bullet – Non Invasive Interventions

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This address is an urgent appeal to physical therapists in New Zealand regarding their capacity to lead in the assault on lifestyle conditions and to serve as a model for other countries in the pursuit of national and global health. Lifestyle conditions are the leading causes of premature death in Australasia including New Zealand and increasingly in middle- and low-income countries, and are associated with enormous, well-documented social and economic burdens. Non invasive interventions consistent with physical therapy that exploit non drug and non surgical approaches are unequivocally the interventions of choice given their generally superior outcomes with respect to prevention, 'reversal' in some cases, as well as management. Through a coordinated integrated program for evidence-informed professional change engaging the clinical community, educators, researchers and other stakeholders (public policy makers and politicians), the profession can position itself to impact national and world health. Strategies for physical therapists impacting national and global health, individually and collectively, are described. In the words of the famed anthropologist, Margaret Mead, 'A small group of people can change the world. Indeed, it is the only thing that ever has.'

Practice based evidence: The source of innovation

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Rising to the challenge of the evidence-based environment has been a difficult task for a number of alternative or complementary healing practices including traditional Māori healing. Research to determine the efficacy of specific components within an intervention is generally considered inappropriate on either cultural or philosophical grounds and this presents a significant barrier to the integration of these services into the health system. One approach to this issue is to focus on the outcome of the entire intervention rather than the efficacy of particular techniques and this has been the basis of a current research project 'Ng Tohu o te Ora: Traditional M ori Wellness Outcome Measures'. Traditional M ori healers are engaging in research to gather evidence to support the practices and services they offer. At the same time they are also developing networks that shift the nature of their professional practice from that of individual practitioners to a collective body. This provides a window to observe the emergence of a profession and the opportunity to contrast the characteristics of research and practice in this area with those of more established professions like physiotherapy. This paper will explore the role of research and innovation in an evidence based environment and the implications for practice, the setting of professional standards, and interdisciplinary knowledge transfer.

Tackling low back pain: an integrated approach

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Evidence-informed approaches to back pain emphasise a biopsychosocial approach, and the importance of work and activity as key health outcomes. A fundamental aspect to improving outcomes is to address these simultaneously with symptom management, rather than sequentially. This is the defining feature of 'work-focused healthcare'. It is now possible to outline how common musculoskeletal problems such as back pain can be managed effectively. Broadly, clinicians need to

provide three things: an understanding of the problem; symptom management; and, ways to maintain activity and work. Each of these presents specific nuances and clinical challenges to maximise effectiveness. However, this can be described in detail. This overall model fits well with an approach to identifying factors that facilitate recovery, and obstacles that need addressing so they do not delay recovery. The flags framework was devised for this purpose. It focuses on the person, their workplace, and the context in which the person functions. However, simply identifying obstacles is necessary but not sufficient. There needs to be a plan with specific actions on how these are addressed. The easily remembered summary phrase is 'identify obstacles, develop a plan, then take action'. The stepped-care delivery model is gaining prominence in a cost-conscious environment with increasing need to justify resource use, by focusing on the delivery of only 'what's needed when it's needed'. There is an important role for physiotherapists in the effective management of back pain, by adopting a solution-focused approach. This challenge represents an opportunity for the profession.

Getting pain to get over it

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In persistent pain problems, pain relief is considered too lofty a goal and management focuses, often exclusively, on teaching people how to cope with pain, how to manage their pain and how to increase their activity and functional levels despite their pain. Learning to do this clearly improves lives. However, I contend that it is not the whole story. In this lecture, I will argue that what is now known about the biological mechanisms by which the brain produces pain strongly suggests that pain relief is a viable target for treatment. The guiding principles for this position are: nociception is neither sufficient nor necessary for pain; pain emerges into consciousness according to the brain's evaluation of threat to body tissue; as pain persists, the pain system becomes facilitated and other systems start to dysfunction, ultimately contributing to pain; contributions to the perception of threat can be corrected, the facilitated pain system can be dampened and retrained, and the various secondary dysfunctions can be normalised. Importantly, these principles not only provide a strong supporting rationale for pain management approaches, but they extend those approaches by arguing that pain will slowly decrease as training persists. Moreover, the principles relate to human biology, which makes them as relevant to acute injury as they are to chronic debilitating pain. Remarkably, uptake of these principles among proponents of pain management is not common and conveying these principles to patients less so. Evidence shows that reconceptualising how pain is produced by the human brain improves participation, improves pain and disability and improves response to interdisciplinary rehabilitation. I will propose that, on the basis of these documented effects, if we get pain, and we get our patients to get pain, then getting over pain, is as appropriate a long-term goal as coping with pain is a short-term one.

Invited speakers

Independence and quality of life: revisiting core assumptions in physiotherapy and rehabilitation

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This presentation critically examines key assumptions embedded in physiotherapy practice in order to advance current debates and suggest areas for further inquiry. Recent advances in health care treatment and technologies have resulted in the emergence of new populations of clients with complex rehabilitation needs and often uncertain futures. Prevailing approaches to rehabilitation are rooted in Western notions of the independent, autonomous

individual that constrain professionals' abilities to help clients live well with difference, disability or uncertainty and may contribute to their marginalization. In physiotherapy research and practice, quality of life is pervasively equated with physical function and degree of independence. However research shows a lack of correlation between person's perceptions of well being and their functional abilities. Through research and case study examples, a critical social science approach is used to discuss how prevailing understandings of 'independence' and 'quality of life' increasingly limit the abilities of physiotherapists and other rehabilitation professionals to adequately address clients' needs. Critical approaches can be used to reconsider dependency, focusing on connectivities and living well in the present. The implications for a re-imagined physiotherapy will be discussed including how changes to assumptions about independence and quality of life can contribute to broader social changes that improve the wellbeing of clients.

"Why use Aquatic Physiotherapy in the treatment of neurological patients?"

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In the past hydrotherapy or aquatic physiotherapy was the poor relation of "real" physiotherapy. Some thought it was not useful for neurological patients who actually require normal weight bearing or more sensory stimulation than is present in water with reduced gravity. I will use a case presentation to illustrate the progress of a young head injured patient and show how hydrotherapy can be used to achieve many of the goals we would work on with land rehabilitation, often more effectively, enjoyably and easily. When run efficiently hydrotherapy can be a cost efficient option. With a poor prognosis the initial goals of treatment were to see if this young man still enjoyed the water, to give his family hope that there would be something in life that he could still enjoy and some recreational activity that they might do with him. His initial response to treatment led to a fully integrated aquatic rehabilitation program. The rehabilitation goals of tone normalization, sensory integration, pain reduction, muscle elongation, improved stability, strength, function, fitness & co-ordination can be achieved in water. The clinical reasoning behind the use of shoes, splints, weights and modified swimming is discussed. Long term neurological patients often develop a musculoskeletal stiffness that hinders their functional recovery so aquatic manual therapy techniques can form part of their aquatic physiotherapy treatment. In conclusion we need to be mindful that when treating in a hydrotherapy pool we need to think like physiotherapists and understand how the properties of water change biomechanics and normal human movement.

Older people and activity: any movement is good movement

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Activity is essential to wellbeing for older people. Poor physical function predicts development of depression, disability, health service use and institutionalization, and disability in turn predicts development of depression. Physical activity has the potential to interrupt the development of disability from both depression and poor physical function. Even small gains in functional status and mood may result in significant benefits in functional performance and quality of life. Frail older people often operate close to their functional reserve and are at risk of rapid decline with a reduction in usual habitual activity. Falls, depression and low levels of physical activity often hang together associated with significant disability. This talk will review the impact of physical activity on health for older people, including those who are very frail in residential care. A discussion of local research on promoting activity to older community dwellers, those with depression and those most frail will set the scene for discussion on potential local initiatives.

Virtual reality: Just a game or useful for rehabilitation?

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Use of and access to virtual reality (VR) technology has blossomed over the last 10 years. While the gaming industry is by far the largest market, the use of VR for more serious applications, including rehabilitation, has also increased. VR affords a medium to create safe, controllable environments that can be used to augment traditional therapeutic practices. Importantly, VR can increase motivation and engagement in rehabilitation across a range of populations, and is widely accepted even in older individuals with little technology experience. This talk will first outline the basics of VR, including user interfaces and display systems, and then present three applications of VR in current and future research projects. The first of these is a study using a custom-designed series of games to improve arm movement control following stroke. Results from the initial participants will be reported and will include assessments of the intervention itself as well as changes in movement ability. The second study involves a commercial VR rehabilitation system for children with cerebral palsy. The system has been applied in a novel school-based setting to evaluate its potential use with children in rural New Zealand areas who do not have access to regular physiotherapy. The final study will describe the possible use of VR to study gait disorders in Parkinson's disease. The talk will be concluded with a few future ideas for maximising the benefits of VR to facilitate the rehabilitation of movement disorders.

Reasoning your way through the injured athletic shoulder

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The majority of athletic shoulder injuries that create a challenge for the physiotherapist are those related to overuse during overhead activities. Research related to these lesions has predominantly been conducted on throwers and, in particular, baseball pitchers. This paper focuses on the throwing shoulder, but similar presentations are found with other overhead sports. Early hypotheses related to the pathology of the painful athletic shoulder have changed from subacromial impingement secondary to anterior laxity, and intra-articular/internal impingement and eccentric load on the biceps anchor during follow-through leading to fatigue failure of the superior labrum. The current most favoured hypothesis is that of a primary lesion to the superior labrum secondary to altered glenohumeral mechanics during the late cocking phase of the throw. Disagreement on the pathology makes clinical evaluation and interpretation of physical findings difficult. To make the process even more challenging, critical evaluation of the plethora of clinical tests reported for diagnosis of Superior Labral Anterior Posterior (SLAP) lesions indicates that none has a satisfactory level of reliability or diagnostic accuracy. The only definitive treatment for a SLAP lesion is surgical repair, which does not address the contributing features that lead to development of the lesion in the first instance. Evaluation for and attention to the common contributing factors is essential in conjunction with the throwing coach, both pre- and post-operatively. Successful interpretation of the presenting features and ongoing diagnostic reasoning is required for the physiotherapist to reach a satisfactory outcome for the injured overhead athlete.

Muscle endurance: a review and update

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Following many injuries, a period of disuse or immobilisation is required and muscle is relatively inactive. An inactive muscle undergoes rapid changes in structure and cellular function that are detrimental to performance. For the clinician to

rehabilitate patients efficaciously, an understanding of neural and muscular mechanisms associated with endurance is important. Muscle endurance refers to the ability of a muscle to maintain performance over a sustained period of time. Muscle endurance requires central and peripheral mechanisms to be operating effectively. The relative contributions of the neural and peripheral mechanisms are still debated.

Central mechanisms include those proximal to the neuromuscular junction that lead to a decline in performance when attempting to sustain a sub maximal or maximal load. It is apparent that voluntary activation can decrease notably in such tasks and is in part due to reduced drive from the motor cortex. Variations in motor neuron recruitment and firing rate occur accordingly. In addition, the motoneuron pool is influenced by afferent feedback from muscle receptors. It also seems likely that afferent feedback will affect drive from the motor cortex. Furthermore, afferent signals provide a stimulus to invoke powerful vascular responses that regulate blood flow to the activated muscles.

Differences in muscle endurance have been noted between men and women. Studies indicate that supra spinal responses to fatiguing exercise are similar for men and women indicating that the source of the difference is likely to be at spinal and muscle levels. There is some evidence for gender differences in acidosis and increased dependence upon glycolytic metabolism in men during fatiguing tasks. The percentage of type II to type I muscle fibre has also been implicated. Interestingly, these differences are not as apparent under ischemic conditions suggesting that the delivery of oxygen is an important factor.

The type of task being undertaken is a major influence upon the amount of fatigue that will be measured and will also influence training effects. Physiological processes are altered optimally through exercise that is specific. It is apparent that combining training for different goals (e.g. strength or endurance) lessens the optimal physiological adaptations achievable and can therefore influence task performance.

While a single training session may induce signalling pathways to up-regulate cellular processes, they do so for only a few hours after the exercise session is completed, and hence are insufficient to induce a chronic adaptation. With on-going training, acute changes in signalling processes become cumulative and stimulate a higher level of synthesis of specific molecules leading to longer term adaptations within muscle. The optimal training program for improving muscle endurance has yet to be derived, however, there are guidelines associated with repetitions, sets, and work-rest intervals that allow a generalised prescription to be utilised with confidence of reasonable changes in performance being achieved in patients undergoing rehabilitation.

What does working together really mean?

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This presentation responds to an invitation to address the theme of the conference - *Working together: research and practice*. Issues related to four areas of working together will be examined:

- a) **clinicians working together:** how do teams work, what are the barriers to teamwork and how can we get the best results from team work?
- b) **clinicians working with researchers:** it has been argued that in order for research to produce findings that matter to clinicians and, to ensure translation of research findings into practice, clinicians and researchers need to work together. Are there effective strategies for doing this and importantly - does it make any difference to patients?
- c) **working with clients and their whanau/family:** it is increasingly suggested that in order for efficacious interventions to be effective in the real world, engaging and working with clients and their whanau / family is central. Just how can one do this?
- d) **working with policy makers and decision makers:** The wider environment we work in with regard to funders, systems and policy makers impacts on every thing we do. What are the best ways to interact and share knowledge with these key stakeholders to deliver optimum outcomes for patients?

The basis of what we do and how we do it will be examined with a specific reference to research that indicates the key issues in each of these domains and how, if we are willing, we could do it all better.

Neurological screening in the assessment of sports-related concussion

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Concussion and mild traumatic brain injury (mTBI) are common injuries in contact and collision sports, however, it has been noted that many concussions go undetected and unreported. Undetected concussions are serious because they increase the likelihood of athletes continuing to practice and play, placing themselves at risk of a subsequent and possibly more serious injury. Valid and reliable screening tools are therefore essential in assisting the sports medicine professional in recognising a concussion. The Sport Concussion Assessment Tool (SCAT) is a standardised global assessment for the identification of sport-related concussion (SRC). Commonly reported physical signs of concussion include impaired coordination, unsteady gait, and poor balance and therefore an integral component of the SCAT is the neurological screen, which contains the assessment of motor performance tasks including balance, gait and coordination measures. While many items of the SCAT have been developed and validated for inclusion, the neurological screening component of the assessment remains qualitative and limited in its utility. The development of quantitative tools that screen for neurological dysfunction attributable to SRC is an important component of the development of the SCAT and one which our research group is undertaking. This presentation will discuss the clinical development and validation of neurological items involving balance and coordination for inclusion in the SCAT2 and further working versions of this tool. Results of our recent studies that have investigated the diagnostic accuracy and reliability, as well as selected elements that might influence the neurological screening examination in a sports setting (e.g. exercise/sports participation, environment, footwear etc.) will be discussed.

College Fellowship presentations

Ankle sprains: patient perceptions of function and performance of physical tasks. A mixed methods approach.

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Introduction: Ankle sprains are common and often become recurrent problem. As a result patients may suffer significant time off work and restriction in activities of daily living.

Study Design: A concurrent nested strategy using a smaller qualitative study within a larger quantitative study

Participants: Forty participants who presented with an acute sprained ankle and underwent physiotherapy treatment.

Methods: Participants and physiotherapists completed various questionnaires at the initial and discharge treatment. Additionally participants completed the questionnaires at six weeks following discharge when they also underwent specific physical testing for strength, balance, proprioception and agility. Ten participants completed a semi-structured interview.

Results: The key findings from this study provide evidence that while physiotherapists and patients have a similar perception of the severity of an ankle sprain at the initial visit this perception is not maintained at discharge. Patients have a lower self perception at time of discharge and this was confirmed by both the questionnaire and interview results. The study also found that performing functional tasks is valuable in assisting patients gain a greater appreciation of their function. This study found significant differences for joint position sense and performance agility testing between the injured and uninjured ankles. The clinical implications of the joint position sense and performance agility testing findings are still unclear and in particular what influence these deficits have on patient's perceptions of their recovery or additionally any influence on the high recurrence of ankle sprains.

Conclusions: The relevance of these findings indicates that physiotherapists need to be aware that patients are likely to have lower self expectations of the ability of their recovering ankle at discharge. Hence there is a need for physiotherapists to spend more time clarifying patient's concerns and fears prior to discharge and incorporate strategies to improve patient confidence in their management plan.

Static Stretching- biomechanical effects across the lifespan

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Stretching is one of the most prescribed exercises provided by physiotherapists. The most commonly applied type of stretching is static stretching. This type of stretching is often used to improve and maintain joint range of motion and improve function. The proposed mechanisms associated with changes in ROM following stretching regimens include neurophysiological and biomechanical phenomena. Increases in musculotendinous length, increased stretch tolerance, alterations in muscle stiffness, viscoelastic stress relaxation and reflexes have been observed. This presentation will provide a summary of a series of studies that have investigated the effects of long term stretching interventions in adolescent male populations and in elderly populations. Data will also be presented with respect to short and long term stretching interventions in those people with a common health condition, osteoarthritis. Information will be presented to look at the different biomechanical responses in these populations as well as the effects of static stretching on function.

Hamstring injuries: beyond strength, flexibility and core stability

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Prevention and management of hamstring muscle injuries have focussed on traditional outcomes of strength, flexibility and endurance, and recently also on core stability. The incidence and recurrence rate of these injuries, however, remain high. The aim of this research was to explore issues of motor control in hamstring-injured athletes ($n = 17$) in comparison to control athletes ($n = 19$) using a cross-sectional study design. Muscle activation patterns of the quadriceps, hamstring and gluteal muscles, determined by surface electromyography (EMG), were determined during two tasks: isokinetic muscle performance assessment (concentric and eccentric knee flexor and concentric extensor contractions), and transition from double- to single-leg stance.

Isokinetic and EMG amplitude variables were compared within-subject and between-subjects. There was no evidence for a significant between-group difference for peak torque (PT) values and antagonistic ratios (concentric hamstring PT to concentric quadriceps PT, and eccentric hamstring to concentric quadriceps PT, $P < .05$). However, the HG injured limb generated lower average torque towards the end range of motion in comparison to the HG uninjured limb ($P = .034$) and to the CG bilateral average ($P = .025$). Furthermore, the EMG root mean square (RMS) decrease from the start to the end range of the eccentric flexor contraction was greater for the HG injured limb biceps femoris (BF, $P = .005$) and medial hamstrings (MH, $P < .001$) in comparison to the CG bilateral average.

During the transition from double- to single-leg stance, the EMG onsets of the HG injured limb BF ($P < .001$) and MH ($P = .001$), and the HG uninjured limb BF ($P = .023$) and MH ($P = .011$) were significantly earlier in comparison to the CG bilateral average. The transition normalised EMG RMS was significantly higher for the HG injured side BF ($P = .032$), MH ($P = .039$) and VL ($P = .037$) in comparison to the CG bilateral average (ANCOVAs, controlling for pre-transition normalised EMG RMS).

The results suggest that during maximal isokinetic eccentric contractions, the average torque towards the lengthened position decreases in hamstring-injured limbs in comparison to controls. This may be due to structural changes or due to neurophysiological inhibitory mechanisms. During the static weight-bearing task an earlier onset of the HG hamstring muscles was evident in comparison to controls. The hamstring muscles and the VL of the injured limbs were activated at greater normalised amplitude when compared to the controls. The increased muscle activation in the hamstring-injured limbs may indicate a greater demand towards stability of the kinetic chain. Future research should determine the mechanism and clinical implications underlying the loss of eccentric flexor torque towards the lengthened position and the increased activation of thigh muscles during the static weight-bearing task in hamstring-injured athletes.

Acknowledgement: Prof. S. John Sullivan, Prof. Helen Nicholson, Dr Stephan Milosavljevic, University of Otago, for their support and guidance.

Free paper presentations

Global Rating of Change (GROC): the minimally important change at which patients choose to stop seeking treatment

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The Global Rating of Change (GROC) provides a common anchor for statistical estimations of outcome measure responsiveness. There is debate regarding the most appropriate cut-off value for the GROC for anchor-based derivation of minimally important change (or minimum clinically important difference). The study aimed to estimate the GROC cut-off value at which patients voluntarily discontinue seeking care. Patients in a multi-centre cohort of 1628 patients with various musculoskeletal disorders attending an episode of physiotherapy care were administered the GROC (a 15 point scale, 1-15 range). We analyzed the GROC at treatment visit 6 (GROCV6) and discharge (GROCdc). We considered patients who discontinued therapy after 6 visits, but prior to planned discharge by their physiotherapist, to have voluntarily discontinued seeking care. We defined the median value as a conservative estimate of the cut-off, to avoid contamination by non-success, and report the mode and inter-quartile range (IQR). Results: Of 931 patients with GROCV6, the median GROCV6 was 14 (IQR 14, 15). Of 697 patients with no GROCV6, 63 had recorded a GROCV6. The mode and median GROCV6 was 13 (IQR 11, 14). We conservatively estimate the minimum GROC cut-off value at which patients voluntarily discontinue seeking care is 13 on a scale of 1-15, representing "Quite a bit better". This may serve as an anchor value to derive minimally important change. Physiotherapists' discharge planning appears to coincide with a GROCV6 of 14, representing "A great deal better". These conclusions are limited by overlap in data distributions and postulatory novel methods.

Correlation between surface electromyography and visual analogue scale assessment of lower trunk muscle fatigue

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Surface electromyography (sEMG) and Visual Analogue Scale (VAS) are both reported to assess lower trunk muscle fatigue and lower trunk discomfort during floor activities. These assessment tools are important methods with regard to the clinical application; however, the relationship of sEMG and VAS is unknown. This cross-over design study investigated the correlation between normalized median frequency (normalized MF) of sEMG of lumbar multifidus (LM) and internal oblique (IO) muscles and lower trunk discomfort using VAS every five minutes throughout 30 minutes in crossed sitting and heel sitting postures. Twenty-three healthy Thai subjects aged 20 to 30 years were asked to sit for 30 minutes in each posture on two occasions. Normalised MF of the muscles was recorded and VAS was used to investigate the fatigue and discomfort of trunk every five minutes for 30 minutes. Pearson correlation coefficient revealed a significant negative correlations between normalized MF in all muscles and VAS in crossed sitting posture ($r = -0.98$ in right LM, $r = -0.94$ in left LM, $r = -0.99$ in right IO and $r = -0.88$ in left IO) and heel sitting posture ($r = -0.99$ in right LM, $r = -0.99$ in left LM, $r = -0.98$ in right IO and $r = -0.96$ in left IO). Therefore, it may be possible to use VAS for assessing lower trunk muscle fatigue instead of sEMG.

The use and treatment efficacy of kinaesthetic taping for musculoskeletal conditions: a systematic review

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Kinaesthetic taping is a new therapeutic tool, and has become increasingly popular within the sporting arena. Despite anecdotal support, there is very little evidence within the literature to support the use of kinaesthetic taping. A systematic literature review was conducted to evaluate and critique randomised controlled trials (RCTs) which have examined the therapeutic use of kinaesthetic taping to assess its treatment efficacy for musculoskeletal conditions. An electronic search was undertaken using the databases of Scopus, Cochrane Library, Physiotherapy Evidence Database (PEDro) and the EBSCO Health Database to identify RCTs investigating kinaesthetic tape and its effects on musculoskeletal conditions. Four studies met the inclusion criteria, however only three studies were critiqued as the fourth was not accessible. Three independent reviewers critiqued and assessed the quality of the studies using the 11 item PEDro scale. Two of the three studies exhibited high methodological quality. One study exhibited limited methodological quality. Despite these findings, none of the three articles concluded a clinical significance for the use of kinaesthetic taping. The literature review highlights the need for more high quality RCTs to examine the use of kinaesthetic taping for the treatment of musculoskeletal disorders.

Development and Validation of a Patient Satisfaction with Physiotherapy Scale

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Patients' perceptions about the treatment techniques and their implementation are not the sole indicators of treatment satisfaction. Patient-clinician interaction and communication are also important. Currently in New Zealand there are no measures of patient satisfaction that consider the patient's interaction and communication with their physiotherapist.

This study developed and validated a questionnaire that measures patient satisfaction with their interaction and communication with the physiotherapist. Initially the Patient Satisfaction with Physiotherapy Scale (PSPS) was developed using relevant items from the Medical Interview Satisfaction Scale and the Sports Injury Clinic Athlete Satisfaction Scale. The resultant 17 item version of the PSPS was administered to 271 physiotherapy patients, who were attending at least the second appointment in a course of treatment. They also answered questionnaires about their intent to adhere (AIQ), the value they placed in their physiotherapy (VPRQ), and demographic and injury characteristics. These questionnaires tested concurrent validity. A factor analysis of the PSPS revealed a 13 item subscale that measured aspects of the physiotherapist-patient communication and interaction, and had factor loadings of .80 to .54, and a Cronbach alpha of .91. The 13-item PSPS had a significant correlations with the VPRQ ($r = .55, p < .01$) and AIQ ($r = -.17, p < .01$). In conclusion the 13 items on final PSPS have high factor loadings, and are internally consistent. The PSPS has moderate to weak concurrent validity with VPRQ and AIQ respectively. In physiotherapy, this questionnaire could be used for research purposes and as an auditing tool where the results are included in contract applications.

Strengthening for improvement of pain and function for people with Osteoarthritis of the knee: what are the optimal prescription parameters?

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Conservative treatment of Osteoarthritis (OA) is recommended with evidence showing strength training can have benefits on pain and function for people with OA of the knee. The purpose

of this review is to examine the quality of the literature pertaining to strength training for OA of the knee and investigate optimal training prescription for best pain and functional benefit. A search to identify relevant randomised control trials (RCTs) was conducted through six electronic databases and via a hand search. Eleven RCTs enrolling a total of 1360 participants were included in this review. The PEDro scale was used to assess the methodological quality of the RCTs and the Internal Validity Score was used to quantify the overall quality of evidence. The overall quality of evidence regarding strength training for knee OA was found to be limited as blinding is problematic given the nature of the interventions being investigated. Pain was reduced in ten studies however with considerable variability compared to controls. Function improved in only six studies. The range of functional and non-functional interventions across the studies may be a reason for the mixed results in changes of function. The parameters used for each intervention across the studies were so varied that no clinical recommendation could be made for exercise prescription, particularly intensity. For more accurate clinical recommendations to be made future research will need to conduct higher quality studies with better prescribed, functional interventions to ascertain how to best decrease pain and improve function for people with knee OA.

Does time of day affect the outcome of the Dix-Hallpike manoeuvre when testing for Benign Paroxysmal Positional Vertigo (BPPV)?

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BPPV is responsible for 25% of cases of vertigo, with incidence peaking in the 70-85 year age group. BPPV also causes unsteadiness, falls, anxiety, decreased activity levels and quality of life. Diagnosis with the Dix-Hallpike manoeuvre and treatment with repositioning manoeuvres is effective and significantly reduces development of secondary symptoms. False negative results with the Dix-Hallpike test have been reported resulting in misdiagnosis, inappropriate treatment and costly diagnostic tests. A randomised cross-over trial was undertaken with 50 participants referred to the Kapiti Health Centre for Physiotherapy for BPPV. Hypothesis: that the phenomenon of fatigability and habituation is likely to produce a variation in the results of the Dix-Hallpike manoeuvre when performed at different times of the day. Participants were randomised into two groups and tested on two consecutive days in the morning and afternoon with the order of the tests reversed for each group. The manoeuvres were digitally recorded using video-oculography, allowing a blinded assessor to also assess nystagmus. Results: both tests positive-21/50, both tests negative-23/50, positive morning/negative afternoon-3/50, negative morning/positive afternoon-3/50. The difference in marginal proportions was 0% (95% CI-9.6 to 9.6) and McNemar's chi-squared test had a test statistic value of zero, $P=1.0$. Therefore time of day is not a factor in false negative tests. However 22% of those with a positive Dix-Hallpike, tested negative on one of the days. These results support the clinical practice of retesting patients on more than one day if they have a history suggestive of BPPV but a negative Dix-Hallpike test.

Specific motor control exercise for lumbo-pelvic pain of articular origin: A systematic review.

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Specific motor control exercises (SME) are commonly prescribed in the treatment of LBP. Previous systematic reviews give conflicting evidence in support of these over other forms of intervention for LBP. This is possibly due to the heterogeneity of patient groups causing a washout effect. The purpose of this study was to conduct a systematic review of SME for lumbo-pelvic pain of articular origin. The PEDro scale was used to critique the papers. The levels of evidence used by the Cochrane collaboration were adopted to make recommendations. Inclusion

criteria were: the study was an RCT; the study group had to receive a SME; the study had to have articular related pain; the paper had to score 6 or higher on the PEDro scale. Five papers that met the inclusion criteria were identified. Results showed there is moderate evidence for the use of SME for articular lumbo-pelvic pain when: used alone (chronic pain); combined with another form of active treatment (chronic and sub-acute pain); combined with medical management and return to normal activities (acute pain). Although the review does provide moderate support for the use of SME for articular lumbo-pelvic pain, there are a number of factors which suggest that the results should be interpreted with caution. This does highlight that a washout effect may have occurred in previous reviews and that there does appear to be a group of patients with LBP that SME can benefit. Further research is highly recommended and some suggestions for future trials are made.

The role of physiotherapists in facilitating persons following spinal cord injury back to employment.

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Return to paid employment has emerged as a key measure of successful rehabilitation following spinal cord injury (SCI). However, return to work rates in the literature range from 13-69%, with the majority of evidence being empirical and focusing on return to work rates and identifying the demographic variables associated with employment. There is little research on what barriers individuals face to employment and why some individuals overcome those barriers to return to employment. The aim of this project was to better understand employment in New Zealand following SCI, based on the experiences of people with SCI and vocational rehabilitation professionals working within our unique funding system. Twelve people with SCI and six vocational rehabilitationists were interviewed to explore their experiences of employment, in particular perceptions of the barriers and facilitators. All the people with SCI were employed prior to injury. At the time of interview four were employed, three were actively looking for work and five were unemployed. All six vocational rehabilitationists either worked within the Kaleidoscope programme on-site at a New Zealand spinal unit, or were private practitioners contracted by Kaleidoscope. Analysis of transcribed data used methods congruent with the qualitative methodological approach (Interpretative Phenomenological Analysis). Support, both practical and psychosocial, was identified as an essential facilitator in assisting persons following SCI back to work. Physiotherapists working with persons following SCI may have a significant role in this support system and are well placed to contribute to the development of the 'scaffold of support' required for sustained employment.

Transition from student to new graduate: Exploring the experiences of new graduate physiotherapists (a pilot study).

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Despite a growing interest in the transition from novice to expert practice, there are presently no known studies that examine the experiences of new graduates (NGs) within Physiotherapy Private Practice (PP) in NZ. Anecdotal evidence indicates that transition from student to practitioner may be problematic and worthy of investigation. The study's aim was to ascertain how well undergraduate qualification prepared NGs for clinical practice. Nine participants graduating one year before (2007) with bachelors degrees in physiotherapy were recruited by public advertisement in the NZSP newsletter 'Physio matters' and the Internet Facebook group 'AUT University.' The study explored the meaning given to participants' experiences of their first year of practice and drew on phenomenology as its methodological framework. Data was gathered by anonymous survey

questionnaire, and participants' responses were independently analysed by two researchers. Thematic analysis was conducted to establish key themes emerging from the text. The findings of this pilot study suggest that the transition experiences of NGs in PP in NZ share many similarities with those found elsewhere in the literature, not least because NGs in this study found their first year of practice more difficult than expected. Key themes that emerged included educational fit, educational gaps, expectations, support, professional relationships, and workload; all improved with experience and transition. This pilot study confirmed that NGs are faced with a difficult transition from student to practitioner. A crucial factor that appears to relate to the degree of 'transition shock' that NGs experience is the quality of relationships with work colleagues.

Introducing the Physiotherapy Practitioner Role in Haemophilia

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The instance of haemophilia and the specialist nature of its care mean that health care providers often lack knowledge and experience in understanding of the needs of patients with bleeding disorders. Where specialised haemophilia services are not provided these occurrences have the potential to cause more issues, at greater cost both to affected patients and health care providers. Recent research indicates that while the accelerated blood-induced joint damage that characterises the haemophilia population is directly proportional to the number of bleeds that have affected the joint, this joint damage is also directly proportional to how quickly a bleeding episode is rehabilitated with physiotherapy. It is known that the frequency of bleeding episodes and subsequent joint damage increases with each un-rehabilitated bleeding episode, leading to long-term costs to both patients and healthcare providers. The incidence of chronic intraarticular pathology in young men in countries where there has been no provision of physiotherapy services relative to nations with an advanced haemophilia physiotherapy program provides clear evidence for the effectiveness of a co-ordinated management regime. This has resulted in a newly expanded haemophilia physiotherapy service being introduced from July 2009 at the Auckland District Health Board (ADHB). The initiative is part of an ongoing drive by the ADHB and the National Haemophilia Management Group to raise the quality and effectiveness of Auckland regional and national physiotherapy services for patients with Haemophilia and related bleeding disorders.

Physiotherapy led clinic reduces orthopaedic spinal waitlist times - outcomes of a 6 month retrospective audit

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The Orthopaedic Physiotherapy Spinal Assessment Clinic (OPSAC) was set up in June 2007 in response to ministry of health performance indicator requirements having not been met for Orthopaedic Spinal First Specialist Assessments (FSA's). 0.2 FTE was allocated for a Senior Physiotherapist to assess priority "C" referrals in orthopaedic outpatients under the supervision of a spinal consultant. A 6 month retrospective audit was performed between April - September 2008 to measure clinic outcomes and the overall effect on Spinal FSA waitlist times. Patient demographics, attendance, waitlist times, clinic outcomes, and results of investigations were collated and statistically analysed. Spinal FSA waitlist times from May 2007 to October 2008 were compared. Staffing costs (per hour) were calculated by a Chief Financial Officer within the Auckland District Health Board. Of the 81 scheduled clinic appointments, there was an 83% attendance rate with a mean wait time of 27 days. 57% of patients were removed directly from the orthopaedic wait list following initial assessment. 19.5% of patients were referred for further investigation (MRI), of which 87% showed radiographic evidence of the suspected spinal pathology. 23.5% of patients were returned directly to the Spinal FSA waitlist to see a spinal consultant. Spinal FSA wait list times reduced significantly and

have been maintained within Ministry of Health requirements from August 2007 to date. Cost savings were calculated at \$138/hour when compared with a consultant led clinic. The OPSAC has been a cost effective initiative to reduce spinal FSA waitlist times and improve access to specialist care.

Does the Patient-Specific Functional Scale (PSFS) reflect the International Classification of Functioning, Disability and Health (ICF)?

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This observational content validity study investigated the extent to which the Patient-Specific Functional Scale (PSFS) reflects the domains of the International Classification of Functioning Disability and Health (ICF). The ICF provides a common framework for clinical outcome measurement. As the PSFS is becoming increasingly widely used in musculoskeletal physiotherapy, it is necessary to investigate how well the PSFS reflects the ICF. We analyzed 2911 items from the PSFS, from 1050 patients with various musculoskeletal disorders. The data were a random sample of participants in the Otago Outcome Measures Project cohort collected at four University of Otago School of Physiotherapy Clinics, situated within three New Zealand cities. Items nominated by patients within the PSFS were categorised and mapped, using thematic analysis techniques, to the components, chapters and categories of the ICF. We conducted subgroup analyses by body region of injury and by age group. All (100%) of the analyzed items could be mapped to the ICF. Most items nominated by patients mapped to the ICF 'activity' component (80.0%), followed by 'participation' (7.7%), 'impairment' (7.4%) and the fourth group involved items that overlapped between 'activity' and 'participation' (4.9%). Similar results were found for each of the five body regions in subgroup analyses. 'Activity' is the most common ICF component represented from patient-nominated items when completing the PSFS, with 'participation' moderately represented and 'impairment' poorly represented. The PSFS will therefore better represent the ICF when used in conjunction with other common impairment-based clinical outcome measures.

Going smoke free in a detoxification unit – the physiotherapist's role.

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It is well researched and documented that smoking has a serious deleterious impact on health. It is estimated that 90% of the clients admitted to the Inpatient Medical Detox are dependent on nicotine. This paper describes the process of commencing a smoke free policy in the Inpatient Medical Detox Unit in Auckland in 2009. While clients are admitted for withdrawal from alcohol, opiates, benzodiazepines and other addictive substances and not for nicotine cessation, government regulations require a non smoking policy in the Unit. The initial dispensation given to mental health units has now been revoked and mental health units are required to be smoke free. The planning and implementation of the policy is discussed briefly with particular emphasis on the physiotherapist's role in the multidisciplinary approach. Strategies utilised by the team include nicotine replacement therapy, brief intervention therapy with physiotherapy support of exercise and acupuncture. On discharge most clients have reduced their daily use of cigarettes, some are committed to continue abstinence and some leave more determined to smoke. As no follow-up study has been done to date the long term results of this intervention are not known. Research has shown that supporting lifestyle changes, particularly with exercise, is an effective and worthwhile intervention. A reflection on lessons learned from this experience and potential adaptations of some methods to other roles physiotherapists in the wider community may have to contribute in supporting lifestyle changes are discussed briefly.

To sleep or not to sleep

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Impaired sleep is a common complaint which often impacts significantly on the development of, treatment and motivation to address many health issues, including substance dependence problems. Sleep disturbance and dysfunction is a major lifestyle challenge physiotherapists encounter when working with clients in numerous areas of practice. Many physiotherapists do not feel confident to competently address this issue with clients. Adopting some easily implemented assessment and treatment strategies can enhance the efficacy of physiotherapy treatment. The importance of exercise, stress management and relaxation are emphasised. Sleep education is provided by physiotherapists to clients of the Auckland Medical Detox Service as an integral part of their treatment to facilitate withdrawal and promote relapse prevention. This approach builds on skills taught in breathing retraining, chronic pain and anxiety management and body awareness. This paper describes the evidence based assessment and treatment of sleep impairment. It also provides suggestions for implementation into wider general physiotherapy practice. While this programme has not been evaluated it is based on the landmark research of sleep laboratories in the United States and published in books such as *The Promise of Sleep* (William Dement) and *Power Sleep* (James Maas).

The diagnosis of subacromial impingement syndrome and associated pathology in the primary care setting.

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Subacromial impingement syndrome (SIS) is a clinical syndrome that indicates pain and pathology involving the subacromial bursa and rotator cuff tendons within the subacromial space. This exploratory study (males n=23, females n=15) was conducted with subjects undergoing a standardised physiotherapy clinical examination of the shoulder followed by a diagnostic ultrasound scan to compare the results with the shoulder examination. The results show that night pain and pain with overhead activity has a high sensitivity for subacromial bursa fluid/bunching being present. Night pain was also found to be the best predictor of subacromial bursa fluid/bunching being present ($P<0.012$). Male gender ($P<0.034$) was the best predictor of partial thickness rotator cuff tears while being 60 years of age or older ($P<0.01$) significantly correlated with full thickness rotator cuff tears. The Drop Arm Sign ($P<0.01$) and External Rotation Lag Sign ($P<0.01$) were significantly correlated with SIS and full thickness rotator cuff tears. Clinical tests for all three pathological stages of SIS and subacromial bursa fluid/bunching being present, had equivalent or if not greater diagnostic accuracy than previous report studies in the literature. The Hawkins-Kennedy Test and Neer Sign can be used in the primary care setting to rule out the presence of subacromial bursa fluid/bunching or SIS if the tests are negative. For mid to end stage SIS (rotator cuff tears) the Empty Can Test and Drop Arm Sign with their high sensitivity can be used to rule out rotator cuff tears, especially to the supraspinatus tendon, when the tests are negative.

The Patient-Specific Functional Scale (PSFS): responsiveness, reliability and construct validity for patients with upper extremity musculoskeletal problems

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The Patient Specific Functional Scale (PSFS) has not previously been examined for patients with upper extremity musculoskeletal problems. This multicentre cohort study examined the

responsiveness, reliability, and construct validity of the PSFS and of the Upper Extremity Functional Index (UEFI), in patients with upper extremity musculoskeletal problems, undergoing an episode of physiotherapy. Patients (n=180) attending physiotherapy completed the UEFI, PSFS, and Numerical Pain Rating Scale (NPRS) at their baseline assessment and at follow-up. At follow-up, patients also completed a 15-point Global Rating of Change (GROC), which was used to trichotomise patients as improved, stable or worsened. Responsiveness was determined using Receiver Operator Characteristic (ROC) curves to calculate: accuracy by determining the area under the curve (AUC); and minimal important difference (MID) by calculating the sensitivity and specificity values (95% Confidence Intervals (CI)) for the selected cut-off scores. Reliability was evaluated with intraclass correlation coefficients (ICC type 2,1) (95%CI). Independent samples *t* tests were used to determine construct validity by comparing the mean changes in score for the improved and stable groups of patients. AUC was 0.887 for the PSFS and 0.877 for the UEFI. MID was 1.2 for the PSFS and 8.5 for the UEFI. Reliability was moderate for the PSFS 0.713 and good for the UEFI 0.848. Significant differences ($p < 0.0001$) were found between the stable and improved groups for both the PSFS and the UEFI. The PSFS demonstrated good responsiveness, moderate reliability, and good construct validity for patients attending a musculoskeletal physiotherapy clinic with upper extremity problems.

Investigation of tendon parameters by ultrasound imaging in patellar tendonopathy

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Patellar tendon pain is a common condition in an active population. Studies of achilles tendons have shown that the pathological changes in tendon tissue are associated with pain and function. Ultrasound imaging findings have also shown abnormal tendon properties. However, there are limited ultrasound studies on the patellar tendon with regards to tendon pain, quantification of tendon morphology and also the effect of eccentric exercise.

The primary aim of this presentation is to present the ultrasound findings of a patellar tendonopathy population. These results are part of a larger study that assessed the effect of eccentric exercise within athletic adults with chronic patellar tendonopathy. A total of 17 participants were recruited. Images were obtained for both asymptomatic and symptomatic patellar tendons. Symptomatic tendons were significantly thicker ($p \leq 0.05$) than asymptomatic tendons. Neovascularisation and altered tendon ultrasound properties were apparent in symptomatic tendons of only four of the 17 participants (23.5%). Of the participants that subsequently completed a twelve week eccentric decline board loading programme (n=9, 52.9%), pain, function, tendon thickness, hypo echoic areas and neovascularisation were reassessed. Pain and function improved significantly in all of these participants. Altered tendon parameters seen under ultrasound were also noted.

In conclusion, image abnormalities were evident in less than a quarter of symptomatic tendons. Changes in the patellar tendon may or may not be directly related to the reduction of pain post loading. Further investigation of the underlying causes of pain in the patellar tendon, pathological tendon property changes and the reduction in pain associated with patellar tendonopathy is needed.

Knowledge and experiences of aspects of Māori culture amongst students applying for entry to the Bachelor of Physiotherapy programme.

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Cultural awareness and cultural safety are critical dimensions of physiotherapy competencies required for entry-level practice. The aim of this project was to explore the level of experience, knowledge and understanding of Māori culture and The Treaty of Waitangi held by candidates applying to enter Year II of the

Bachelor of Physiotherapy (BPhy) programme. Candidates who met the criteria and were interviewed for entry into Year 2 in 2010 (n=358) were recruited via email and invited to complete a web-based questionnaire on their level of education in the Māori language; exposure to Māori culture and cultural awareness and safety. Keywords describing cultural awareness and cultural safety were identified. Survey responses were then coded and data analysed using descriptive statistics. A response rate of 39% for fully completed questionnaires was achieved. Of the respondents 95% reported some knowledge about the Treaty of Waitangi, with over 50% having confidence in their ability to recall its overall significance in New Zealand history. The majority (99%) of respondents were aware of health disparities between New Zealand population groups and the need to address these issues. Respondents also had a good level of understanding of cultural awareness and safety. Overall results demonstrated that potential physiotherapists possess core knowledge regarding the implications of the Treaty of Waitangi with respect to healthcare delivery. The information gathered from this questionnaire will be beneficial when reviewing relevant components of the BPhy curriculum and, in addressing student learning that is required to develop cultural competence in preparation for entry-level practice.

Back Up – a UK example of evidence-informed back and neck pain management

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UK insurers have historically used a traditional medical-model approach to managing common musculoskeletal problems such as back and neck pain. This has resulted in problems such as high rates of consultant/specialist involvement, growing consumption of healthcare resources, increasing rates of sickness absence from work, and customer dissatisfaction. An initiative was jointly developed between a leading medical insurer and a leading case management and rehabilitation provider. The goal was to deliver an evidence-informed service that provides an excellent customer journey. This begins with first-contact by the insurer, removing the need for early GP involvement, and rapid telephonic triage by a clinical case manager (physiotherapist). This invariably occurs on the same day. The person with back or neck pain is then allocated to one of: a self-management approach, supervised telephonically by a PT or exercise therapist, and supported with printed and online video material; assessment and possible treatment by a PT; or, referral to a specialist. A unique aspect (at least for the UK), is that the person can access PT services within 2 days. The results include large reductions in sickness absence and improved RTW rates, reduced treatment costs, and very high rates of customer satisfaction. This initiative deploys physiotherapists using a wide range of their skills that extend beyond simple treatment modalities. Its success was recognised in winning the Employer Rehabilitation Initiative of the Year category at the 2009 Rehabilitation First Awards in the UK.

Comparison of a non-invasive method of measuring thoracic segmental spinal angles with angles drawn from radiographs.

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This study sought to validate selected surface thoracic segmental angles generated by a non-invasive measurement device, the Spinal Mouse®. Mean Spinal Mouse® segmental angle data were obtained for three levels in 24 asymptomatic adult female volunteers (mean age 25.05 ± 10.59 years) registered in upright standing and then, end range flexion or extension. Corresponding segmental Cobb angles taken from the superoposterior and superoinferior points on the superior endplates of adjacent vertebrae from lateral thoracic radiographs, which had been registered in the same positions for these participants, were obtained using ImageJ® software. Spearman's correlation coefficient was used to examine agreement between mean segmental surface angles and corresponding radiographic measurements. An alpha value of 0.05 was used to determine the

level of statistical significance. The results showed that respective correlation coefficients measured at T3/4 in upright, extension and flexion were (0.190, -0.021, -0.024); T7/8 (0.282, 0.200, 0.112) and T11/12 (0.115, 0.127, 0.792). There was a strong correlation (0.792) between the surface angles at the T11/12 level in the flexed posture. The preliminary results suggest that of the surface thoracic angles derived from the Spinal Mouse®, the T11/12 angle when registered in flexion is a valid approximation to that obtained from lateral radiographs but correlations at T3/4 and T7/8 levels, for any of the angles derived in upright standing or extension are not. Further work is needed to explore meaningful relationships between measurements of the surface profile of the thoracic spine and the more complicated underlying bony vertebral bodies and position of registration.

Reconstruction of identity following traumatic brain injury: reflections on a metasynthesis of qualitative research and the role of physiotherapy

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A qualitative metasynthesis was conducted to explore reported experiences of surviving traumatic brain injury (TBI). Fifteen databases were searched for qualitative research published between 1965 and June 2009, investigating the lived experiences of recovery following TBI acquired during adulthood. Two reviewers independently screened 1629 abstracts and full copies of 79 papers to identify 23 relevant studies. Included studies were evaluated using methodological criteria to provide a context for interpretation of substantive findings. Data were extracted and synthesized by three reviewers, using QSR NVivo to assist with data management. Eight interrelated themes were identified to describe the enduring experience of TBI, including two related to personal identity: 1) disconnect with pre-injury self and 2) reconstruction of self-identity following TBI. The experience of loss of identity was associated with loss of a sense of connection with one's body and loss of one's place in the world, but also, for some, appeared to result from a metaphysical crisis directly arising from brain injury: a loss of sense of internal unity. Reconstruction of self-identity should thus be considered a potentially important outcome to target following TBI. Physiotherapists may be able to meaningfully contribute to reconstruction of self-identity by assisting people to reconnect with their 'new' body post-TBI through physical activity, by facilitating opportunities for TBI survivors to rediscover meaningful roles or 'reinvent' themselves (e.g. through engagement in goal setting and/or uptake of work or disability-related sports), or simply by providing time to listen to the personal experiences and concerns of people living with TBI.

Lumbar motion and trunk muscle activation during repetitive lowering: effects of posture and fatigue.

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High frequency lifting and lowering have been associated with an increased risk of low back injury. Whilst a number of researchers and clinicians have focused on muscle activation and lumbar posture of individuals using different lifting techniques during the lifting phase, few studies have investigated these measures during lowering. Hence, the purpose of this study was to examine spinal motion and trunk muscle activation of individuals using a self-selected lifting posture during the lowering phase of a repetitive manual handling task to fatigue. Thirty-one male subjects were required to lift and lower a 13 kg box using a self-selected posture (squat, mixed or stoop) 20 times per minute until fatigued. Electromyographic activity of erector spinae and abdominal muscles, and lumbar motion data were collected during the lowering phase of the task at baseline and when physically fatigued. Results showed that individuals adopting a stoop lifting technique flexed their spine to end range of motion

and produced significantly greater lumbar velocity than those using a squat technique ($P < 0.05$). Lower erector spinae activation patterns during lowering were similar to that of upper erector spinae for the squat lifters. However, stoop lifters displayed a significant reduction in lower erector spinae activation at the end of the lowering phase. Levels of abdominal muscle activation were relatively low when compared to erector spinae for each posture, and increased significantly when subjects were fatigued ($P < 0.05$). These findings suggest that stoop lifters may increase loading of passive structures of the spine and that abdominal muscle co-activation may be a mechanism to aid spinal stability during repetitive lowering when fatigued.

What is fascia? – emerging functional understandings of an evolving anatomical construct.

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Fascia forms the ubiquitous fibrous connective tissue fabric of the biological body, yet many people either don't know this, or manage to overlook it when developing their diverse knowledge of the human body. Increasing physiotherapeutic use of ostensibly fascia-centric therapies (including but not limited to myofascial release, fascial taping, positional release, craniosacral therapy, and dry needling) raises questions about the theoretical underpinning of these popular clinical practices. Traditional anatomical knowledge is predominantly based on the examination of dissected cadavers that have been painstakingly 'cleaned' of their fasciae, resulting in an enduring institutional under-reporting of bodily form, and an endemic mis-understanding of fascial functions. Consequentially, a great deal of biomedical and physiotherapeutic discourse appears to tacitly presume the existence a stereotypical body norm, which is unnaturally devoid of fascia. Emerging anatomical research demonstrates there is considerably more to fascia than has been conventionally thought, resulting in the downstream development of innovative hypotheses about fascial function and a re-estimating of fascia's relevance to clinical practice. An interdisciplinary reading has raised my concern that the apparently wholesale acceptance of a single, demonstrably incomplete and arguably flawed, anatomical model of the body across a broad range of academic and clinical communities appears to be both uncritical and uncontested. This paper describes how evolving anatomical knowledge of fascia might contribute to developing contemporaneous understandings of fascial function.

“Perceptions of an aqua-aerobics programme to improve physical function and falls risk in older adults with lower extremity osteoarthritis”

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Falls are a major concern in the New Zealand older adult population. While land-based falls prevention programmes are already in place, these may be difficult or inappropriate for individuals with osteoarthritis. A mixed methods study was undertaken to investigate the effects of an aqua-aerobics programme on physical function and falls risk in older adults with lower extremity osteoarthritis. This paper presents the qualitative findings of participants' perceptions of the benefits of the aqua-aerobics programme, and the barriers and promoters to participation and sustainability. Participants who had completed the first twelve weeks of the aqua-aerobics intervention were invited via mail to participate in semi-structured focus groups and individual interviews. The General Inductive Approach was used to identify themes and patterns of meaning in the transcribed interview data. This process of analysis was cross checked by three researchers to extend the rigour of the study. Seventeen participants volunteered and were interviewed via four focus groups and one individual in-depth interview. Key

themes to emerge included perceived benefits, companionship and barriers to access. Key to sustainable participation was a motivating instructor and commitment to a structured programme. Most participants expressed that they would not continue aqua-aerobic exercises on their own. Strong positive feedback as well as constructive criticism forms the basis of recommendations which may be used to create an optimal programme and to promote participation. These research findings will inform practice, guiding those wishing to implement or participate in aqua-aerobics programmes.

The same but different: perceptions of clinical education by stakeholders in physiotherapy.

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Clinical education (CE) is both an integral component of undergraduate physiotherapy education and a mandatory requirement of registering bodies. CE is based on relationships of individual (clinical educators, university/physiotherapy staff, managers, students) and organisational (university, healthcare institutions, registration body) stakeholders. These relationships are interdependent, linked by the need to train the future workforce, yet are often tense as each stakeholder is driven by unique and competing motives. The results of 36 semi-structured interviews are presented, undertaken with stakeholders (including 18 clinical educators) throughout New Zealand. A critical lens is provided by Bourdieu, a French philosopher. Bourdieu and Wacquant provide the analytical framework to explore tensions and power struggles that exist through the interplay of agents (individual and organisational) within fields of practice (CE, physiotherapy, healthcare). Results indicate stakeholders possess differing and often competing interests in CE which reflect individual and organisational values and expectations. CE is perceived by some stakeholders as an integral part of the education continuum from the university to the workplace yet professional and organisational cultures perpetuate the segregation of clinical 'practice' and 'education'. The commoditisation of CE has moved CE away from its vocational roots into a commercial world in which all stakeholders must compete for resources. Although a common shared vision of CE exists, underlying embedded beliefs remain resistant to change and are a continuing source of tension. The exploration of tensions from different perspectives provides an insight and opportunity for stakeholders to work together and towards a unified vision and practice of CE.

The incidence and impact of urinary stress incontinence in female outpatients with bronchiectasis.

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Urinary stress incontinence (USI) is the involuntary leakage on effort, exertion, or coughing, activities which are common in persons with bronchiectasis (BCT). BCT is characterised by excessive secretions, chronic cough and frequent chest infections; the prevalence in New Zealand is high compared with other developed countries. One UK study found 20/43 patients with BCT experienced USI. Assessment of USI is rarely included in respiratory assessments due to its social stigma despite evidence to support its relevance and the benefit of pelvic floor rehabilitation. This single centre, descriptive audit aims to capture the incidence and impact of USI in 30 consecutive females attending a physiotherapy-led BCT clinic. Non-pregnant females aged between 18-80 years with a diagnosis of BCT, confirmed on CT scan, are included in the study. Questions pertaining to bladder control and the impact of USI on quality of life (QoL) are completed in addition to baseline demographic, respiratory and obstetric data. Initial results indicate 7/13 patients experience USI (average age 51.5 years). Coughing/sneezing cause most leakage (5/7). USI negatively affected patients' emotional health (3/7), their ability to undertake airway clearance techniques (7/7), spirometry (2/7) and results in frustration (5/7). Interim data demonstrates to date that the incidence of USI is high in patients attending the BCT clinic.

USI impacts on patients' emotions, physiotherapy management and QoL. A more holistic management plan aims to alter the perception of respiratory physiotherapists to USI in order to positively impact on both respiratory physiotherapy outcomes and specifically, patient QoL.

Working together in a changing and challenging environment - ACC and Physiotherapy

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The economic and political environment that ACC operates in has changed significantly in the past 18 months. These changes have meant ACC has needed to refocus the direction it takes so it continues to be in a strong position to address present and future challenges. As part of this process ACC has reviewed and made changes to the way it purchases many treatment services including physiotherapy – which we recognise is an important part of rehabilitation for people recovering from an injury. Throughout this process ACC has acknowledged the need to establish good provider relationships. We have therefore worked closely with Physiotherapy New Zealand to develop and implement an interim purchasing arrangement for physiotherapy services. Looking forward we will all continue to face challenges. It will be important we continue working together to ensure that the ACC scheme is sustainable and continues to offer New Zealanders a world-leading 24 hour no-fault accident compensation scheme.

Active stiffness and strength in individuals with unilateral anterior shoulder instability: A bilateral comparison.

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Active muscle stiffness may protect the unstable shoulder from recurrent dislocation. This study aimed to compare strength and active stiffness in individuals with traumatic unilateral anterior shoulder instability, and to examine the relationship between active stiffness and functional ability. Maximal Voluntary Strength (MVS) of the muscles involved in shoulder horizontal adduction and their active stiffness at 30%, 50% and 70% MVS was tested bilaterally in 16 male subjects with traumatic unilateral anterior shoulder instability. High velocity perturbations into horizontal abduction were undertaken and stiffness calculated from the changes in angle and torque in the first 60 msec of movement. Additionally, quality of life, function and perceived instability were measured using the Western Ontario Stability Index (WOSI), American Shoulder and Elbow Surgeons (ASES) scores and Single Alpha Numeric Evaluation score (SANE) respectively. There was a significant decrease in horizontal adduction strength, and stiffness at 30% and 50% MVS in the unstable shoulder. No significant correlations were shown between active stiffness, and quality of life, function or perceived instability. The observed reduction in stiffness in the unstable shoulder warrants the inclusion of exercises in the rehabilitation program in an effort to protect the joint from perturbations that might lead to dislocation. The lack of an association between active stiffness, quality of life and overall function may indicate that stiffness plays a less direct role in shoulder stability, reflecting the greater freedom of motion required for effective shoulder motion.

Whole body vibration: the next frontier in exercise rehabilitation?

A review of therapeutic efficacy

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The objective of this study was to review and critically evaluate the past literature for physiotherapist delivered whole-body vibration training (WBVT). Randomised controlled trials were searched electronically and manually from 2002 to December 2009. Study quality was independently assessed by two reviewers using the Physiotherapy Evidence Database (PEDro) scale. Results were summarised in a best evidence synthesis. The search identified 20 studies which met the inclusion criteria. Three studies were conducted in an orthopaedic population, five in a neurological, five in the aged, three in post menopausal women and four in healthy young adults. Studies were of moderate methodological quality (median PEDro score=6, range:4-8). Collectively, there was evidence of improved strength, balance and bone mineral density and decreased pain with WBVT. Strength benefits were similar to those achieved with traditional resistance training. Studies that demonstrated no or little effect typically used frequencies lower than used clinically or recommended by the equipment provider. There is preliminary evidence that physiotherapist delivered WBVT can have therapeutic benefit for a variety of conditions. The comparable efficacy with traditional resistance training suggests WBVT could be a viable alternative for patients who are unable to participate in these programs such as people with osteoporosis. The paucity of studies indicates that further research is required to more accurately quantify the WBVT benefits in these and other clinical populations. In a culture of evidence based-practice this should be a priority for physiotherapy research as WBVT is already widely used and becoming an increasingly popular treatment modality for physiotherapists.

Are people with chronic low back pain less active than people with acute low back pain?

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Evidence-based guidelines advocate graduated return to activity for rehabilitation of people with acute (ALBP) and chronic low back pain (CLBP). However the affect of LBP on activity levels remains unclear. This three month non-experimental cohort study explored free living activity of people with ALBP and CLBP, receiving physiotherapy, at baseline, week six, and week twelve with the RT3 activity monitor. The minutes per day spent in Moderate and Vigorous Physical Activity (MVPA/day) and number of MVPA bouts lasting ten minutes in duration per day were evaluated. The mean (SD) minutes of MVPA/day increased from 55.7 (36.8) at baseline to 61.3 (38.2) at week twelve in the ALBP group (N = 67) and decreased from 52.1 (37.8) at baseline to 45.2 (31.0) at week twelve in the CLBP group. The mean (SD) number of ten minute bouts of MVPA/day peaked at 1.9 (1.8) in week six for the ALBP group. Repeated measures ANOVA found significant interaction between time and LBP group for minutes of MVPA/day, Wilks Lambda = 0.90, F(2, 92) = 5.2, p = 0.007 consistent with a different pattern of change in activity with time by back pain group. Both LBP groups met national activity recommendations for minutes of MVPA/day. However the daily number of 10 minute MPVA bouts did not meet the recommendations in either group during the study. Minutes of MVPA/day was consistently lower for the CLBP group compared to the ALBP group and the minutes of MVPA/day decreased over the twelve week period in the CLBP group despite physiotherapy intervention.

Responsiveness of the RT3 activity monitor to measure change in the free living activity of patients with low back pain.

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Low back pain (LBP) is a common musculoskeletal condition. There is strong evidence for the resumption of activity being an effective intervention in the rehabilitation of LBP. However, until recently the ability to measure a change in free living activity has been limited. This three month non-experimental cohort study investigated the responsiveness of the RT3 activity monitor to measure a change in activity from week one, to weeks six and twelve in patients with acute and chronic LBP. Activity was measured in Mean Vector Magnitude Units/minute (MVMU/min). Change in activity was assessed with a 15 point Global Rating of Change (GROC) scale which runs from -7 to +7. One hundred and eleven LBP patients receiving physiotherapy were recruited. Only between week one and week six was a small positive relationship found between the GROC and the RT3; R² 11.6%, F(1,96) 12.6, p < 0.0005. The GROC scale was then dichotomised into participants who perceived that their activity was better and into participants who thought their activity was no different or worse with two cut point values; +5 and +1. The area under the curve for the GROC cut point five was 0.6 and for the GROC cut point one was 0.73. The minimal clinically important difference for GROC cut point one was 40 MVMU/min with a sensitivity of 0.81 and specificity of 0.42. The RT3 activity monitor was responsive to change. However, the relationship between perceived activity change by participants and an objectively measured change in activity requires further investigation.

Does physiotherapy reduce the incidence of postoperative pulmonary complications in patients following pulmonary resection via thoracotomy? A randomised controlled trial.

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Postoperative pulmonary complications are an important cause of morbidity following thoracotomy and physiotherapy interventions are commonly provided with the aim of preventing and treating these. This study aimed to determine if prophylactic postoperative respiratory physiotherapy reduced the incidence of postoperative pulmonary complications and decreased length of stay in patients following pulmonary resection via thoracotomy. Seventy six patients undergoing elective thoracotomy were randomised to a treatment group (n = 42) receiving respiratory physiotherapy interventions on a daily basis until discharge or a control group (n = 34) who received standard care involving a clinical pathway but no postoperative physiotherapy intervention. Postoperative pulmonary complication data were recorded daily throughout hospitalisation by a physiotherapist blinded to group allocation using a diagnostic tool previously described. There was no significant difference between groups in baseline demographic data or in surgical interventions. Overall incidence of postoperative pulmonary complications was 3.9% (n = 3) and there was no significant difference between the incidence of postoperative pulmonary complications in the Treatment and Control Group (p = 1.00, absolute risk reduction -0.02, 95% CI -0.13 to 0.11). No significant difference was found between groups for LOS (p = 0.87), with the median (interquartile range) length of stay for the Treatment Group 6.0 (4.0) and the Control Group 6.0 (1.0) days. Given the low incidence of postoperative pulmonary complications, these results suggest that prophylactic

postoperative respiratory physiotherapy may not be required in addition to standard care involving a clinical pathway following open pulmonary resection.

Gamma-loop dysfunction contributes to quadriceps activation deficits in people with knee osteoarthritis.

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A consequence of knee osteoarthritis (OA) is an inability to fully activate the quadriceps muscles, a problem known as arthrogenic muscle inhibition (AMI). The purpose of this study was to determine whether quadriceps gamma-loop dysfunction contributes to AMI in people with knee OA. Fifteen subjects with knee OA and fifteen matched controls with no history of knee joint pathology participated in this study. Quadriceps and hamstring torque (Nm) and electromyography (EMG) were collected during maximum effort isometric contractions. Twenty minutes of 50Hz vibration was then applied to the infrapatellar tendon. After tendon vibration, maximum effort isometric contractions were repeated, with torque and EMG collected in an identical manner. One sample t-tests were undertaken to analyse whether percent changes in torque and EMG differed from zero after vibration in each group. Following tendon vibration, quadriceps torque decreased significantly in the control group ($p < 0.05$) but did not change in OA subjects ($p > 0.05$). Hamstrings torque was unchanged in both groups ($p > 0.05$). Similarly, after tendon vibration quadriceps EMG amplitude decreased ($p < 0.01$) in the control group, but was unchanged in the OA group ($p > 0.05$). EMG amplitude of the hamstrings remained unchanged in both groups ($p > 0.05$). The results demonstrate that gamma-loop dysfunction contributes to quadriceps AMI in patients with knee joint OA. This dysfunction may partially explain the marked quadriceps weakness and atrophy seen in these patients, increasing the risk of disease progression and impairing physical function and quality of life.

The recovery of muscle strength and function after anterior cruciate ligament (ACL) reconstruction: Implications for rehabilitation and return to sport.

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Rehabilitation after ACL reconstruction has progressively shifted from more conservative protocols to accelerated rehabilitation programmes that aim to return patients to sport within 6 months. Despite this, there is limited evidence that physical function and muscle strength recover fully in this time frame and ongoing controversy concerning the optimum clinical criteria for return to sport. Thirteen ACL reconstructed patients (10.4 ± 5 months post surgery) and 10 healthy controls participated in this cross-sectional study. Self reported lower limb function, dynamic balance (star balance test), hop test performance and normalised quadriceps and hamstrings muscle strength (Nm/kg*100) were assessed. Limb symmetry indices (LSI) were calculated for the star balance and hop tests by dividing the score on the injured/non-dominant leg by the score on the uninjured/dominant leg. Differences in LSI and muscle strength between the ACL and control groups were analysed using independent t-tests. All ACL reconstructed patients had been cleared to return to sport despite limited objective testing. None had been able to achieve their pre-injury level of sporting activity. The LSI achieved by the ACL group was significantly lower compared to the control group in the star balance ($p < 0.001$) and hop tests ($p < 0.001$). Compared to the control group, the ACL group were 25% and 37% weaker in their quadriceps ($p < 0.05$) and hamstrings ($p = 0.01$) respectively. These findings question the delivery of current rehabilitation protocols and highlight the importance of objective testing in deciding when an ACL reconstructed patient should return to sport.

The immediate effects of neuromuscular electrical stimulation on cortical excitability and grip control in people with chronic stroke

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Impaired grip control is common following stroke. While neuromuscular electrical stimulation is widely used in rehabilitation following neurological injury, its use as an adjunct to improve grip control has not been explored. This study aimed to identify whether a short intervention of neuromuscular electrical stimulation had immediate effects on cortical motor excitability and grip control in people with chronic stroke. Fifteen people with chronic stroke participated. Participants performed a simple grip force tracking task with or without neuromuscular electrical stimulation of the finger flexor muscles. Cortical motor excitability was measured using transcranial magnetic stimulation. Multi-digit grip control accuracy was measured during ramp and sine wave force tracking tasks, and maximal grip strength was measured before and after each intervention to monitor muscle fatigue. No significant differences in cortical motor excitability were found following either the neuromuscular electrical stimulation or voluntary activation intervention. Accuracy during one component of the force tracking tasks significantly improved ($F(1, 14) = 4.701, p = 0.048$) following both interventions. Maximal grip strength reduced significantly following both interventions; after the assessment of cortical excitability ($F(1, 8) = 9.197, p = 0.016$) and grip control ($F(1, 14) = 9.026, p = 0.009$). Short duration force tracking training, either with or without neuromuscular electrical stimulation, did not increase cortical motor excitability in participants with chronic stroke. Short duration force tracking training, both with and without neuromuscular electrical stimulation, did lead to improvements in training-specific aspects of grip control, reinforcing the importance of task-specificity in rehabilitating hand function.

Optimising rehabilitation for older adults with osteoarthritis - accuracy and timing of movement may be as important as muscle strength.

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The incidence of lower limb osteoarthritis increases sharply after the age of 60 often associated with reduced muscle strength. However there is a growing body of literature suggesting that muscle weakness and reduced neuromuscular control are primary impairments predisposing joints to damage, rather than secondary impairments caused by pain and immobility. Joints that are unprotected by accurate and timely muscle activity are vulnerable to cumulative damage during ambulation due to an increase in impact at initial contact. Descent from a step is a common task that produces a large impact and may highlight muscle activity and joint range changes that occur in older adults that help to explain the onset of joint damage. A systematic literature search was conducted using Ovid, Evidence Based Medicine Reviews, Allied and Complimentary Medicine, CINAHL, MEDLINE, PsychINFO and EBSCOhost electronic search engines. Key words used were (Step OR Stair) AND (Climb OR Descent), (Impact OR Ground reaction force OR shock absorption) and (Muscle active* OR muscle contract*) AND (lower limb OR leg). Eligible studies published from 1975 through to the present day were selected if they evaluated any kinematic or kinetic aspects of stair descent in the older or younger population. Results showed an increase in muscle pre-activity and co-activity and a decrease in joint range of motion in older compared with younger adults, leading to an increased rate of joint loading in the older adults. Physiotherapeutic interventions relating to timing and accuracy of movement can address these problems and will be presented.

Hip abductor muscle volume in patients with lateral hip pain: a case-controlled study

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Hip abductor strengthening exercises may be included in the physiotherapy treatment of patients with lateral hip pain (LHP). However, little is known about the changes that occur within the gluteus medius (GMed) and gluteus minimus (GMin) muscles in this patient group, particularly with regard to atrophy. We hypothesised that hip abductor muscle atrophy would be apparent in patients with LHP, and undertook a case-controlled study to determine the mean volumes of GMed and GMin. Ten females with LHP, aged between 43 and 69 years, and 10 age-matched asymptomatic women were recruited. Magnetic resonance images of both hips were obtained. Using an imaging software package (OSIRIX v.3.4) and the Cavalieri method, the volumes of GMed and GMin were estimated for both groups. An unpaired Student's t-test was used to determine significant differences between volumes. Muscle atrophy, particularly affecting GMin, was evident in participants with and without LHP but there was no significant difference in muscle volume between groups (GMed [Right (mean \pm SEM) LHP 217.7 \pm 9.6cm³, Control 231.3 \pm 7.8cm³; Left: LHP 237.3 \pm 12.0cm³, Control 240.6 \pm 10.0cm³] and GMin [Right: LHP 62.9 \pm 5.8cm³, Control 67.2 \pm 3.5cm³; Left: LHP 66.3 \pm 4.9cm³, Control 65.6 \pm 3.0cm³]). This study provides evidence of muscle atrophy in patients with LHP. Further research to investigate the relationship between atrophy, strength and LHP is warranted, using a larger sample. When rehabilitating patients with LHP, physiotherapists should be aware of the potential for gluteal muscle atrophy and integrate this information into clinical practice.

Comparison of immediate effects between single manipulation and single mobilization directed at the thoracic spine in chronic mechanical neck pain

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Mechanical neck pain is a most common disorder in the general population, especially in the working-age group. The economic expense caused by mechanical neck pain is extremely high. Recent studies have shown that either performing thoracic manipulation or mobilization on mechanical neck pain resulted in immediate improvements in symptoms however no study has compared the effectiveness between these two techniques on mechanical neck pain. This study was compared the immediate effects of a single manipulation and single mobilization of the thoracic spine in patients with chronic mechanical neck pain. Twenty four people participated in this study. Participants were randomly allocated into two groups: single thoracic manipulation and single thoracic mobilization. In the single manipulation, participants received the Screw thrust on T6-T7 group whereas receiving the unilateral PA in the mobilization group. Cervical range of motion was measured using a Cervical Range of Motion device and pain with the Visual Analogue Scale, immediately before and after the intervention. Pair t-test demonstrated that within-group, there was a significant increase in range of motion in all directions after performing both interventions ($p < .01$ in manipulation and $p < .05$ in mobilization). In the single thoracic manipulation group there was a significant decrease in pain level ($p = .004$) but not in the single thoracic mobilization group ($p = .07$). There was no statistical significance between groups ($p > .05$) using analysis of covariance. The results suggest that single manipulation and single mobilization directed at the thoracic spine can increase cervical range of motion in all directions in chronic mechanical neck pain.

Head, heart and hands. Creating mindful dialogues in community-based physiotherapy.

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Within community-based healthcare, the interpersonal relationships between physiotherapists and their family care teams are more complex than has been previously acknowledged. In this qualitative study, semi-structured home-based interviews were held with physiotherapists and family care teams of people with chronic and complex healthcare needs within New South Wales, Australia.

Methodologically, hermeneutic phenomenology was used to explore the lived experience of the relationships that develop between physiotherapists, clients and their family care teams. Analysis of data reveals that participants use sophisticated ways to make meaning of the way in which person-centred care within community settings is enacted and evolves as people allow their therapists to learn about them within their home and community. These sophisticated ways of making meaning involve complex usages of language, such as poetic expression and metaphor. In addition, physiotherapists use composite forms of attention to enhance communication and interaction with their clients. The importance of an emotional connection within the developing relationship to achieve wellbeing for clients and members of the family care team is also under-appreciated. A deeper understanding of these issues within physiotherapeutic interactions may contribute towards the development of enhanced therapeutic relationship skills in undergraduate physiotherapy education and in the continuing professional development of those skills for practising physiotherapists in community-based healthcare.

Cortical excitability following wrist extension exercises augmented with electrical stimulation in chronic stroke participants

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Exercise augmented with electrical stimulation can enhance function in people with stroke and increased cortical activity may be a mechanism in this process. This study compared the effects of three exercise regimes on cortical motor excitability in 14 chronic stroke participants. Cortical excitability was evaluated by measuring the amplitude of motor evoked potentials (MEPs) from transcranial magnetic stimulation to the motor cortex supplying the wrist extensors. All participants completed three exercise sessions of 60 wrist extension contractions as follows: (1) voluntary resisted wrist extension, (2) electromyography-activated electrical stimulation combined with voluntary resisted wrist extension (3) automated electrical stimulation to the wrist extensors. MEP amplitude was assessed prior to the intervention and 0, 5 and 10 minutes following the intervention. Across all three exercise protocols, MEP amplitude was significantly increased five minutes after the intervention compared to immediately following the intervention ($p < .05$). However, there was no difference in MEP amplitude between any of the individual exercise protocols. While results from similar studies in healthy adults have indicated an increase in cortical excitability following electrical stimulation combined with voluntary muscle activation, our results indicate that a single session of augmenting wrist exercises with electrical stimulation does not enhance cortical activity in this population of stroke survivors.

The risky business of lifting infants: factors associated with musculoskeletal disorders experienced by mothers

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Physiotherapists commonly treat mothers with musculoskeletal disorders (MSDs). Despite a well recognised association between MSDs and lifting, there is little evidence about treating injuries arising from lifting infants. This quantitative study investigated the risk factors for MSDs associated with lifting infants in the home, using the Sanders and Morse Ergonomics of Caring for Children Survey and an observation checklist, which allowed factors related to the load, the mother, the environment and the task to be rated as low, medium or high risk. Rating criteria were derived from the current ergonomic literature. Twenty-five mothers with one or two infants weighing between 9-15kg (n=30) were recruited via a snowball method. Risk factors identified from 87 structured observations were: that infants present a challenging load, that infant-related lifting tasks involve extended horizontal and vertical lift distances, frequent twisting and side-bending, lifting while seated, an externally controlled work pace, and a home environment with obstacles, varying floor surfaces, stairs, slopes and confined lifting spaces. Individual factors include mismatches between mothers' strength and fitness and the lifting requirements, pre-existing pain or injury, pregnancy, and fatigue. The tasks mothers identified as most physically stressful, such as 'bending while carrying a child', were those with high levels of observed risk and could explain their reported musculoskeletal pain. Given that a notable number of risk factors for MSDs are present when mothers lift their infants, physiotherapists may benefit from incorporating evidence from this study into their assessment, treatment, and prevention advice when working with mothers.

Electromyographic response of shoulder muscles to experimentally-induced sub-acromial pain

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This research investigated electromyographic (EMG) shoulder muscle response to experimentally-induced sub-acromial pain, induced via injection of 2.0mL of 5.0% hypertonic saline in 20 healthy participants (aged 18-31 years). Fine wire EMG was used for subscapularis, supraspinatus and rhomboid major muscles, and surface EMG for middle deltoid, upper trapezius, lower trapezius, infraspinatus, and serratus anterior. Muscle activity was recorded during a standardized humeral elevation task in conditions with and without shoulder pain. Block randomization of pain by gender was used to determine the order of testing. EMG and video kinematic data were simultaneously collected during the 5 repetitions of humeral elevation. The MVC-normalised mean amplitude of each muscle for four phases of elevation (rest-30°, 30°-60°, 60°-90°, 90°-120°) was used for data analysis. Median frequency data was also collected for the entire elevation task for each muscle. One-way Analysis of Variation was used to determine differences between muscle activity in the pain and no pain condition during the 4 phases of elevation. Paired t-tests compared median frequency of each muscle between the two conditions. The mean amplitude of muscle activity was not significantly different between the pain and no pain conditions for any muscle during any phase of humeral elevation. Median frequency of activation was significantly different between the pain and no pain conditions for deltoid, supraspinatus, and infraspinatus. The EMG changes suggest shoulder muscles shift toward slow-twitch motor-unit recruitment relative to pain location. Analgesic clinical interventions in shoulder rehabilitation are substantiated through this research.

Posters

Are physiotherapists who work with females with chronic cough asking about urinary incontinence?

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Patients with chronic cough are at significant risk of developing urinary incontinence (UI) which often leads to exercise avoidance and cough suppression. It is widely acknowledged that screening for UI should be integral to the routine care of those with chronic cough. The purpose of this study was to gauge current physiotherapy practice in New Zealand and ascertain if physiotherapists ask female patients with chronic cough if they experience UI. A survey was developed and sent to physiotherapists working in District Health Board hospitals. The survey was divided into age-specific patient groups and each eligible physiotherapist was asked to identify how frequently they asked about UI in each group. 122 surveys were distributed and 78 were returned; totalling a 64% response rate. The overall trend was that physiotherapists were more likely to ask about UI as patients got older. Of the patients older than 50 years, 14% were always asked about UI. However, no children in the 5-10 group were asked about these symptoms all of the time. These findings demonstrate that physiotherapists do not routinely ask their respiratory patients about urinary incontinence but are more likely to as patients age.

Reliability, precision, and validity of shoulder proprioception measurement using Biodex System 3

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Proprioception is assessed by active and passive joint position sense (AJPS, PJPS), kinesthesia (threshold to detect passive motion direction, TTDMD) and force sense reproduction (FSR). This study determined the reliability and validity of these variables using the Biodex System 3. Thirty uninjured individuals (mean age 25.3 yrs), and 9 individuals (mean age 25.6 yrs) with recent shoulder injuries participated in the study. Test-retest reliability was determined for both shoulders of uninjured participants on two occasions. Intraclass Correlation Coefficients (ICC_{3,1}), and standard error of measurement (SEM) were calculated for the test-retest analysis. Variables of the injured shoulder were compared to the dominant side of the uninjured participants (Mann-Whitney U test). 'High' to 'very high' reliability was found for dominant and non-dominant side TTDMD (ICC_{3,1}: 0.87 and 0.92) and 'high' reliability for PJPS (ICC_{3,1}: 0.72 and 0.79), whereas 'moderate' to 'high' reliability was found for AJPS and FSR for the dominant side (ICC_{3,1}: 0.68 and 0.75). The SEM for AJPS and PJPS were 1.36° to 0.98°, and for TTDMD and FSR 0.15° and 0.60 Nm, respectively. AJPS, TTDMD and FSR differences between injured shoulders and dominant sides of the uninjured group were not significant (p >0.05). However, the PJPS was significantly higher for the injured shoulders (p=0.016). Our results indicated "high" test-retest reliability for PJPS and have demonstrated that this variable may distinguish between injured and uninjured participants.

Reliability of hand-held dynamometric strength testing in people with diabetes /chronic conditions

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This study determined the intra- and inter-tester reliability of lower and upper limb muscle strength for participants with diabetes mellitus and other chronic conditions using a newly

designed hand-held dynamometer.* Thirteen adults (aged 67.15 ± 6.11 years) with diabetes mellitus/chronic conditions were recruited from the Diabetes Community Exercise Programme, University of Otago, Dunedin. One registered physiotherapist and two final-year physiotherapy students measured the maximal isometric strength of the knee extensors at 60° knee flexion and elbow flexors at 90° elbow flexion. The registered physiotherapist retested the measurements during a second session. Intraclass Correlation Coefficients (ICC_{2,1} and ICC_{3,1}) and the 95% confidence intervals (CI) were calculated to define relative reliability between testers and between test-retest sessions respectively. The standard error of measurement (SEM) and smallest real difference (SRD) was quantified for the test-retest data, and expressed relative to the group mean (SEM%

and SRD%). ICC_{3,1} (95% CI) for test-retest agreement was 0.98 (0.95-0.99) and 0.94 (0.77-0.98) for the knee extensors and elbow flexors respectively. ICC_{2,1} for inter-tester agreement was 0.95 for knee extensors, and 0.83 (0.56-0.94) for elbow flexors. The SEM for re-tests for knee extensors was 1.45kg (SEM %: 5.59%) and for elbow flexors 2.17 kg (SEM%:10.11). SRD was 4.03kg (SRD% 16%) and 2.85kg (SRD%: 28%) for knee extensors and elbow flexors respectively. The IRL dynamometer demonstrates "high" to "very high" intra- and intertester reliability in people with diabetes/chronic conditions. This study provides guidelines for minimum clinical differences for muscle strength of clients with chronic diseases.

* Industrial Research Limited (IRL), Christchurch, New Zealand.

LETTER TO THE EDITOR

Re: The Future of the New Zealand Journal of Physiotherapy

Dear Editor,

I would like to commend Haxby Abbott, retiring Editor of the NZ Journal of Physiotherapy (NZJP), for the well balanced article he wrote titled "The Future of the New Zealand Journal of Physiotherapy" which was published in the March issue of NZJP (Abbott 2010).

I feel it is absolutely imperative that the National Executive proceed with a great deal of caution in relation to this proposed "merger" of the NZJP and the Australian Journal of Physiotherapy (AJP), now named the Journal of Physiotherapy (JoP).

The NZJP regularly publishes quality articles and commentaries that are relevant to our jurisdiction which would be of little interest to our Australian counterparts. New Zealand representation on the Editorial Committee of the JoP would only mitigate this risk if they had significant voting power. Haxby has outlined an excellent table of the pros and cons of the "merger" in his article.

I would encourage all members to take time to read Haxby's article and to be proactive in the NZSP consultation process, which I am sure will now take place under the capable leadership of Gill Stotter.

Kirsten Davie

Abbott JH (2010): The future of the New Zealand Journal of Physiotherapy. *New Zealand Journal of Physiotherapy*. 38(1):1-6

A prospective, randomised trial of immediate exercise following lumbar microdiscectomy: a preliminary study

Newsome RJ, May S, Chiverton N and Cole AA (2009): A prospective, randomised trial of immediate exercise following lumbar microdiscectomy: a preliminary study. *Physiotherapy* 95: 273-279. (Abstract prepared by Jody Watson)

Background: Patients with disc herniation do not usually respond to non-operative therapy. Microdiscectomy is generally regarded as the gold standard for surgery and has been shown to result in shorter operative times, quicker return to work and similar long term outcomes compared to more aggressive forms of surgery. Currently, multiple post-operative regimes are used in hospital settings, most of which contain exercise programmes, but few commence immediately post-surgery. With increasing cost pressures on health care systems it is important that regimes are as effective as possible with the aim of reducing length of stay.

Aim: To assess whether commencing exercises immediately following lumbar microdiscectomy enabled patients to become independently mobile earlier with no increased risk of complications.

Methods: Thirty patients were recruited who met the inclusion criteria of first-time single level lumbar microdiscectomy; failure to respond to conservative treatment; and magnetic resonance imaging revealed a disc prolapsed at a level consistent with symptoms. Exclusion criteria were: previous discectomy; more than one level indicated; and emergency cauda equina surgery. Participants were randomly allocated to either the intervention (n=15, 46% male, median age 38) or control (n=15, 73% male, median age 37) group. Those in the intervention group commenced exercises within 2 hours of surgery beginning with bed exercises, progressing to mobilising out of bed within 5 hours, and becoming independent as they felt able. The control group did not receive bed exercises but did mobilise within 4-5 hours of surgery. Both groups were given the same standard exercise and advice sheets. Outcome measures included the time taken to become independently mobile, time to fulfill discharge criteria and return to work, along with the Oswestry Disability Scale, Visual Analogue Scale and the Short Form McGill Pain Questionnaire. Measures were taken before surgery, and 4 weeks and 3 months post-surgery.

Results: The intervention group became independently mobile earlier than the control group (median 7 hours, compared with 19 hours for control group) and if employed, returned to work more rapidly (median 6 weeks, compared with 8 weeks for control group). At 15 hours post-surgery 80% of the intervention group were independently mobile compared with only 40% of the control group. Pain and disability scores were similar in both groups with improvement after surgery. One revision occurred in each group which is consistent with reported revision rates.

Conclusion: The authors suggest patients undergoing microdiscectomy should begin bed exercises within 2 hours of surgery and become independently mobile the same day. This may lead to improved health outcomes, decreased length of hospital stay and reduced costs to health care.

Commentary

It has been suggested that microdiscectomy is the gold standard for surgical treatment of lumbar disc herniation (Apostolides et al 1996), a problem that likely represents no more than 5% of the back pain population (Adams et al 2006). Anecdotal evidence suggests that most surgeons in New Zealand tend to only provide restrictive advice following microdiscectomy, i.e., outlining movements that patients are not allowed to perform, for example, flexion (www.healthpoint.co.nz; www.orthopaedicsurgeon.co.nz). They may also prescribe progressive walking programmes aiming for independence as soon as possible post-operatively, followed by a gradual increase in activity as tolerated, returning to work as soon as possible. Some surgeons will recommend outpatient physiotherapy, if required, a few weeks post-operatively.

This preliminary study highlights the input that physiotherapists can provide in the immediate post-operative phase following microdiscectomy. The authors accept that the sample size is small, although in the discussion they state they have used the immediate exercise regime in over 2000 patients since the trial, with promising results. The exercises used in this study are simple to teach to patients and straightforward for patients to perform. They involved the physiotherapist passively flexing the patient's hip and knee towards his/her chest within the available range and tolerance. This movement was repeated 10 times on one lower limb and then the other. The patient was then encouraged to perform these exercises every 30 minutes.

Although those in the intervention group became independently mobile, and returned to work earlier than those in the control group, no significant differences in traditional questionnaire-based outcome measures were reported, or any difference at the 3 month follow-up. While this study provides evidence for short-term benefits, no comment can be made on long-term outcome. The authors discuss the possibilities of further research and suggest that earlier outpatient physiotherapy may be required. Given the skills that physiotherapists have in pain management, exercise prescription and rehabilitation, further research into continuing care post-microdiscectomy would be beneficial.

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Mechanisms and Management of Pain for the Physical Therapist. Kathleen Sluka (Editor). 2009. IASP Press, Seattle ISBN 978-0-931092-77-0, soft cover. 394 pages. 90.00 US\$

The editor of this book, Professor Kathleen Sluka, is a physiotherapist and internationally recognized pain researcher who sits as a councilor for the International Association for the Study of Pain (IASP). She has made an outstanding contribution to her profession, having published over 100 peer-reviewed journal articles focusing on the neural mechanisms of musculoskeletal pain and its treatment by physiotherapy interventions such as TENS and manual therapy. As outlined by Sluka, the purpose of this book is to provide students and clinicians with an up-to-date and comprehensive education in pain management, as recent advances in pain research continue to outstrip the minimal coverage this topic receives in undergraduate physiotherapy courses.

The book is divided into 4 sections that are further subdivided into chapters, with contributions from 13 different authors. Section 1 starts by presenting the basic definitions and models of pain before outlining the neurophysiological mechanisms involved in pain processing and modulation. This includes some detail on the neurotransmitters involved and importantly, emphasises the neuroplastic changes that occur within the nervous system following tissue damage. Finally, differences in pain processing are explored with respect to genetics, gender, age, ethnicity and psychological traits. Section 2 is specifically concerned with physiotherapy pain management and includes chapters on pain assessment, exercise induced analgesia, TENS and manual therapy. For each of the modalities included, a review of the known neurophysiological mechanisms is presented and some key clinical considerations are discussed. Section 3 deals with interdisciplinary pain management with a focus on chronic pain and includes chapters on the medical treatment of pain (including basic pharmacology) and psychological approaches to pain management. Section 4 is divided into a series of chapters dealing with the pain arising from specific pathologies/syndromes. These include myofascial pain and fibromyalgia, temporomandibular disorders and headache, spinal pain, neuropathic pain and pain associated with arthritis. Finally, a series of 10 case studies bring the book to a close. Each case study begins by outlining the key subjective and objective assessment findings. From these, patients are dichotomized as displaying primarily a peripheral component to their pain, primarily a central component, or both, and a treatment plan is provided accordingly.

This book provides a well balanced, contemporary overview of a complex topic. It is set out in a logical manner and is well indexed, making it easy to read and navigate. This is further enhanced by the use of diagrams and tables to supplement the text.

The book has a broad scope, covering a range of relevant topics and emphasizing a biopsychosocial understanding of pain – that pain does not simply depend on nociceptive signals but is strongly influenced by psychological and sociocultural factors. In general, the earlier sections on pain mechanisms and physiotherapy management provide sufficient detail without obscuring the key, take home messages. However, as with many edited texts, the quality varies somewhat from chapter to chapter. In addition, the pathology specific chapters in section 4 seemed brief and read a little like a Cochrane review – providing a general overview of each topic while missing some of the subtleties that may be useful for clinicians. Nevertheless, the core principles in the text are sound and Sluka's evidence based bias is a real strength of this book, enabling the reader to make informed clinical decisions to enhance pain management.

Overall, this is an excellent text for physiotherapy students and a valuable resource for clinicians wanting to improve their understanding of pain mechanisms and its effective management.

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Essentials of Law for Health Professionals (3rd ed.) Forrester, K. and Griffiths, D. 2010 Mosby Elsevier. ISBN978-0-7295-3915-9. Softcover. p. 386. \$69.00 NZD

Increasingly, health professionals are aware that a working knowledge of relevant law is essential for best practice and peace of mind. Ideally the law is used preventively, to avert disputes through education. *Essentials of Law for Health Professionals* has great potential to achieve this goal by addressing legal issues that may arise in practice in Australia. Undoubtedly, it is welcomed by health professionals, educators and health administrators. While the content is not specific to physiotherapists, it is certainly relevant to them.

The text is structured in 5 sections: introduction to law for health professionals; legal concepts for health professionals; life and death issues; and working within the law. Designed for students of health studies, each chapter usefully lists learning objectives, review questions and activities that guide discussion. The case law summaries, tables of comparative legislation, and guides to further reading (including websites) are very informative. (Additional resources for case law, legislation and journal articles in Australia is www.austlii.edu.au and in New Zealand is www.nzlii.org).

Rather than simply focusing on patient disputes, the book offers legal information on a broad range of issues that health professionals may encounter, from management of health information to employment contracts. Of equal importance to professionals in training, it is affordable. Publication of a concise but comprehensive legal textbook for non-lawyers is an ambitious task, given Australia's 6 states and 3 mainland territories. The authors reported that they "attempted to state the law as it currently exists in many Australian jurisdictions". Rather than relying on the text as a comprehensive manual of health law in all jurisdictions, it may be advisable for educators to supplement the text with additional legal information that is relevant to their jurisdictions.

As nurses with advanced degrees in law and doctorates, Forrester and Griffiths are expertly positioned to publish this third edition. The authors adopt simple English to explain the relevance of the law in a practical fashion. While less relevant to foreign audiences, the book is a valuable resource for international comparisons. The authors have admirably translated the complex discipline of health law for practitioners. As a result, this publication will greatly benefit health professionals and those they serve.

NB: An error was detected in the case summary regarding professional discipline of a New Zealand nurse, Lesley Martin. Subsequent to the events reported in the book at p. 232, the Professional Conduct Committee appealed the decision of the Health Practitioners Disciplinary Tribunal to the High Court. The appeal was allowed. The tribunal's orders were reversed and the nurse's registration was indeed cancelled: *Professional Conduct Committee v Martin* (High Court, Wellington, CIV-2006-485-1461, 27 February 2007).

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Atlas of Acupuncture. English First edition 2008. Focks, C 2008. Churchill Livingstone Elsevier. ISBN-10:0443100284. Hardcover: 733 pages

The Atlas of Acupuncture edited by Dr Claudia Focks is a comprehensive pictorial anatomical atlas. This large hardback atlas has been translated into English by J Schuster from the German *Atlas Akupunktur* and has contributions from U Marz and I Hosbach. The naming and description of the acupuncture points follows the Traditional Chinese Medicine (TCM) format.

A key component of any anatomical atlas is the quality of the illustrations. While the anatomical photographs are in black and white they have been professionally taken and are clear and easily viewed. The lack of colour does not detract from the quality of the illustrations. A number of the photographs have been overdrawn to emphasise the proximity of structures that lie under the skin. These drawings have been made in clear fine print and enhance the understanding of the anatomical structures. Aside from the anatomical photographs, additional drawings are in a combination of blue, black and white. This remains consistent throughout the book and all illustrations are of an excellent quality.

The first three chapters offer an introductory overview to TCM. The first chapter provides a broad explanation of the channel systems and energy flow. This description is based on the TCM philosophy. The second chapter provides a detailed description of the measurement system used in acupuncture. The third chapter presents an anatomical orientation to the body. While this may be a useful refresher, most physiotherapists are likely to find this chapter of limited value.

The fourth, fifth and sixth chapter present the major theme of this book; the anatomical presentation of each acupuncture point. A channel description and clinical relevance of the channel is provided prior to a description of each acupuncture point along the described channel. There is a full page devoted to each acupuncture point. Each page has three distinct sections, the anatomical photographic section, the description section and a legend section. Often two or more photographs are presented to assist in exact point location. These are always clear and well labelled. The text description of each point offers the reader the Chinese name and English translation, an anatomical location, a description of how to find the point, a needle direction guide along with actions, indications and special features of the point. Along the side of the page is a handy pictorial legend that highlights seven key features of each point. The legend provides a quick reference for important aspects of the acupuncture point. An example is a picture of the lung with an exclamation mark over the lung indicating where care needs to be taken when needling due to the lung lying under the acupuncture point. In summary the presentation of each acupuncture point is comprehensive and of value to practitioners who are new to acupuncture.

Chapter seven provides an additional sectional anatomical illustration of the major points according to body location. Chapter eight describes the acupuncture points according to their traditional orientation and continues the standard of high quality illustrations. Chapter nine, the final chapter presents a narrative description of scientific studies of specific acupuncture points, but not acupuncture treatments. This chapter provides a quick reference guide to studies involving individual acupuncture points. However a more detailed critical review of the studies would be needed before an appreciation of the effectiveness of the results could be made.

The book contains a one page appendix that identifies some inconsistencies related to different interpretations

of TCM. The Bibliography fails to include studies identified in Chapter nine, the research chapter. This omission is a significant error in the book and I am unclear why this has been made. Finally a comprehensive index lists all acupuncture points with both the numerical and Chinese names as well as a list of the conditions contained in Chapter nine.

In conclusion this well illustrated anatomical text may appeal to beginner acupuncturists with an interest in the traditional philosophies of acupuncture. However for physiotherapists requiring a Western Acupuncture approach this anatomical atlas is likely to be of limited value. Specifically there is a lack of information regarding neurophysiology and in particular the nerve supply of acupuncture points. These are key concerns for Western acupuncturists. Fortunately there are a number of acupuncture anatomical atlases that already provide this necessary information.

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Pelvic Floor Disorders. Kotarinos R & Ariail A. 2009. Primal Pictures Ltd. DVD-ROM (PC and MAC) - single user license only. 145.00 GBP

The use of video, sound, and computer-generated graphics in instructional education has been commonplace for more than 20 years now. In health care, these can often add extra value because they bring to life the images on the page and offer some visual sophistication to the viewer. This DVD attempts to do this by offering an educational tool for those interested in pelvic floor disorders.

The authors of the DVD are both physical therapists. Rhonda Kotarinos has had several articles published in the area of physiotherapy approaches to pelvic floor dysfunction, including chronic pain and its myofascial origins, and Allison Ariail has a published case report article on the use of transabdominal ultrasound imaging in retraining pelvic floor muscles of a post-partum woman.

The title 'Pelvic Floor Disorders' adequately describes the content of the DVD-ROM but doesn't emphasise the marvellous visual content of the 3 dimensional anatomical graphics. The visual content is a great strength of this item.

The purpose of this DVD-ROM is to act as both an educational and teaching tool for clinicians who may wish to present the topics using slides and anatomical illustrations. There are detailed models of the pelvis, pelvic floor muscles, reproductive system, urinary and digestive systems, bone regions, surface markings and nervous systems. It is an invaluable guide to anatomy, diagnosis, treatment and rehabilitation of commonly presenting pelvic floor disorders. The audience who would most benefit from this would range from undergraduate to post-graduate students and practitioners in the medical and physiotherapy professions. It would also benefit those teaching about pelvic floor conditions.

The DVD is easy to navigate. It has a clear structure and well laid out subject headings. Once into the individual sections finding my way through the various options again seemed quite intuitive. The hovering and naming of items was useful.

The content of the subject matter is comprehensive and combines the excellent anatomical images with up to date and relevant written coverage of the conditions. The written text is frequently referenced to relevant sources and doesn't offer advice that has not been well researched. The anatomical images can be rotated, with the ability to add or subtract layers of anatomical detail. All anatomical structures are labelled when hovered over.

The clinical information section is well researched and seems to be in keeping with the advice offered at the most recent International Consultation on Incontinence (2009).

The patient information section connects via the internet to the Primal Information site. This has some good practical tips of how to manage pelvic floor disorders again with some great diagrams, and the ability to customise advice for the patient. However I don't think this advice should be used on its own but would serve as an adjunct to a professional clinical assessment, analysis and supervised, progressed treatment plan.

As a clinician and a teacher I feel quite excited about this product and will surely use some of the images as a teaching adjunct. I think physiotherapists will love the visual nature of this DVD-ROM both for clarifying anatomical detail to themselves and informing others.

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Functional Anatomy of the Spine. (2nd ed.) Middleditch, A. and Oliver, J. 2005. Butterworth-Heinemann (Oxford). ISBN 0750627174. Softcover, 359 pages. RRP NZ\$115

The authors of this publication state that they sought to provide a book on 'functional anatomy of the spine' to fill the niche they found while undertaking their own postgraduate studies in physiotherapy. Indeed, few books are available that address this broad and complex subject area. This book was originally published in 1991, with the current version being updated and revised to 'identify new and relevant literature'. The authors recommend the text to physiotherapists and other health professionals working in the field of musculoskeletal medicine.

'Functional Anatomy of the Spine' (2nd ed.) is easy to read, with clear text and headings that are easy to access. Topics seem to be appropriately ordered, and the content of the book flows well, being logical in order and clearly written. Diagrams have been retained from the earlier edition and the artwork has been improved into a much clearer style and presentation. However, the art work is all drawn and there are no plates or photographs in the book.

Examination of the references from the previous edition indicates that minimal changes have been made since the 1991 edition. Indeed in many chapters, less than five percent of references were new with many authoritative authors and papers being absent from a number of chapters. Since one of the stated purposes of this new edition was to include 'new and relevant literature', it was disappointing to reveal such large gaps in the included material. In addition to this lack of material, it was disappointing to find many generalisations in the text which were not supported by references. Some of the statements were, in fact, so broad that this significantly undermines the academic credibility of the book. Many diagrams simplified and portrayed their subject matter in a way that was either incorrect or marginal, especially in the interpretation of accepted anatomical representations, most of which can be easily found in recognisable texts. Maintaining the same diagrams (from the first edition) has undoubtedly made this second edition easy to reproduce, however I feel that such a book would benefit from better artwork and visual media.

I hesitate to recommend this book to practising clinicians or students. While it covers a large range of material and generally presents such information clearly, my concern is the nature of the content itself, which in my view indicates the book is not as 'up to date' as it claims. It may be useful as a quick point of reference to provide a broad, easy to read outline of a topic, however, it should not be used as a reliable source of contemporary understanding in relation to functional anatomy of the spine.

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Clinical Education in the Health Professions. Clare Delaney, Elizabeth Molloy (eds) 2009. Churchill Livingstone. ISBN: 978 0 7295 3900 5 (pbk). 193 pages. RRP NZ\$99.43

"Clinical Education in the Health Professions", as the title suggests, is written with clinical educators as the intended audience. The book brings together a timely and cogent series of contributions from authors recognized as leaders in contemporary clinical education. The purpose of the book is to invite readers, using a range of up-to-date references, to consider their current education practices, and compare them with suggested best practice. Physiotherapy clinical education is drawn upon frequently to illustrate modern educational approaches, reflecting the professional origins of most of the authors.

The book is divided into three sections: knowledge construction, communities and cultures of practice, and teaching and learning practices. Within each of these sections, which flow logically from one to the next, are some real gems for clinical educators. For example, an action plan to integrate personal, cultural, and institutional factors of both student and educator is outlined. There is an emphasis on how students position themselves in a new workplace, and suggestions on how clinical educators can facilitate that positioning. Also, there are good examples of how interprofessional education activities might work, and some practical examples of how feedback with a student may be enhanced.

The writing style of contributors is variable. Some chapters are heavy on academic-speak, which make them less palatable to the pragmatic approach of most clinical educators. The majority of chapters, however, should provide easier reading to anyone who aims to affirm or improve the clinical education of students. The contribution on clinical competence, framed in an Australian context, fails to address indigenous health education issues in any way, rather focusing on supporting immigrant students. Otherwise, all of the chapters are very relevant to a New Zealand audience.

One could be tempted to skip straight to the final few chapters, in particular those on clinical reasoning, feedback, and assessment, because therein lie the best tips for practice enhancement. However, the understanding of concepts in these final chapters is underpinned by preceding sections, so it is recommended that readers familiarize themselves with the theories presented throughout the book. Overall it is a good read, and well worth purchasing as a relevant and up-to-date reference for all clinical educators.

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