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2010
Volume 5, No. 1

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The worldwide mission of The McKenzie Institute® International is to further the philosophies for musculoskeletal disorders developed by Robin A. McKenzie of New Zealand. The philosophies and treatments are know internationally as the "McKenzie Method® of Mechanical Diagnosis and Therapy®."

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- **Educating health care providers in the principles and practical application of Mechanical Diagnosis and Therapy, as developed by Robin Anthony McKenzie.**
- **By research and study of musculoskeletal disorders and back care treatment generally, and in particular in reference to the McKenzie Method.**
- **To promote and support research that will advance the knowledge, skill and treatment of mechanical disorders of the spine.**
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On the Cover: *The Bronze Lady*

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Editorial

Helen Clare, Editor-in-Chief

2010 and a new direction for MDT education

MDT for spinal disorders has reached a level of maturity and worldwide recognition. Whilst some continue to dispute its level of efficacy, the support from the research ensures that its importance cannot be denied.

There is now a general acceptance of the need to determine specific sub groups within the broad category of non-specific spinal disorders. Robin McKenzie was ahead of his time when he advocated this recognition of "like" groups of patients with low back pain. Some forty years later, when hundreds of clinical trials have failed to demonstrate significant differences in outcomes, when generic treatments are provided to patients with low back pain, the identification of "like subjects" has become the "holy grail".

The reliability of the MDT classification of spinal disorders is well documented.

It is time, however, to move forward and establish the reliability of the MDT classification and the efficacy of the MDT treatment approach in the extremities.

Whilst we are comfortable with a non-anatomical classification with spinal disorders, the use of a non-pathological/non-anatomical diagnosis in extremity musculoskeletal disorders is very foreign for clinicians. Historically, our training has been based on the determination of an anatomical lesion, e.g. meniscal tear, ligament strain, tendon impingement. We typically feel very confident that our armoury of clinical tests allows us to make a tissue-specific diagnosis. However, the research literature now questions the reliability and validity of a number of these clinical tests. Diagnosing based on radiological findings has also been found to be wanting, with numerous studies showing poor correlation between the presence of pathology and the presence of signs and symptoms. Hence, our reliance on a tissue-specific diagnosis needs to be questioned.

The use of MDT principles in the treatment of extremity disorders is not new. Robin McKenzie has encouraged clinicians for decades to take the same principles used for spinal disorders and apply them to the extremities. With the passage of time, and some trial and error, extremity MDT is gaining acceptance. The publication of the Human Extremities - Mechanical Diagnosis and Therapy in 2000 formalised the concepts and provided a frame work through which clinicians learn. It is time for the MDT principles, as they are applied to the Extremities, to become an integral part of the McKenzie educational program. During 2010, MDT for the lower limb will be introduced in the Part C course and MDT for the upper limb will be introduced on the Part D course. This will ensure that clinicians are introduced to the use of MDT in the extremities early in their training and as a result have greater confidence in applying it in their clinics.

The volume of research on the reliability and efficacy of MDT with extremity disorders is limited at this time. In this era of evidence based practice, this can pose a concern for us as clinicians. However, we must remember that, historically, most medical and physiotherapy treatments were developed and utilised clinically, well before the research was done to support their use.

Robin McKenzie did not wait until the evidence was available to support MDT for spinal disorders before he introduced the concept to clinicians. The research to support the outcomes achieved in the clinic followed many years later. The same pathway needs to be followed for the extremities. Clinicians need to be introduced to the concepts and they will have the opportunity of establishing its value and usefulness in their own working environment. From there, the ideas for research studies will be developed.

Importantly, we need you, the clinicians, to "share" your clinical experiences, to raise questions about clinical responses and to discuss how the MDT principles in the extremities may be further developed. The IJMDT is the ideal forum for this exchange, be it through single case studies, case series or more formal research. I encourage you to put pen to paper and share in the dissemination of the use of MDT for extremity disorders.

Expressions of Interest
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Have you considered being part of the team which ensures that this Journal is published?

The Journal of Mechanical Diagnosis and Therapy has been in existence for five years. The current review committee has done a superb job during that time assisting authors with their submissions and ensuring that material accepted for publication is of a consistent standard.

There is a need to expand the panel of reviewers and to appoint a team of sub-editors, who in time would rotate into the role of Editor. Involvement by an expanded team will ensure a lighter workload for all involved.

Interest and enthusiasm are the primary requirements, as assistance with the other requirements will be provided.

If interested or if you have any questions, please contact me at clare.ha@bigpond.com.

Helen Clare
Editor IJMDT

An observational study of centralization and directional preference in older patients with back pain

David Oliver, PT, BSC and Stephen May, PhD

Abstract

Study Design: A multi-centred observation study.

Objectives: To determine the prevalence of centralization and directional preference in the older population with back and/or leg pain. A secondary objective was to identify if there was a relationship between imaging findings and the presence of centralization and directional preference.

Methods: One hundred fifty consecutive patients aged 65, and older, were given a routine mechanical evaluation according to McKenzie's principles of Mechanical Diagnosis and Therapy by four clinicians trained in the approach, at three locations in the USA. Anonymous data was collected following the mechanical evaluation on age, gender, McKenzie syndrome classification, centralization, directional preference and imaging findings supporting a medical diagnosis when present.

Results: Mean age of patients was 76 years; 51% were female. One hundred thirty-one of the 150 (87%) patients were classified as derangement; none were classified with dysfunction or postural syndromes. Centralization was recorded in 21% of patients, and directional preference in 87%. Seventy-eight (52%) of patients had imaging studies: 20 (13%) had disc pathology, 27 (18%) degenerative changes and 23 (15%) spinal stenosis. Of these 65, ninety-three percent were classified as derangement and had a directional preference. Eight had no structural pathology identified.

Conclusion: The prevalence of centralization appears to be less in the older population; however, the prevalence of directional preference remains high. The presence of imaging findings of disc herniation, degenerative findings or spinal stenosis appears to be independent of the presence of centralization and directional preference.

Key Words: Centralization, Directional Preference, McKenzie Method

Introduction

In the assessment of patients with spine pain, it is useful if indicators of a good response to a particular intervention can be identified in the initial physical examination. A number of symptomatic and mechanical responses identified during the initial physical examination of patients with spine pain have been identified as useful indictors of good prognosis (Aina et al 2004, Tuttle 2009).

Centralization, which is defined as the lasting abolition of distal pain in response to repeated movements or sustained postures, has correlated with good short and long-term outcomes (Werneke et al 1999, Werneke and Hart 2001, Aina et al 2004). Conversely, failure to achieve centralization has correlated with poor long-term outcome (Werneke and Hart 2001). Decreased pain and increased range of movement during the initial evaluation have also been associated with long-term improvements in pain and function (Tuttle 2005, Hahne et al 2004, Tuttle 2009).

Directional preference (DP) encompasses repeated movements or sustained posture that produce centralization or other therapeutically beneficial responses, such as decreased symptoms or increased range of movement (McKenzie and May 2003). Treatment with DP exercises has demonstrated clear superiority over non-specific exercises in the short-term (Long et al 2004, 2008).

The prevalence of these findings has been shown to be quite high in the back pain population. In a systematic review, centralization was identified in 70% of 731 patients with sub-acute and 52% of 325 patients with chronic low back pain (Aina et al 2004). In a randomised controlled trial, DP was identified at the initial mechanical evaluation in 230 of 312 (74%) acute to chronic patients with low back pain (Long et al 2004). The value of these symptomatic responses is that they indicate effective management strategies that are associated with good prognosis.

Both centralization and directional preference are said to indicate the commonest of McKenzie's mechanical syndromes in spinal problems, which is derangement (May and McKenzie 2003). Derangement syndrome has been identified in about 70-80% of patients with spinal problems (Long et al 2004, Hefford 2008, May 2006). When McKenzie first described the system of Mechanical Diagnosis and Therapy and the three mechanical syndromes, he suggested that derangement was most common in the 20-55 year old age group, after which age, the prevalence gradually reduced (McKenzie 1981). More recently, a study has confirmed a reduced prevalence of centralization amongst older patients. In a study of 418 patients with mixed spinal problems and with mean age of 58 years, the prevalence rate of centralization was 17%, but in those under 45 years rose to about 31%, whereas in those over 65 years, it was 8% in patients with back and 14% with neck problems (Werneke et al 2008). It is unclear if this reduced prevalence applies to DP also.

Low back pain is prevalent in older populations (Bressler et al 1999). A systematic review, and two more recent studies, found variable rates of back pain in the elderly, varying between 13 and 49%, with a lack of certainty about the true rate (Bressler et al 1999, Hartvigsen et al 2004, Jacobs et al 2006). However, an older age group has never before been the specific focus of a study regarding centralization and DP. The aim of this observational study was to chart the prevalence of centralization and DP in a consecutive series of older patients with back pain. A secondary aim was to determine if the presence of these clinical findings was affected by the presence of medical diagnoses based on imaging findings.

Methods

Four physical therapists agreed to participate; they all held a Diploma in Mechanical Diagnosis and Therapy (MDT), which is the highest level in the McKenzie educational programme. They had a mean of 18 years (range 9-25) experience as a physical therapist and 14 years experience with MDT. They all treated patients in private clinics in the USA, using MDT methods of assessment, classification and management.

Data was collected on all consecutive patients referred for physical therapy with a diagnosis of low back pain with or without referral into the leg, aged 65 years and older. The only exclusion criterion was patients referred immediately following spinal surgery. Each clinician was issued a data collection spreadsheet to be completed following the initial assessment of the patient. If at that point the classification was unclear, clinicians had the opportunity to confirm classification within up to three visits. The data collection sheet collected information on age, gender, MDT classification, centralization, DP and direction of DP, and medical diagnosis supported with imaging studies, if present.

Data was routinely collected in private practice, without any additional intervention being conducted, and data was anonymous before being sent by the participating clinicians. All data was Health Insurance Portability and Accountability Act (1996) compliant, patient details, except age, were not included in the data set and therefore, consent was not required. Following data collection, patients were managed with normal clinical practice and follow-up and outcomes were not recorded.

Imaging studies comprised reports from magnetic resonance imaging (MRI) and/or radiograph that had been made by a radiologist and accompanied the medical referral. Original imaging studies were not seen. These were not available for every patient.

Results

Complete data sets were collected on 150 patients, with individual therapists collecting data on between 27 and 48 patients, mean 37.5%. Mean age 76 years, 51% female.

One hundred and thirty-one patients (87%) were classified with derangement syndrome; none were classified with dysfunction or postural syndrome. Of the 19 (13%) with non-MDT classifications, 13 (9% of total) were classified as mechanically inconclusive, 4 (3%) as clinically relevant spinal stenosis and 2 (1%) with hip pathology: one of which was classified as derangement and the other as an articular dysfunction.

Centralization was present in 31 (21%), and DP in 130 (87%) patients. Of those demonstrating directional preference, 83% had a DP for extension, 2% for flexion and 15% for a lateral direction.

Reports from imaging studies accompanied 78 (52%) patients, of which 20 (26%) had disc pathology, 27 (35%) degenerative changes and 23 (29%) spinal stenosis. Of these 65, ninety-three percent were classified as derangement and had a directional preference, which included all of those diagnosed as disc herniation, 26 out of 27 of those diagnosed with degenerative changes, and 19 out of 23 diagnosed with spinal stenosis. Only four out of 23 diagnosed with spinal stenosis appeared to have clinically relevant stenosis on examination. Eight imaging reports stated that no structural pathology had been identified.

Discussion

This was an observational study of consecutive patients over 65, who had been referred to four physical therapists. The therapists conducted a mechanical classification and management (McKenzie and May 2003), as in normal clinical practice, but also collected data about age and occurrence of centralization and DP. Prevalence of centralization was 21% in this population, which is consistent with previous research that showed decreased prevalence in the older age group (Werneke et al 2008). However, in that study, the prevalence of centralization in those over 65 years of age was only 8%. The reasons for the lower prevalence in that study may be due to the use of standard operational definition and strict definition and measurement method using an overlay template to document centralization during the initial evaluation. In the present study, therapists simply had to decide if centralization occurred against the operational definition provided, and furthermore could use up to three treatment sessions to reach their conclusion. The prevalence of centralization in these older age groups is clearly less than that reported in most previous studies, which were in younger populations (Aina et al 2004). However, in this observational study, derangement classification and DP prevalence remained high at 87%, which is slightly higher than previous studies of the back pain population with estimates around 74% (Long et al 2004, Hefford 2008) and 78% (May 2006). Taken together with the present study, these data would suggest that DP is the more important finding, given its very high prevalence rates in all ages of the back pain population, and the reasonably consistent level of detection from four different populations. All four of these studies used multiple therapists in multiple sites, which strengthen the validity of the findings. Both centralization and DP have demonstrated reliability of detection by therapists (Werneke et al 1999, Fritz et al 2000, Kilpikoski et al 2002), which further strengthens the validity of the phenomenon.

A secondary aim of the study was to see if there was any association between imaging studies and the findings of centralization or DP. From the patients who provided this data, the imaging findings appeared to provide very little useful clinical data to the physical

examination, as the majority of those who had received a medical diagnosis based on the imaging studies, in fact, turned out to have a DP. A number of limitations should be recognised. Given the opportunistic and incomplete nature of this data collection, any conclusions should be drawn with caution until these findings are supported by further research. There was a lack of clear cut pre-defined operational definitions for the medical diagnoses provided by multiple radiographers, which might question their validity. For the study as a whole, there was no follow-up and no repeat measurement with outcome measures. Though this was not the purpose of the study, it therefore cannot be confirmed that centralization and DP were necessarily associated with a good outcome, though this is what previous research has shown (Werneke et al 1999, Werneke and Hart 2001, Long et al 2004, 2008). Further research should be done to determine a number of issues identified by this observational study. The link between DP and positive clinical outcomes could be substantiated, and it could be confirmed that DP exercises are the most effective method of managing patients with DP. Clearly, any conclusions related to the imaging studies aspect of the study should await further, more rigorous, research. Clinically, the study suggests that DP is an important and very common finding with important management implications. Examination to determine the presence of DP should be routinely included in the physical examination of patients with back pain. Its presence suggests a clear management strategy with the use of DP exercises.

Conclusion

Centralization is determined by a specific symptomatic change, whereas directional preference is identified by any positive symptomatic and or mechanical response and is, therefore, more prevalent. The prevalence of centralization in older patients with back pain was low (21%), but the presence of directional preference was high (87%) in 150 consecutive patients who were at least 65 years old.

Acknowledgements:

The authors acknowledge Mark Miller, Michelle Spross and Scott Herbowy for data collection, and the latter for original discussion of the idea.

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Self-management of pain problems - a review of underlying concepts

Stephen May, PhD, MA, FCSP, Dip. MDT, MSc

Introduction

Given the increasing prevalence of chronic disease, especially in the West, associated with increased longevity of life, it is hardly surprising that official healthcare organisations have begun to embrace a shift in management. This obviously includes chronic musculoskeletal problems, such as chronic low back pain and osteoarthritis. The World Health Organisation (WHO 2002) identified eight elements that were deemed essential for the successful management of chronic diseases:

- a paradigm shift from systems based on care of an acute episode
- ensure commitment to information sharing at all levels
- integrated healthcare structures
- align health, educational and social welfare policies
- effective use of healthcare personnel
- shift from the patient as a passive recipient of care to a model where the patient takes some responsibility for their care
- support patients in their communities
- emphasize prevention.

The sixth point places special emphasis on self-management by the individual with the problem.

In the UK, the NHS has placed greater emphasis on the management of chronic diseases (DoH 2004), and with the Expert Patient Programme, has attempted to put the patient centre stage in their own care (Kennedy et al 2005, Lee et al 2006). There are similar, but varying, degrees of support for, and action related to, such a shift in healthcare direction in the USA, Netherlands, Sweden, New Zealand, Australia and other countries (Zwar et al 2006). This review will consider a number of underlying concepts that are relevant to self-management, as it relates to musculoskeletal problems:

- what is meant by self-management
- self-management programmes
- barriers to self-management
- are clinicians providing treatments that can be used for self-management
- the patients' perspectives.

A second part of this review addresses the effectiveness of self-management strategies (May, *submitted*).

Definitions

From population-based epidemiological data, we know that a large percentage of people with, for instance, back pain and knee pain, do not seek healthcare. (Walsh et al 1992, Hillman et al 1996, Linton et al 1998, Santos-Eggimann et al 2000, Picavet and Schouten 2003, Woolf et al 2004, Jinks et al 2007). People in the general population who have such problems, yet are not seeking support from any clinicians, may be said to be truly self-managing in an autonomous way. However, there are also those who occasionally or intermittently might seek healthcare, but generally are self-managing an ongoing chronic musculoskeletal problem. These might be termed largely self-managing.

Interestingly, most of the literature focuses on the largely self-managing population, rather than the autonomous self-managers; particularly about the way to improve self-management with clinician-patient interactions. Early self-management programmes focused on education about the condition, with the implication that this knowledge would impact on health behaviours. More recent programmes have become more comprehensive, and addressed practical and psychological issues (Newman et al 2001). These programmes attempt to influence behaviour, as well as health status, and encourage patients how to identify and solve problems, set goals and plan actions (Lorig 2002). It has been suggested that this involves five key elements: problem-solving, decision-making, resource utilisation, forming a patient/clinician relationship, and taking action (Lorig and Holman 2003). Similar, but slightly diverse, elements have been proposed: patient-defined problems; goal setting and planning; a continuum of self-management training and support services; active and sustained follow-up (von Korff et al 1997). It has been suggested that core concepts to be promoted are: health promotion activities; appropriate interaction with clinicians and adherence to recommendations; self-monitoring of status and making appropriate decision on basis of monitoring; management of the effects of the condition in relation to one's interaction with society (Osborne et al 2004). A key issue highlighted in all these criteria is the promotion of self-efficacy, which is an individual's confidence and ability to perform healthy behaviours (Lorig et al 1999). However, this is coupled with patient-empowerment to manage independently of clinicians and patient-clinician interaction to achieve these goals.

Thus the term 'self-management' can refer to collaboration between patients and clinicians to ensure individuals acquire the skills and confidence to manage their problems on a day-to-day basis and have access to support, if needed (Bodenheimer et al 2002a, 2002b, Lorig 2003). This is distinct from those with similar musculoskeletal problems who never approach clinicians for support and are completely autonomous in their self-management.

Self-management programmes

There are numerous ways of delivering self-management programmes and a variety of models of programmes (Newman et al 2001). Some have a formal syllabus, others are more flexible, duration can run from one to 52 weeks, with single to multiple sessions, some use a group format, others an individual format, some are face-to-face, others use

video, telephone, or multiple methods of education (Newman et al 2004). Back education campaigns have been conducted using the mass media (Buchbinder et al 2008). Programme facilitators vary and include lay educators, health educators, physicians, mental health workers, physical and occupational therapists and nurses (Warsi et al 2003, Newman et al 2004). Programmes typically include some combination of (Reid et al 2008):

- education about pain and its implications
- training in relaxation
- training in coping skills
- training in problem solving related to day-to-day activities
- training in communication with healthcare providers.

Early exponents of OA self-management programmes emphasised the prime role that self-efficacy played in effective self-management and stressed the role that enhancing self-efficacy should have in self-care programmes (Lorig et al 1999, Marks et al 2005a). A set of criteria for successful self-efficacy enhancing programmes were defined as follows (Marks et al 2005b):

- use of variety of learning strategies
- involvement of significant others and other healthcare providers
- foster self-management and self-monitoring across a range of variables
- encourage and support change
- foster self-appraisal and problem-solving
- use of trained educators and detailed manual drawn from patient and practitioner in-put
- use of individual and collaborative group sessions.

At the moment, there is insufficient evidence to determine the most effective format of delivery (Newman et al 2004). Although meta-analytical methods have been used to analyse data from multiple studies, it has been argued that heterogeneity of interventions disqualifies a meta-analytical approach (Newman et al 2004). It is likely that different components of the programmes may address different aspects of the condition, and be relevant to different conditions (Newman et al 2001). In a meta-analysis of individuals with OA knee, it was found that exercise programmes had a small, but positive, effect in physical health and overall impact, but not on psychological well-being (Devos-Comby et al 2006). The self-management programmes, without the exercise element, only seemed to impact on psychological outcomes. The authors suggested that self-management programmes should include an exercise component to effectively impact on pain and function (Devos-Comby et al 2006).

Chodosh et al (2005) specifically attempted to understand the characteristics of programmes that were most associated with success. From previous literature and expert opinion, they postulated five characteristics that should be associated with greater effectiveness:

- programme is tailored to individual needs and is not generic
- group setting with other individuals with the same problem
- medical providers more likely to be effective than non-medical providers
- review from programme provider at a later date
- some emphasis on the psychological element of living with a chronic condition.

However, there were no significant differences in outcomes between those programmes that did or did not include these elements, but they concluded that the last two elements were of greatest importance.

In a review of UK self-care support initiatives for older patients with long-term conditions, the most common features of the programmes were patient education, the promotion of exercise and the improvement of self-efficacy (Berzins et al 2009). All the interventions for people with OA contained components that aimed to improve pain management, many contained advice related to diet, and some contained advice to include the partner in the programme. Teaching was generally in group format with discussion sessions reinforced with written material. Weingarten et al (2002) conducted a met-analysis of disease management programmes for patients with chronic illnesses and noted the wide range of interventions used and that most programmes used more than one intervention. They concluded that all programmes were effective at changing clinicians' or patients' behaviour, but it was not possible to know which was the most effective (Weingarten et al 2002).

In relation to the *therapeutic alliance* (Brady 1998) between clinician and patient, the clinician has the responsibility to deliver the programme as outlined here, but in turn, the individual with the condition has certain responsibilities also. These are (Brady 1998):

- to learn about the condition
- to learn about its management
- to take responsibility for its management
- to be involved in joint decision-making with the clinician
- to evaluate the healthcare experience.

The therapeutic alliance only functions if both parties embrace the concept and successfully perform their role within it. For the clinician, it demands recognition of equality with the patient, as well as the skills to deliver the programme, and rejection of the classical medical

model with the patient as passive recipient of care. For the patient, there must be some kind of acceptance of the condition, desire and competence to rise to the challenge and take on board the skill set required to manage day-to-day, and rejection of the classic patient role as recipient of a cure.

Barriers to self-management

Barriers to self-management can arise from several perspectives. Clinicians and individuals with the condition might not take on board their responsibilities within the therapeutic alliance as outlined above, and the self-management programme might not be effective at delivering adequate improvements in pain and function.

Psychosocial issues might impact on patients' ability to take on effective self-management strategies. Amongst patients with low back, hip or knee pain there was decreasing use of exercise as a self-management strategy with increasing severity of depression (Damush et al 2008). Higher levels of pain and depression were associated with reduced coping and reduced physical activity in patients with knee OA (Axford et al 2008). Those with a poorer knowledge base about OA experienced more pain, whilst those with a better knowledge base were coping better and had less depression (Axford et al 2008). Another important psychosocial issue is the level of self-efficacy, with higher levels of control, negating the association between chronic pain and reported difficulty exercising (Krein et al 2007), and higher self-efficacy associated with low fear-avoidance (Denison et al 2007). These findings would suggest that unless depression is addressed and self-efficacy promoted, self-management strategies will not be effective (Axford et al 2008, Damush et al 2008, Krein et al 2007).

Psychological factors have been found to be the strongest predictors of whether individuals with OA participate in physical activity. One systematic review looked at sociodemographic, psychological, personality, health and social related variables, which were associated with higher levels of physical activity in patients with OA (Wilcox et al 2005). Age, education, income, gender, marital status, race, unemployment, pain and disease severity were generally inconsistently linked to physical activity. Higher levels of self-efficacy, well being and perceived benefits, lower levels of depression and previous physical activity were generally associated with physical activity. Other sociodemographic and environmental factors were little studied (Wilcox et al 2005).

There is growing recognition that patients may be at different stages of change with respect to the adoption of self-management strategies (Keefe et al 2000, Benjaminsson et al 2007); and that these are associated with different coping levels (Hadjistavropoulus and Shymkiw 2007). Individuals at the *pre-contemplation* stage of adopting relevant self-management strategies were associated with higher levels of pain, depression, anxiety and external health locus of control and lower levels of self-efficacy and control (Hadjistavropoulus and Shymkiw 2007). Whereas, those at the *action* stage of adopting self-management strategies were associated with higher self-efficacy and internal health locus of control and with better physician information (Hadjistavropoulus and Shymkiw 2007). Whether the coping levels predicted the stages of change or vice versa is unclear.

In qualitative studies involving patients with back pain, barriers to self-management strategies, such as exercises, have been identified as the cessation of symptoms, pain, time and family constraints (May 2001, 2007, Morris 2004). Some degree of acceptance of the condition has been recognised as necessary to adopt self-management strategies (May 2007, McCracken 1998). Some individuals failed to achieve this acceptance, do not endorse self-management and still look for a cure from untried clinicians or await further investigations (Cooper et al 2009).

Furthermore, not all patients are congruent with the self-management philosophy, with misconceptions about management of back pain commonly held by patients and the general population (Keen et al 1999, Klaber-Moffet et al 2000, Goubert et al 2004). For instance, highlighting activity-avoidance and bed rest during a back pain episode. A survey of clinicians and the general population in Norway examined their beliefs in what were termed the seven 'myths' of low back pain; whilst these outdated ideas were not agreed with by the GPs and the physiotherapists, some were commonly agreed with by the general population (Ihlebaek and Eriksen 2004). The 'myths' most commonly agreed were: a slipped disc required surgery, imaging studies can always identify the cause of back pain, everyone with back pain should have an x-ray, most back pain is caused by lifting, and to a lesser extent, one should take it easy until the pain goes.

Clinician-centred barriers to recovery should also be considered. Lack of congruence in perceptions between clinicians and patients has been shown. In a large survey in eight countries in Europe, communication between primary care physicians and patients was poor (Woolf et al 2004). The physicians believed that musculoskeletal pain was well managed, but few patients were given information about their condition and misconceptions about benefits and risks of treatment were common and limited patients' ability to actively participate in decisions about their care. *Lack of accurate, meaningful information that inhibits patients' ability to make informed choices about treatment is a major barrier to patient involvement in disease management* (Woolf et al 2004, p346).

Physician-patient perceptions of pain intensity have been shown to differ, with clinicians underestimating patient's pain (Mantyselka et al 2001). In a rather dated

report, rheumatology staff underestimated the extent to which patients desired education about their disease (Potts et al 1984). Although GPs valued increased patient involvement in their own healthcare, this was in conflict with other values, such as professional responsibility, and challenged by contextual factors, such as length of consultation period (Blakeman et al 2006).

It is not just medical staff who are incongruent with patients' perceptions. Chiropractors have been shown to seriously underestimate the degree to which patients wish to take responsibility for the problem, with 80% of patients rating their responsibility as high, compared to 22% of chiropractors (Jamison 2000). Patients with chronic pain found that their self-management strategies were little influenced by an episode of physiotherapy (Cooper et al 2009, Lansbury 2000). Nurses, compared to physiotherapists and medical staff, have been shown to be anxious about the role of expert patients and limited in appropriately facilitating self-management, due to professional insecurity and a cultural perception of the patient as a passive recipient of care (Wilson et al 2006). Lay perspectives about healthcare for people with knee OA revealed that only a minority recalled having been given information from health professionals about OA, day-to-day management, self-care strategies and prognosis (Victor et al 2004). The authors concluded that there was an unmet need for information and support to help maintain independence.

Thus barriers to self-management can arise both from patients and clinicians. Patients can be deterred by internal problems, such as poor mental health or poor self-efficacy, inappropriate beliefs or failure to come to terms with the problem; or external factors, such as time or family. Equally, clinicians can fail to empower patients through lack of effective information, can underestimate the degree to which patients want information and self-management strategies about their problem, or can find the facilitation of self-management inimical to their professional role.

Are clinicians providing the appropriate interventions to encourage self-management?

From numerous guidelines and systematic reviews, and with the emphasis on self-management strategies for chronic problems such as back pain and osteoarthritis, it is clear that interventions should be based around exercises and advice. However, a population-based study in the USA found that patients with back and neck pain, who had seen a care provider in the past year, had variable exercise prescription; with only 14% of those who had seen a physician receiving advice to exercise, 33% of those who had seen a chiropractor and 64% of those who had seen a physical therapist (Freburger et al 2009). They concluded that exercise was being underutilised as a treatment for chronic back pain and that practice was not adhering to current guidelines. That physical therapists appear very likely to provide home exercises has been born out by surveys and audits from the UK (Jackson 2001, Gracey et al 2002, Sparkes 2005), Ireland (Byrne et al 2006, Casserly-Feeney et al 2008), Denmark (Hamm et al 2003), and Canada (Poitras et al 2005), in which exercises were said to be provided in between 30% and 95% of interventions. Although the majority of therapists did provide exercises in these studies, there were still substantial numbers of therapists providing passive, therapist-centred interventions, such as spinal mobilisation, interferential or ultrasound (Gracey et al 2002, Hamm et al 2003, Poitras et al 2005, Casserly-Feeney et al 2008), or pulsed short-wave diathermy (Jackson 2001). These studies would suggest that physical therapists are not always providing the necessary interventions to optimise self-management and that perhaps other clinicians are doing an even poorer job (Freburger et al 2009).

Patients' perspectives

We know from population-based epidemiological studies that a large proportion of individuals with musculoskeletal symptoms do not seek healthcare. Another insight into patients' perspectives about management can be gained from qualitative studies, which do not have the same generalisability as these population-based studies. Nonetheless, such studies do allow access to the beliefs and attitudes of individuals with musculoskeletal symptoms. A number of such studies have been conducted and they all report a generally positive attitude toward self-management.

Literature has highlighted the general requirement that patients have regarding information about their condition, that patients do better when they are involved in decision making about their care, and that lack of information is a major source of dissatisfaction (Payton et al 1998, May 2001a, Verbeek et al 2004, Laerum et al 2006, Lansbury 2000). Specifically, a group of individuals, who had received physiotherapy for back pain, wanted information regarding the condition, self-management strategies, the process of treatment and overall prognosis (May 2001b). A criteria of satisfaction was that treatment should be a consultative process, in which patients' concerns, questions and needs were included in the management process (May 2001b).

A random sample of over one thousand Swedish adults responded to a questionnaire (61% response rate) about attitudes regarding responsibility for musculoskeletal disorders (Larsson and Nordhol 2008). The majority of respondents showed an internal view of responsibility for musculoskeletal problems and did not place responsibility on external others. However, having musculoskeletal disorders, being physically inactive, taking sick leave for musculoskeletal disorders, and low educational attainment was associated with a more external attitude and a low level of self responsibility.

Individuals with upper limb disorders in the UK reported a 'wait-and-see' approach to the onset of symptoms, a reluctance to visit their GP and a preference for self-management strategies involving life style changes, self-medication (although limitations in this approach were also recognised), ergonomic tactics and exercises (Calnan et al 2005). They did not visit their GP as they did not see their problem as serious, they did not wish to waste the GP's time and they were rather skeptical about effective treatment. If they did attend, this was usually due to a worsening of chronic symptoms or a perception that such persistent symptoms were out of the normal, and they were most interested in symptom alleviation, rather than a diagnosis. Those who attended multiple clinicians found that the different diagnoses and treatments that were offered were a source of confusion (Calnan et al 2005).

Patients who had attended physiotherapy services in the UK reported ongoing use of self-management strategies and that the use of such strategies were essential given the day-to-day nature of musculoskeletal symptoms (May 2001, 2007, Morris 2004). Exercises and postural advice were the most commonly used strategies, but ongoing access to physiotherapy services was desired by some. In one sample of back pain patients, internal, rather than external, health locus of control was higher, indicating their perceptions of an ability to control symptoms (Roberts et al 2002).

The King's Fund in the UK published a report on patients' perspectives on self-management for chronic conditions, based on a literature review and some qualitative research (Corben and Rosen 2005). This highlighted the fact that self-management programmes will not always produce immediate behaviour changes, that motivation may fluctuate over time and that not all people want to, or can, self-manage a long-term condition. Motivation to self-management is mediated by many issues, including length of time since diagnosis, disease severity, age, social support and level of education. Clinicians can enhance the patient-clinician encounter with listening skills, identifying the patient's concerns, allowing time for discussion, understanding the patient's experience, and ensuring the patient contributes to the plan of care. Ideally, the healthcare service should be flexible to the patients' needs (Corben and Rosen 2005).

Conclusions

Self-management requires behaviour change and motivation on the part of patients, and it is clear that many patients do embrace the concept and practice self management strategies independently in the community. However, such positive attitudes may be variable over time in one individual and be variable between individuals. Certain psychological, condition-specific and sociodemographic attributes have already been identified that make the practice of self-management more or less likely. As made clear already, self-management is not about patients acting independently at all times, but being supported intermittently by healthcare professionals. Just as personal or social barriers may restrict patients' ability to embrace self-management effectively, the behaviours and actions of healthcare professionals can promote or demote the ability of patients to perform these strategies.

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Cardiovascular and metabolic responses to active and passive repetitive lumbar spine exercises

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Objectives: To examine the cardiovascular and metabolic responses of active (extension, flexion) and passive lumbar exercises (extension) in the lying position.

Methods: Twenty-nine informed, healthy subjects asymptomatic of LBP, cardiopulmonary and/or metabolic disease volunteered. Subjects performed active flexion, extension, and passive extension (Repeated End-range Passive Exercise (REPEX) machine) exercises. Heart rate, blood pressure, rate-pressure product (RPP) and metabolic response (VO2) were recorded.

Results: RPP and VO2 increased significantly (P<.05) for active flexion and extension exercises, but not passive exercises. Overall heart rate, systolic blood pressure, RPP and metabolic cost was significantly (P<.05) greater in active extension than in flexion, while both were more demanding than the passive extension.

Conclusions: There were significant increases in cardiopulmonary and metabolic responses with active lumbar exercises. Extension was more stressful than flexion. Passive exercises did not significantly increase cardiopulmonary or metabolic responses over baseline figures. Active exercise intensity did not exceed what the American College of Sports Medicine labels low level, which does not require clinical supervision. Further study is recommended to ascertain exercise intensity levels and possible risks when patients with low back pain, cardiopulmonary conditions or metabolic disease employ these common exercises.

Introduction

For over a quarter of a century, the McKenzie Method has recommended repetitive exercise for the lumbar spine, such as flexion and extension exercise in lying position, for management of low back pain (McKenzie 1981). More recently, the REPEX (Repeated End-range Passive Exercise) table[1] has been developed and marketed for the purpose of assisting patients in performing these particular exercises throughout a full range of motion (ROM) (Gonzalez et al 2004). Although the cardiovascular responses of individuals to exercise that are performed in a lying position are documented, less in known concerning metabolic responses.

The McKenzie initial assessment process utilizes multiple sets, as needed, of 10 to 15 repetitive loading exercises, in various positions, to categorize patients (McKenzie and May 2003). For the purpose of treatment, 10-15 repetitions performed every two to three hours are often prescribed to treat low back pain and obtain favorable responses (centralization of symptoms, increase in ROM) according to the McKenzie Method of Mechanical Diagnosis and Therapy (MDT). However, at times, a clinician may instruct the patient to perform more than one set of 10-15 repetitions, especially during examination (McKenzie and May 2003, Al-Obaidi et al 2001). Also, some patients believing “more is better”, may perform more than 10-15 repetitions. Two common exercises used are extension in lying (EIL) and flexion in lying (FIL). Based on the response to repetitive movements, the clinician is able to classify the majority of patients as having one of three syndromes: postural, dysfunction and derangement (McKenzie and May 2003).

In a previous study, heart rate (HR), systolic blood pressure (SBP), and rate pressure product (RPP) measurements were obtained following active repeated FIL, EIL, flexion in standing (FIS), and extension in standing (EIS) (Al-Obaidi et al 2001). Al-Obaidi et al (2001) used the simple non-invasive measure of HR, SBP and RPP to assess the subjects’ cardiovascular response to common lumbar spine exercises. Myocardial workload can be expressed as the product of HR and the systolic arterial blood pressure then multiplied by 10^{-2}, known as the RPP (Brannon et al 1993). HR and arterial blood pressure are major determinants of the myocardial oxygen consumption and as they increase, so does the RPP (Brannon et al 1993).

Al-Obaidi et al (2001) determined that cardiovascular demands increased with increasing repetitions for each of four exercises. However, cardiovascular changes were minimal, compared to baseline, with exercises in the standing position. That study concluded the greatest amount of demand was placed on the heart during exercises in lying positions (EIL, FIL) versus the exercises in standing positions (FIS, EIS) (Al-Obaidi et al 2001).

The energy requirements of physical activity are calculated by measuring the oxygen requirements of the amount of exercise or activity being performed, commonly called the oxygen consumption (VO_2). VO_2 provides a measure of energy cost of exercise (which can easily be converted to kilocalories) and in combination with expired carbon dioxide (VCO_2) can provide information about the fuels for exercise (American College of Sports Medicine 2006). Actual measurements of VO_2 are commonly obtained using a procedure called open circuit spirometry. During open circuit spirometry, the subject uses a mouthpiece and nose clip, which directs the expired air to an integrated metabolic system and computer interface that measures the volume and percentage of oxygen and carbon dioxide of the expired air (American College of Sports Medicine 2006).

To our knowledge, there are no studies that have measured the metabolic cost, when performing repetitive active and passive lumbar spine exercises. The primary purpose of this study was to examine the cardiovascular response and metabolic cost of two commonly prescribed repetitive back exercises – EIL

and FIL. EIL and FIL were chosen because they showed the greatest cardiovascular changes in the previous study (Al-Obaidi et al 2001) when performed actively. In order to increase the understanding of the cost of exercise for these common repetitive low back exercises, this study analyzed the metabolic cost and cardiovascular response. This study also measured the metabolic cost and cardiovascular response when extension in lying was performed passively on the REPEX machine vs. active EIL. Additionally, results were compared measuring the cardiovascular response of the two active (EIL, FIL) exercises from this study to a previous study (Al-Obaidi et al 2001).

METHODS

Subjects

Twenty-nine healthy male (n=17) and female (n=12) subjects, asymptomatic of cardiopulmonary and/or metabolic disease and representative of an age (mean=35.52, SD=13.50, range=22-63) susceptible to low back pain (McKenzie 1981), volunteered for participation in this study. Height (mean=173.82 cm, SD=11.24, range=154.94-198.12) and weight (mean=84.78 kg, SD=20.44, range=50.91-131.82) were recorded.

The subjects were recruited in the community on the basis of convenience. Exclusion criteria for study included:

1. history of low back pain (LBP) within the last year
2. diagnosis of cardiovascular abnormalities or transient conditions within the last year
3. diagnosis of lumbar spine deformities such as scoliosis
4. diagnosis of primary or secondary malignancies
5. active infection
6. active inflammatory disease such as rheumatoid arthritis or ankylosing spondylitis
7. central nervous system dysfunction
8. failure to meet the criteria of the physical activity and readiness questionnaire PAR-Q & YOU, a questionnaire for people aged 15-69, developed by the Canadian Society for Exercise Physiology (American College of Sports Medicine 2006).

Subjects gave informed consent and completed the questionnaire (Par Q & YOU) prior to participation in the study. All subjects were given the same pre-test instructions at least one day prior to the participation in the data collection. The suggestions given were as follows:

1. Wear comfortable, loose-fitting clothing
2. Drink plenty of fluids over the 24-hour period preceding data collection
3. Avoid food, tobacco, alcohol, and caffeine for three hours prior to performing the exercise
4. Avoid exercise or strenuous physical activity the day of data collection
5. Get an adequate amount of sleep (six to eight hours) the night before performing exercises for data collection (American College of Sports Medicine 2006).

Instrumentation

Upon arrival, subjects' reported height and obtained weight were recorded on the first day of data collection. Expired lung gases were examined for the purpose of determining the amount of oxygen utilized and carbon dioxide produced at rest, as well as, during the first and second set of repetitions of each exercise. In order to accommodate the comfort of subjects and maximize the efficiency of data collection, a mouthpiece and one-way valve were modified by lengthening, with plastic tubing, the space between the mouthpiece and one-way valve. This modification allowed subjects to lie prone on the REPEX table without having to alter head position and to allow maximum comfort **(Figure 1)**. Expired lung gases were collected, analyzed and examined using a metabolic cart[2]. The system was calibrated on a daily basis.

In addition to expired lung gases, HR and BP were measured at rest and during all passive and active exercise. HR was transmitted to the metabolic cart via a Polar[3] monitor worn around the chest of each subject. The Polar monitor allowed the HR to be monitored continuously, while the metabolic cart was collecting expired lung gases. BP was obtained using an automated BP cuff (Propaq)[4] that was calibrated prior to the experiment. The RPP was then calculated using SPSS version 11.5[5]. All active repetitive and passive repetitive exercises were completed in the lying position on the REPEX table. For passive extension in the prone position, the modified non-rebreathing valve was secured to the table at a comfortable level for the subject to allow the head and neck to relax.

Research Design and Procedures

Healthy subjects were randomly assigned to perform the three exercises using a cross-over design. Each subject performed the three exercises in a different order, with at least one day of rest between exercise periods. Subjects performed flexion in lying by lying supine with knees and hips flexed about forty-five degrees and the feet flat on the plinth. The subject was then instructed to bring the knees up towards the chest, applying overpressure with hands around the knees to achieve maximum possible flexion. The knees were then released and the feet were placed back on the plinth in the starting position.

Subjects also performed EIL by lying in the prone position, with hands palm down, under the shoulders. Subjects then raised only the top half of the body by

straightening the arms, while the pelvis and thighs remained relaxed and were allowed to sag with gravity. The top half of the body was then lowered back to the plinth.

All active exercises were performed while lying on the REPEX table in the neutral position with the power off. For the passive exercises, subjects were also positioned on the REPEX table and passively moved through extension movements in lying at a rate of 10 repetitions per minute. Active exercises were performed at the same rate as the REPEX table with the use of electronic metronome[6] at a rate of 10 repetitions per minute.

Each subject performed two sets of an assigned exercise during each test period. Each test period was six minutes in length. During the first minute, the subject was lying passively on the table to obtain resting values, minutes two through three were used to perform the first set of 20 repetitions, minute four was a one minute rest period, and minutes five through six were used to perform the second set of 20 repetitions. HR and BP were obtained within 20 seconds of completion of each set of exercises. Metabolic values were continually measured; participation was at approximately the same time of day for each subsequent test period throughout the duration of each test period. Test periods were spaced to ensure subjects had ample time to return to resting values (at least 24 hours). Subjects were also asked to participate at approximately the same time of day for each subsequent test period following the first test period. Passive extension in lying was performed to the end range of the subjects' comfort or to the maximal end range of the REPEX table.

Data Analysis

Data analysis was performed using SPSS version 11.5. Analysis included demographic and descriptive statistics. Repeated measures analysis of variance was used to determine significant mean differences between the three exercises (Portney and Watkins 2000). When significant differences were found between the three exercises, *post hoc* comparisons were made using the least significant difference test (Portney and Watkins 2000). An Alpha level of 0.05 was used for determining statistical significance.

Prior to the recruitment of subjects, the methods for this study were reviewed and approved by the Angelo State University Institutional Review Board.

Role of the Funding Source

This study was partially funded by a Research Enhancement Grant from Angelo State University. The University did not play a role in study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the report for publication.

Results

Results indicated significant (P<0.05) increases in HR from baseline to the first and second sets of the two active exercises (FIL and EIL). See **Table 1**. There were significant (P<0.05) increases in SBP from baseline to the first and second sets of active extension exercise and passive extension, but not in the flexion exercise **(Table 1)**. Diastolic blood pressure (DBP) was significantly increased (P<0.05) in active extension over baseline (first and second sets), but not with active flexion or passive extension (P>0.05). **See Table 1**. The results for HR and SBP were used to determine the RPP for each of the three exercises. It was found that RPP increased significantly (P<0.05) for the active flexion and extension exercise (both sets), but not the passive extension (REPEX) exercise **(Table 1)**. Metabolic cost (VO_2 $ml \cdot kg^{-1} \cdot min^{-1}$) increased significantly (P<0.05) with the active exercises (both flexion and extension). No significance (P>0.05) was found during the passive (REPEX) exercise **(Table 1)**. In summary, cardiovascular responses, represented by RPP, increased significantly (P<0.05) with the active exercises (FIL and EIL), but not with the passive EIL exercise **(Figure 2)**. The metabolic cost increased significantly (P<0.05) with the active exercises (FIL and EIL), but not with the passive EIL exercise **(Figure 3)**. Furthermore, there was no significant difference (P>0.05) between values of the first and second sets of exercise in both active and passive modes and for all measured parameters **(Table 1)**. Overall heart rate, systolic blood pressure, rate pressure product, and metabolic cost was significantly (P<0.05) greater in active extension than in flexion, while both were more demanding than the passive extension exercises (REPEX). **See Table 1**.

Discussion

The results of this study indicate that active repetitive exercises (EIL and FIL) significantly increase the cardiovascular and metabolic response in this subject population. We chose to study exercise only in the lying position because responses to exercise in the standing position have not been shown to be significant (Al-Obaidi et al 2001). Similar to a previous study, EIL and FIL increase the work of the heart in people with no known spinal impairments and no cardiovascular or cardiopulmonary insufficiencies (Al-Obaidi et al 2001). Unlike the previous study (Al-Obaidi et al 2001), our results indicate the greater increase in cardiovascular response with active EIL, instead of active FIL. Furthermore, the results of this study confirm increased metabolic costs for active extension exercises over active flexion exercises. The effects of active EIL also showed an increase in RPP and oxygen consumption between the first and second set. This increase was not statistically significant (P>0.05). In response to Al Obaidi et al (2001), who stated a limitation of that study to be the possibility that each subject could have possibly been holding his/her breath or incorrectly

performing the active exercises; the investigators conducting this study made an effort with each subject when providing instructions on how to perform each exercise. In this study, patients were carefully instructed about breathing patterns and the importance of relaxing the uninvolved muscle groups.

Interestingly, cardiopulmonary and cardiovascular demands while on the REPEX table declined with increasing sets of passive extension, although these values were not significant (P>0.05). Values in **Table 1** demonstrate this decrease in demand. This decrease in demand may have been reflective of the subject's level of comfort and relaxation with subsequent sets, thus making passive extension on the REPEX table a more truly passive exercise. A previous investigation found that electromyographic studies showed that it is difficult to perform EIL without some activation of the paraspinal muscles due to the nature of the movement (Fiebert and Keller 1994).

Active repetitive exercises (FIL and EIL), when compared to passive repetitive exercise (extension) on the REPEX table, as recommended by the McKenzie Method for the lumbar spine, produce hemodynamic and metabolic responses in people with no signs or symptoms of cardiopulmonary and/or metabolic disease. These findings indicate that passive repetitive exercise on the REPEX table is less demanding on the cardiovascular and metabolic system of subjects than active flexion and extension exercises in the lying position. Values (RPP and VO_2) obtained during the first and second sets of passive exercises on the REPEX table did not vary significantly from resting values. The values obtained following active flexion and extension in lying were significantly different than resting values.

Limitations of the study remain because only inferences can be drawn about specific populations and how they will respond to similar exercises. All of the subjects who volunteered for this study were asymptomatic of LBP, of cardiopulmonary and/or metabolic disease and representative of an age susceptible to LBP (McKenzie, 1981). Future studies will need to address specific subjects with known pathologies to collect data about how individuals with those specific conditions will respond to active and passive repetitive exercises, such as those used by the McKenzie Method. At the time of submission for publication, another study has been initiated to analyze how individuals with specific conditions will respond to these same exercises.

Before beginning any exercise regimen, especially for individuals with increased risk, it is important to classify patients or subjects by risk levels. High risk patients may be described as those with known cardiovascular, pulmonary, or metabolic disease (American College of Sports Medicine 2006). It is suggested that all high risk patients be clinically supervised with any exercise, no matter what degree of effort is required for the exercise (American College of Sports Medicine 2006). A moderate risk patient is one who has been pre-determined to have at least two risk factors for cardiovascular, pulmonary or metabolic disease (American College of Sports Medicine 2006). The American College of Sports Medicine (ACSM) (2006) states that it is safe for moderate risk patients to perform low intensity exercises without clinical supervision. Low intensity exercises are those which require less than 3.5 METS for middle aged adults. The maximum metabolic equivalent (MET) value measured during all types of exercises for this study was 3.46 METs during EIL. In this specific sample population, it was determined that EIL, the most demanding exercise for this study, was less demanding than ACSM's defined intensity for light exercise (American College of Sports Medicine 2006). Comparatively, the same individual who produced the highest MET value was working at an intensity that would be similar to grocery shopping (McArdle et al 2001).

Conclusions

The results of this study demonstrate significant increases in cardiopulmonary responses and metabolic costs with active lumbar spine exercises (EIL, FIL) by healthy subjects. Extension exercises are more stressful than flexion exercises. Passive exercise (EIL) on the REPEX table does not significantly increase the cardiopulmonary responses or the metabolic rate over baseline figures. The intensity of active exercise in this study did not rise above what is considered by the ACSM to be a low level, which does not require clinical supervision. Further study is recommended to ascertain exercise intensity levels and possible risks when patients with low back pain, cardiopulmonary conditions or metabolic disease employ these common exercises.

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Footnotes

1. Hill Laboratories Company, PO Box 2028, 3 Bacton Hill Rd, Frazer, PA 19355
2. Physio-Dyne Instrument Corporation, 1 Industrial Dr, PO Box 5025, Quogue, NY 11959
3. Polar Electro Inc., 370 Crossways Park Dr, Woodbury, NY 11791-2050
4. Propaq Protocol Systems, 8500 SW Creekside Place, Beaverton, OR 97008-7107
5. SPSS Headquarters Inc, 233 S. Wacker Dr. 11th Floor, Chicago, IL 60606
6. http://www.pinkandaint.com/weirdmet.shtml

Table 1.
Cardiovascular responses to active flexion, active extension and passive extension exercise.

Exercise ($\bar{X}$ ± SD)	**Rest**	**1st Set**	**2nd Set**
Heart Rate (bpm)			
Active Flexion	69.62 ± 11.80	83.38 ± 12.92*	83.28 ± 10.58*
Active Extension	74.38 ± 11.92	89.86 ± 09.94*	91.55 ± 11.11*
Passive Extension	71.21 ± 11.80	74.90 ± 09.58	74.21 ± 09.99
Systolic BP (mmHg)			
Active Flexion	130.24 ± 14.06	132.41 ± 15.27	132.52 ± 15.22
Active Extension	127.62 ± 13.19	134.55 ± 14.89*	136.61 ± 13.67*
Passive Extension	125.62 ± 12.26	121.38 ± 12.80*	121.52 ± 12.56*
Diastolic BP (mmHg)			
Active Flexion	70.97 ± 09.82	69.66 ± 10.08	68.14 ± 11.82
Active Extension	70.72 ± 10.70	73.97 ± 11.47*	73.79 ± 11.94*
Passive Extension	69.90 ± 08.78	68.97 ± 10.87	68.83 ± 09.83
RPP ($ml \cdot min^{-1}$)			
Active Flexion	90.9 ± 20.0	110.4 ± 21.6*	110.8 ± 21.9*
Active Extension	95.4 ± 20.9	121.5 ± 23.1*	125.8 ± 24.1*
Passive Extension	89.7 ± 18.7	90.9 ± 15.1	90.3 ± 16.3
O_2 Cost ($ml \cdot kg^{-1}min^{-1}$)			
Active Flexion	4.1 ± 0.9	7.0 ± 1.1*	6.9 ± 1.5*
Active Extension	4.6 ± 0.7	7.7 ± 1.2*	8.1 ± 1.5*
Passive Extension	4.3 ± 1.0	4.2 ± 0.7	4.1 ± 0.7

*Indicates a significant increase (P<0.05) in response from resting value.

Figure 1.
Subject on REPEX machine in an extended position with connections to the metabolic cart, heart rate monitor and blood pressure monitor.

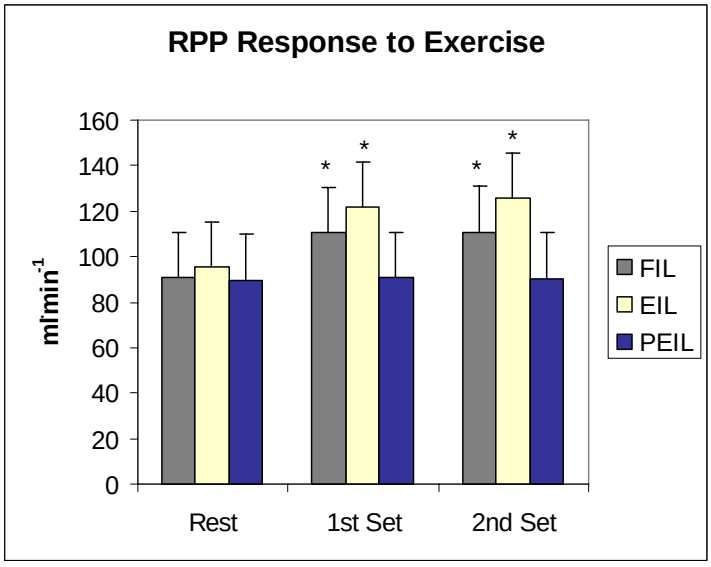

Figure 2.
Cardiovascular responses (Rate Pressure Product) to active (flexion in lying [FIL]), extension in lying [EIL]) and passive extension exercises (passive extension in lying [PEIL]). Asterisk denotes statistically significant change over resting values (*P*<0.05).

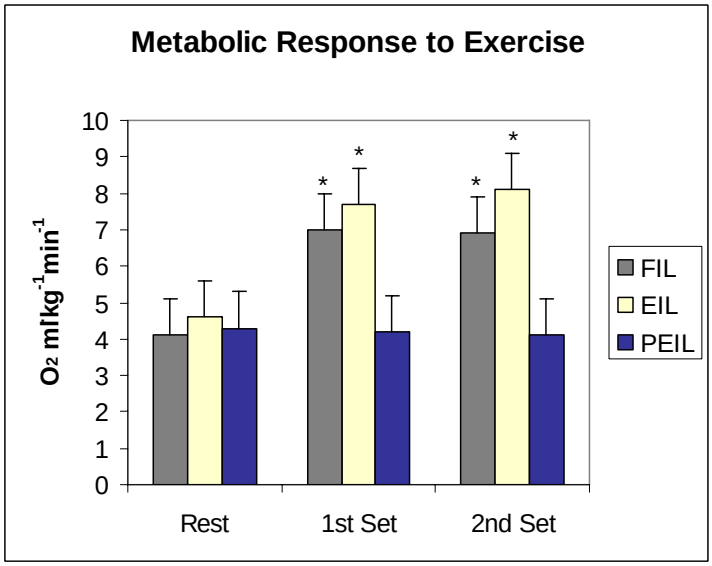

Figure 3.
Metabolic responses (VO_2) to active (flexion in lying [FIL], extension in lying [EIL]) and passive extension exercises (passive extension in lying [PEIL]). Asterisk denotes statistically significant change over resting values (*P*<0.05).

Review of Studies

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■■■■

Kolber MJ, Hanney WJ (2009). The dynamic disc model: a systematic review of the literature. Physical Therapy Reviews 14(3):181-189.

Objective: To systematically review the literature pertaining to the dynamic disc model in the human intervertebral disc.

Design
Systematic Review

Databases
MEDLINE, SPORTDiscus, EMBASE, CINAHL

Inclusion
Keywords
intervertebral disc (IVD), nucleus pulposus, nucleus migration, disc model, disc loading, dynamic disc model. Articles must have appeared in peer reviewed journals, included humans *in vivo* or *in vitro*, addressed migration of the nucleus pulposus (NP) and provide a conclusion about the migration of the nucleus.

Methods: Two independent researchers retrieved articles from the databases above, articles were pooled and cross matched, yielding 12 articles.

Results
A predictable pattern was seen *in vivo* and *in vitro* in the lumbar spine. The nucleus pulposus was identified to move anteriorly during extension and posteriorly during flexion in the normal lumbar IVD. Limited and contradictory data were available to support this model in the symptomatic or degenerative IVD.

Nine of the 11 studies that evaluated sagittal movements identified posterior migration of the nucleus in response to lumbar flexion. Nine of the 11 articles reported that the nucleus pulposus migrated anteriorly during extension, whereas one article reported posterior migration. In regards to rotation, the only study available identified nucleus pulposus migration away from the direction of rotation. Similarly, one study evaluated the NP response to a frontal plane deviation in scoliotic subjects and reported the nucleus pulposus migrated away from the concavity. Four of the research studies reported an unpredictable pattern of nucleus pulposus migration when degeneration was present within the disc.

Conclusions: Overall, a majority of the research studies have identified a predictable pattern of NP migration, in response to loading and positioning. The nucleus pulposus, when loaded in the sagittal and frontal planes, appears to migrate opposite to the side of loading. Thus, flexion will induce posterior migration and extension will induce anterior migration. Available research thus supports the dynamic disc model of NP migration, although this cannot be generalized to symptomatic or degenerative discs. There are no studies identifying this model in the cervical spine or thoracic spine above T10 level.

Comments: The phenomena of centralization, directional preference and derangements are often explained by the disc model. This model was espoused by McKenzie (1981), who suggested that movement of the nucleus can compress internal nerves in the disc and/or spinal nerve roots, resulting in production or peripheralizion of symptoms. Furthermore, movement of the nucleus could also potentially obstruct movements. These clinical observations make up the core of a repeated movement examination. The disc has been implicated as the probable source of centralization and peripheralization (Donelson et al 2007), but given the challenge of finding a gold standard method to identify the disc as the source of symptoms (Carragee et al 2006), McKenzie suggested that it was the most likely source of these symptomatic and mechanical responses.

This systematic review is supportive of the conceptual model underlying derangement syndrome in MDT. It is a nice summary of articles that help to validate the conceptual model used to help understand the derangement syndrome in the lumbar spine. The studies reviewed have examined the nucleus pulposus migration in a variety of positions, both unloaded (supine/prone) and functional loaded positions (sitting/ standing). In general, flexed sitting produced the greatest posterior migration, while extension produced relative anterior migration, and certainly clinically this relates well to patients we see in daily practice with posterior derangement syndrome. This summary of the evidence provides important support for the concept of the disc model. In order to determine the effect (or existence) of a particular phenomenon, that phenomenon must be reliable and valid. This paper supports the reliability of nuclear movement in the opposite direction of spinal movement, especially in discs that are not degenerated. A recent paper by Scannell and McGill (2009) supported the findings of this paper. Not only was the nucleus found to move opposite the direction of motion (posterior for flexion), it was also found to return to its original position with movement in the opposite direction (anterior with extension), as long as the disc was not excessively degenerated by the process of repeated flexion.

The authors note that this consistent pattern is only seen in non-degenerated discs, and direct correlation between clinical outcomes and the dynamic disc model has yet to be established. Earlier work by Donelson et al (1997) showed us that a mechanical evaluation could predict discogenic pain and the state of the annular wall, which supports the notion that the annulus and hydrostatic mechanism must be intact for the model to act consistently.

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Thus, while research continues to support the disc model, we must be aware of two concerns. The first is that this model likely holds up best in those that are less likely to present for treatment: young patients with healthy, non-degenerated discs, who may have more severe acute pain, but often resolve rapidly on their own. Conversely, it is important to note that there are patients who present with historical or imaging findings inconsistent with derangement (elderly patients, or those with stenosis), but who respond and reduce with repeated motions. We must be wary of giving too much credence to the model, and instead continue to treat patients based on their presentation and response to movement and positioning per the principles of MDT. Models such as this are useful constructs to assist our thinking, but must not take the place of an expert clinical examination. Ultimately, while the model could be a biomechanical theory to help explain derangement syndrome, patient management is dictated by symptomatic and mechanical responses.

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Takatalo J, Karppinnen J, Niinimaki J et al (2009). Prevalence of Degenerative Imaging Findings in Lumbar Magnetic Resonance Imaging Among Young Adults. Spine. 34 (16) : 1716-1721.

Objective

To investigate the prevalence of disc degeneration and displacement, annular tears, and Modic changes in lumbar MRI scans in young adults.

Design

Population-based cross-sectional study.

Setting

Oulu, Northern Finland

Patients

558 young adults who had been born between 1 July 1985 and 30 June 1986, and lived within 100km of the city of Oulu.

Intervention

All eligible subjects (n=2,969) were sent a questionnaire and invited to participate in the study. Those who agreed (n=874) were then given a physical examination including isometric strength tests, blood tests, weight, height, and any presentation of low back pain in 2005 and 2006. Two years later, the subjects were then invited to undergo a MRI scan. 316 subjects refused to participate or were excluded due to pregnancy, military service and claustrophobia. The remaining 558 participants underwent a MRI scan and the results were analysed.

Main Outcome Measurements

The features analysed were:

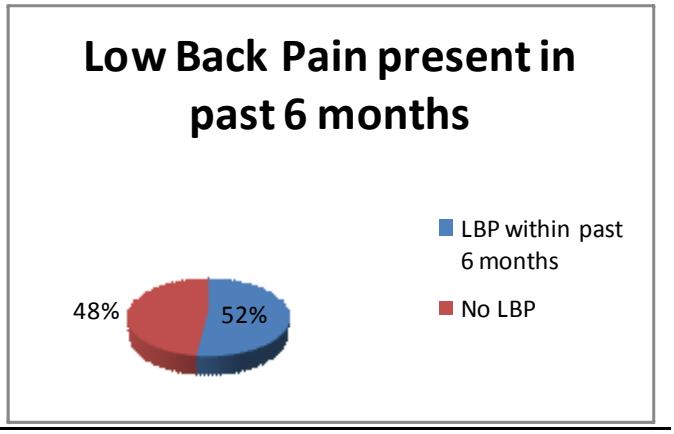
1. The presence of and degree of disc degeneration
2. Modic changes – vertebral endplate and bone marrow change
3. Annular tears – specifically radial tears with nucleus protrusion into the annulus fibrosis
4. High intensity zones – higher intensity signal in annulus than in nucleus
5. Degree of disc displacement - bulging, herniation, and extrusion

Main Results

558 subjects were scanned – 325 women, 233 men. Ages were from 20 – 22 years (mean age 21.2 years). 52% of the subjects reported the presence of low back pain in the previous six months (compared with 49% of a wider general population study completed by the same study group involving 144 subjects) 373 of the 2789 evaluated discs were degenerated (13.4%). 54.5% of the men and 42.5% of the women had at least one degenerated disc (average 47.2%). The degenerated discs were typically found in the lowest two levels – L4/5 and L5/S1; 17% of the subjects had two or more degenerated discs.

The prevalence of Modic changes was 1.4%, with no significant difference between genders. 9.1% of the subjects had at least one radial tear, with no significant difference between the genders; typically the radial tears were located at the lowest two levels.

6.8% of the subjects had at least one high intensity zone (1.5% of the 2,789 evaluated discs). 8.6% of the women had high intensity zones, as opposed to only 4.3% of the men; these lesions were typically found in the lowest two levels, L4/5 and L5/S1.



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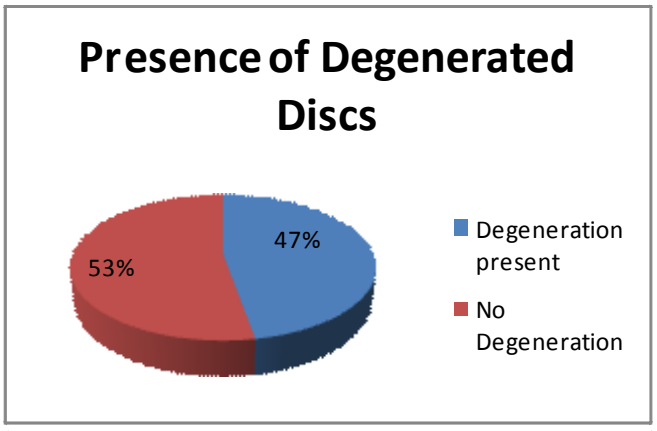
Twenty-five percent of the subjects had at least one bulging disc, with no significant difference between genders. Of the subjects with disc bulging, 6% of men and 7% of women had multiple disc bulges. Disc bulges were seen in the three lowest levels, with L5-S1 being the most prevalent (18.1% of all 2,789 discs evaluated).

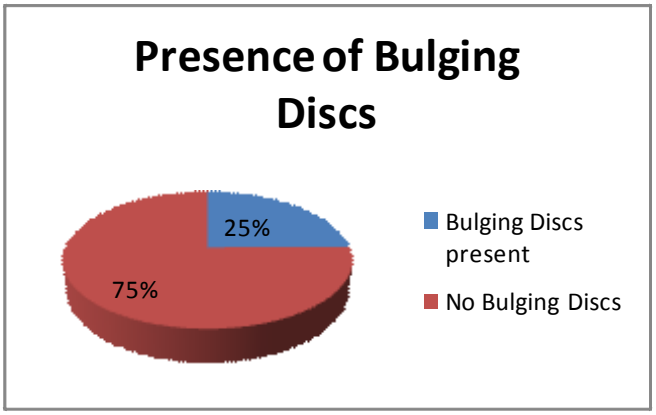
Conclusions

The authors concluded that almost half of the young adults studied had at least one degenerated disc and a quarter had a bulging disc as found on MRI scans of the general public.

Comments

This is an interesting study in terms of the high prevalence of disc degeneration in young adults. However, caution needs to be advised as the authors freely state that their study did not attempt to link the presence of MRI findings and the presence of any symptoms. Although 52% of the participants had stated that they had experienced low back pain in the previous six months, the study did not report the findings of a specific participant – i.e., we are not aware of whether or not the participants with a history of low back pain had the degenerative or bulging discs on their MRI scans. At best, this information can serve as a warning that disc degeneration is common, even by the early 20's, and until further research is completed, we cannot state that this common finding has any clinical relevance to a patient's pain. It does, however, help us demystify the MRI findings some patients may have.





We can now say that a study has shown that 50% of healthy young adults in a European setting have disc degenerative findings on their MRI, and 25% have bulging discs. This clearly demonstrates the normality of these findings and should serve as a warning against over-interpretation of the clinical relevance of such findings.

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Kilpikoski S, Markku A, Markku P, Simonen R, Heinonen A and Tapio V (2009). Outcome comparison among working adults with centralizing low back pain: Secondary analysis of a randomized controlled trial with 1-year follow-up. Advances in Physiotherapy, iFirst Article, pp. 1-8. URL: http://dx.doi.org/10.1080/14038190902963087

Objective

To determine if adults with centralizing low back pain achieved better outcomes when treated by an individually designed therapy program (orthopaedic manual therapy or McKenzie Method), rather than when given general advice to stay active.

Design

Secondary analysis of an earlier prospective randomized controlled trial (Paatelma et al 2008).

Setting

Four occupational health care centres in Finland.

Patients

The sample frame was working adults aged 18-65 with current non-specific low back pain, acute or chronic, first or recurrent, and with or without radiating symptoms to lower limb(s). Out of 134 such patients, 119 (89%) demonstrated centralization and 11% non-centralization. Following this sub-classification, patients were randomised as follows: 42 to Orthopaedic Manual Therapy (OMT), 48 to Mechanical Diagnosis and Therapy (MDT), and 29 to advice to stay active (ASA). This paper considers the outcomes of the 119 centralizers.

Follow up was immediately after the treatment period of one to seven visits (OMT and MDT) and immediately after the advice session (ASA), and also at 3/6/12 months for all three groups. The dropout rate during the follow-up year in the MDT was 6%, in the OMT group 17% and in the ASA group 24%.

Intervention

MDT: An educational component, a copy of "Treat Your Own Back" and an individualized home exercise "according to the principles of the approach (10-15 repetitions every 1-2 hour with or without a sustained end-range position on a regular basis according to symptom response)." Clinician generated forces were used when indicated, including overpressure and mobilization but not thrust manipulation.

OMT: Spinal manipulation, mobilization and muscle stretching techniques as well as an individualized home

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exercise program to actively mobilize the low back with two to three sets of 15-20 repetitions for each exercise as well as a lumbar stabilization exercise and up to one minute of stretching each day.

ASA: 30-45 minutes physiotherapist counseling about the good prognosis of low back pain, pain tolerance, medication and early return to work. Participants were told to avoid bed rest and stay as active as possible, including exercise activities. They were given a two-page summary booklet.

In both active treatment groups (MDT and OMT), the physical therapists treated patients according to their certified method. MDT was carried out by a credentialed physical therapist with ten years experience, OMT by a therapist with twenty years experience in this field and ASA by a physical therapist who had five years of clinical experience.

Main outcome measures

Outcome measures were a 0-100 visual analogue pain scale (VAS), Roland Morris disability questionnaire and a seven-item activity of daily living index.

Main results

At study entry, leg pain, low back pain, disability and functional status were essentially the same in all three groups. After the treatment period (one to seven visits), there was no statistically significant difference in outcomes between the two active treatment groups (MDT and OMT), but low back pain decreased significantly more in the MDT group than in the ASA group (p=0.001).

At three months, significant improvement had occurred in every group (p=0.001), but leg pain decreased significantly more in the MDT than the OMT group (p=0.01) and back pain in the MDT than the ASA group (p=0.04). At six months, leg pain and low back pain had decreased significantly more in both MDT and OMT groups than the ASA group (leg pain: p=0.002 and 0.01; back pain: <0.0001 and 0.003 respectively), and functional status had increased significantly more according to the seven-item activity of daily living index (p=0.006 and 0.046, respectively). The Roland-Morris disability questionnaire had decreased significantly more in the MDT group than in the OMT (p=0.03) and ASA groups (0.001). At 12 months, there were no significant differences between groups in low back pain, leg pain, disability and functional status, but there was a trend toward greater improvement in the MDT than ASA group (p=0.06).

Conclusions

Centralizers (defined on the initial visit), when advised and treated with individually designed treatment approaches, achieved better pain recovery and a longer-lasting treatment outcome than those provided with only advice to stay active. The centralization phenomenon was associated with good treatment outcomes with both MDT and OMT.

Comments

This study was a secondary analysis of a previous trial (Paatelma et al 2008), and considered a sub-group of patients from this trial, namely those who demonstrated centralization at baseline. A large number of the original pool demonstrated centralization (88%), which is a much higher prevalence rate than some recent studies (Werneke at al 2008). The results show that both active treatment groups (MDT and OMT) did better than the advice only group. Furthermore, there were some significant differences favouring the MDT over the OMT group at certain time points, and if one compares the p values between these groups, they tended to be considerably smaller in the MDT group. This indicates a more significant difference between MDT and ASA, than between OMT and ASA.

In the original study, all groups improved significantly at three months, but there were no significant differences between groups. At six and 12 months, there were significant differences favouring the McKenzie group over the advice only group. There were no significant differences between the McKenzie and orthopaedic manual therapy group, at any point (Paatelma et al 2008). In other words, the differences in this sub-group of centralizers were greater than in the original trial.

Advice only to stay active is commonly recommended in guidelines (Airaksinen et al 2004), but the findings from this and other studies (Long et al 2004, Fritz et al 2003) would suggest that such bland advice is not as effective as individualised exercise programs. However, the authors of the present study do question the clinical significance of the statistically significant differences that favoured the active treatment groups.

As for all secondary analyses, weaknesses must be recognised. The original sample size calculation was done for the full trial, and in fact was not even met for that trial. The authors hoped to recruit 180 patients, but only managed to recruit 134 for the original trial, of which only 119 were included for this analysis. This opens the way for a possible type II error, which is where a true significant difference is missed as the study is under-powered with insufficient numbers. In fact, some significant differences were found, so with adequate numbers these differences may have been greater. The drop-out rates in the ASA group were considerable (24%) and the authors speculate that this was due to the lack of individualised therapeutic input, and that differences may simply be due to greater therapist input in the two active treatment groups. However, drop out rates in the individualised OMT group were sizeable, also (17%). Unfortunately, differences in outcome were not compared between centralizers and non-centralizers, though the latter group was very small. Centralization was defined at baseline at a single visit, whereas it has been shown that some initial non-centralizers become centralizers on subsequent visits (Werneke and Hart 2003).

Review of Studies

However, given the high prevalence rate of centralization this would appear to be unlikely in this population.

Despite its weaknesses, a number of tentative conclusions can be drawn from this study. Overall, it provides further support for the prognostic validity of centralisation, especially when treated with directional preference exercises. It highlights, again, the limitations of advice only despite its recommendation in guidelines, it is not very satisfying to patients and is less effective than more individualised treatments. From a research perspective, it reinforces the importance of conducting sub-grouped trials and further cautions against treatment of back pain as a homogeneous entity.

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■■■■

Nenschke N, Maher CG, Refshauge KR et al (2009). Prevalence of and screening for serious spinal pathology in patients presenting to primary care settings with acute low back pain. Arthritis and Rheumatism 60:3072-3080.

Background

The purpose of this study was to determine the prevalence of serious spinal pathology in acute low back pain patients presenting to a primary care setting and to evaluate the diagnostic accuracy of recommended “red flag” screening questions. While a number of clinical guidelines have recommended these red flag questions, many of the questions have not been externally validated in a primary care setting. In addition, their diagnostic accuracy has not been established because they arise from studies of poor methodological quality.

Methods

In this study, 170 primary care clinicians in Sydney, Australia (73 general medical practitioners, 77 physiotherapists and 20 chiropractors) screened a total of 1,172 patients with an initial episode of acute low back pain. Patients were asked 25 red flag questions, which were derived from four guidelines and discussion with experts in the field. The reference standard consisted of close follow-up for 12 months. All patients with subsequent serious pathology were examined by one of two study rheumatologists.

Results

Clinicians were able to identify about half of the cases of serious pathology at the initial consultation. The most common serious pathology was vertebral fracture. The estimate for the prevalence of previously undiagnosed serious pathology in patients presenting to primary care providers for an initial episode of acute low back pain was 0.9%. The authors noted that in Australia, patients must see a primary care clinician before referral to a specialist.

Because the prevalence of relevant pathology was too low for many of the red flag questions, the diagnostic accuracy of these questions could not be determined from the sample size. Nevertheless, some red flag questions were positive for a large proportion of participants, most of whom did not have serious pathology. This high false positive rate leads the authors to recommend caution in interpreting single positive red flag findings and to recommend further studies to identify, instead, clusters of red flag questions with better predictive power. For the most common red flag finding (vertebral fracture) the following cluster was informative: prolonged use of corticosteroids, age >70 and significant trauma.

■■■■

Progressively worsening lumbar radiculopathy with lateral shift deformity managed with Mechanical Diagnosis and Therapy®: A case report

Maria D. Aytona, DPT, Dip. MDT

THE McKENZIE INSTITUTE LUMBAR SPINE ASSESSMENT

Date

Name P.J. Sex M (F)

Address

Telephone

Date of Birth Age 48

Referral: *GP / Orth / Self / Other* neurosurgeon

Work: Mechanical Stresses Homemaker - bending, 50/50 sitting/standing

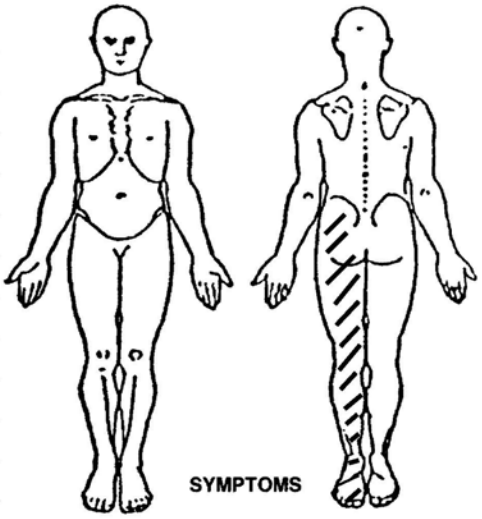
Has been lying down more since this episode

Leisure: Mechanical Stresses Reading, watching t.v.

Functional Disability from present episode No housework, can't put on socks/shoes

Functional Disability score

VAS Score (0-10)



HISTORY

Present Symptoms Per body chart

Present since 10 weeks *Improving / Unchanging / (Worsening)*

Commenced as a result of Twisting her back to reach for something *Or no apparent reason*

Symptoms at onset: *back / thigh / leg* all

Constant symptoms: *back / thigh / leg* all Intermittent symptoms: *back / thigh / leg*

Worse *(bending) (Sitting) / (rising) (standing) (walking) lying*

am / as the day progresses / pm *when still / (on the move)*

other

Better *bending sitting standing walking (lying)*

am / as the day progresses / pm *when still / on the move*

other

Disturbed Sleep *(Yes) / No* Sleeping postures: *prone / (sup) / side R / L* Surface: *(firm) / soft / sag*

Previous Episodes 0 1-5 6-10 (11+) Year of first episode

Previous History Episodic back pain for several years, no apparent reason

Previous Treatments none

SPECIFIC QUESTIONS

(Cough) / (Sneeze) / (Strain) / (+ve) / -ve Bladder: *(normal) / abnormal* Gait: *normal / (abnormal)*

Medications: *Nil / (NSAIDS) / (Analg) / Steroids / Anticoag / Other*

General Health: *Good / (Fair) / Poor*

Imaging: *Yes / No* L5/S1 disc herniation

Recent or major surgery: *Yes / (No)* Night Pain *(Yes) / No* Positional

Accidents: *Yes / (No)* Unexplained weight loss: *Yes / (No)*

Other:

Progressively worsening lumbar radiculopathy with lateral shift deformity managed with Mechanical Diagnosis and Therapy®: A case report

EXAMINATION

POSTURE

Sitting: *Good / Fair / (Poor)* Standing: *Good / Fair / (Poor)* Lordosis: *(Red) / Acc / Normal* Lateral Shift: *(Right) / Left / Nil*

Correction of Posture: *Better / (Worse) / No effect* unable to self-correct Relevant: *Yes / No*

Other Observations:

NEUROLOGICAL

Motor Deficit: Left ankle dorsiflexors 4/5, EHL and plantarflexors 3+/5

Reflexes: Diminished L achilles reflex

Sensory Deficit: Diminished light touch - L dorsum and plantar aspects

Dural Signs: (+)SLR Left

MOVEMENT LOSS

	Maj	Mod	Min	Nil	Pain
Flexion					
Extension	✓				(+)
Side Gliding R				✓	
Side Gliding L	✓				(+)

TEST MOVEMENTS **Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising, peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

	Symptoms During Testing	Symptoms After Testing	Mechanical Response		
			↑Rom	↓Rom	No Effect
Pretest symptoms standing:					
FIS					
Rep FIS					
EIS					
Rep EIS					
Pretest symptoms lying:					
FIL					
Rep FIL					
EIL					
Rep EIL					
If required pretest symptoms:					
SGIS – R					
Rep SGIS - R					
SGIS - L					
Rep SGIS- L					

STATIC TESTS

Sitting slouched: Sitting erect:

Standing slouched: Standing erect:

Lying prone in extension: Long sitting:

OTHER TESTS (1) Manual shift correction in standing - increased, worse

(2) Sustained L sidelying with trunk rotated to the R, decreased, centralizing, B

PROVISIONAL CLASSIFICATION

(Derangement) Dysfunction Posture Other

Derangement: Pain location Unilateral/asymmetrical symptoms below knee, deformity of R lat. shift

PRINCIPLE OF MANAGEMENT

Education: Equipment Provided:

Mechanical Therapy: *Yes / No*

Extension Principle: Lateral Principle: Sustained L sidelying, trunk rotation 2 hourly as needed

Flexion Principle: Other:

Treatment Goals:

Progressively worsening lumbar radiculopathy with lateral shift deformity managed with Mechanical Diagnosis and Therapy®: A case report

Introduction

The McKenzie Method®, also known as Mechanical Diagnosis and Therapy®, is a system of assessment and treatment that utilizes various loading strategies to classify and treat patients with non-specific low back pain. One of the classifications in this system is the derangement syndrome (McKenzie and May 2003). According to the McKenzie conceptual model, the nuclear material in the intervertebral disc can displace, causing mechanical deformation of spinal structures. Depending on the size of mechanical deformation, the symptoms may remain local to the spine or radiate into the extremities. Mechanical deformation may also result in an acute deformity such as a lateral shift (McKenzie 1981).

Managing derangements, especially in the presence of deformities and depending on the symptom severity, can be rigorous and often requires modifications in the techniques used to achieve a favorable symptomatic and mechanical response. In the case of a lateral shift deformity, the technique suggested by McKenzie, if a patient is unable to self-correct, is the manual shift correction in standing. However, if this fails to reduce the symptoms, exploration of force alternatives can be challenging especially when dealing with more severe and progressively worsening symptoms.

A study by Long et al (2004), suggests that as long as a direction is found that reduces or moves the patient's symptoms from distal to proximal, a positive outcome can be predicted. There have been numerous studies showing that centralization of symptoms is a reliable prognostic indicator for patient recovery, even in cases where surgery is indicated. It has been found that a large percentage of patients referred for surgery respond rapidly to conservative treatment (Donelson 2007).

This case report describes the mechanical assessment and treatment of a patient with progressively worsening left-sided back and leg pain and a right lateral shift deformity. This patient had been referred to a neurosurgeon and surgery was recommended. The case report will also discuss the clinical application of the principles of Mechanical Diagnosis and Therapy and the value of centralization as a tool for predicting patient prognosis. It will also discuss the relevance of the conceptual model of the McKenzie Method, as it applies to this particular case.

History

A 48 year old female reported chronic episodic back pain for several years duration, onset for no apparent reason. Ten weeks prior to initial evaluation, the patient twisted her back while reaching for something and felt sudden onset of left buttock, posterior thigh and leg pain. A few days later, she noted numbness in the plantar aspect of her left foot and difficulties bearing weight on the left, due to her symptoms. Following this episode, she was unable to perform any housework and spent most of the day lying down. The symptoms were constant in the left side of her lower back and lower extremity. All symptoms worsened with bending, sitting, arising from sitting, standing for prolonged periods and walking. She felt some relief lying on her back. She had disturbed sleep, waking every four hours due to her symptoms. Coughing and sneezing increased her back and leg pain. She denied any bladder or bowel control problems. She reported feeling "lopsided" when she stood or walked and reported of weakness in the left leg. The patient went to see her primary care physician who referred her for an MRI, which revealed a disc herniation at L5/S1. A neurosurgical consult ensued and surgery was recommended. The patient, however, wanted to try conservative treatment and was therefore referred to physical therapy.

Physical Examination

Observation revealed poor standing posture with an unmistakable right lateral shift. McKenzie (1981) describes a right lateral shift as a position where the upper trunk and shoulders are shifted to the right. Her gait was antalgic and with reduced weight-bearing on the left lower extremity. Neurological assessment revealed weakness of the left ankle dorsiflexors (4/5), left big toe extensors (3+/5) and plantarflexors (3+/5). Achilles reflex was diminished (+1). The patient reported diminished sensation to light touch and pin prick on the left L5/S1 dermatomes. The patient was unable to self-correct her shift deformity.

The McKenzie Method suggests that if the patient is unable to correct the shift using self-generated forces, a clinician technique would be necessary. Manual shift correction, as described by McKenzie, was performed (McKenzie 1981). The patient reported increased leg symptoms with this maneuver, and despite attempts to accommodate her deformity by changing the amount of flexion or extension of the lumbar spine, this procedure was found unsuccessful in reducing the patient's symptoms. This procedure, therefore, was abandoned. The patient was then asked to lie on the left side (symptomatic side). Initially, her symptoms were unchanged, but after a few minutes she reported reduced numbness in her left foot. The patient was positioned in left sidelying, with her left hip extended and her trunk rotated to the right **(Figure 1)**.

After a few more minutes, she reported abolition of numbness in the left foot. Her thigh and leg pain reduced and she noted increased left buttock and lower back pain. The patient stayed in this position for approximately 20 minutes, encouraging further trunk rotation. When the patient got up from the treatment table, she continued to note decreased leg pain and numbness. Her shift was reduced and her pain was mainly in her left lower back and buttock.

Progressively worsening lumbar radiculopathy with lateral shift deformity managed with Mechanical Diagnosis and Therapy®: A case report

Conclusion
Based on the history and physical examination of this patient, a provisional classification of lumbar derangement, unilateral symptoms below the knee with a right lateral shift deformity was made on Day One. The level of impairment based on neurological examination was at L5/S1 level.

Management
Finding a direction of movement or position, in this case, left sidelying position, causing her leg pain to move from distal to a more proximal location, suggests good prognosis for this patient despite the severity of her condition. The patient was instructed to lie in the described position for at least 15 minutes every two hours or when the need arises to control her leg symptoms. She was also advised to sleep in this position. Avoidance of any flexion activities was emphasized. She was scheduled for a follow-up visit the next day.

Follow-up visits/Reassessment
Day Two
The patient exhibited a significant reduction in her lateral shift and reduced antalgic gait. Pain had remained in the left low back and buttock. She rated her overall improvement at 70% and was very amazed at how quickly her leg pain resolved with simple positioning. Her left lateral flexion in standing improved to 75%, but going to end-range reproduced her leg symptoms. Extension was still markedly limited and caused production of left leg symptoms. Her home instructions were reviewed and the patient was encouraged to continue with the same techniques. As her symptoms were improved in less than 24 hours, the home instructions were unaltered. The mechanical diagnosis was confirmed on Day Two.

Day Three
The patient's symptoms were essentially unchanged. Her lumbar range of motion was also unchanged. It was decided that force progression was indicated and clinician overpressure was performed in the same position that centralized the patient's symptoms **(Figure 2)**. Further reduction of left buttock pain was reported. The technique was applied until the patient reported of abolition of buttock pain and increased pain in the middle of her lower back. The patient was then instructed to perform trunk rotation to end-range and increase left hip extension **(Figure 3)**. She was able to maintain centralization of symptoms upon return to standing. She was advised to perform her exercises 10 to 15 times every two hours, as well as, when the leg symptoms return and to continue her avoidance of aggravating factors.

Day 4
Two days later, the patient returned with mainly central back pain. No lateral shift was observed. Left lateral flexion was full, but with end-range pain in the central low back only. Extension was still markedly limited and would increase low back pain. The patient was asked to lie prone. Prone lying reduced back pain. Gradual progression into extension was performed starting from prone on elbows and then repeated extension in lying. The patient was encouraged to go further and further into end-range, however, pain started to radiate into the left low back and buttock, so this was discontinued. She was asked to shift her hips to the right side **(Figure 4)** and in this position, she was able to perform extension in lying without radiating pain. Her extension range improved after three sets of 10 repetitions and her back pain decreased and remained better. The patient was advised to perform this new exercise 10 to 15 times every two hours with caution against production and worsening of left sided symptoms. She was told to stop the new exercises if her symptoms worsened and to return to the left sidelying rotation (initial home program).

Day Five
Three days later, the patient was essentially pain free and reported feeling 90% better. Her sleep was no longer disturbed. She was able to walk longer without pain. Her left lateral flexion was normal and pain free.

Figure 1. Left sidelying with trunk rotation

Figure 2. Clinician overpressure

Extension was full, but still with end-range pain. Neurological assessment was normal. The patient was able to perform extension in lying without shifting her hips. She was instructed to continue with this exercise 10 to 15 times every two hours. She was advised to increase her activity, but to maintain her lumbar lordosis. Posture correction in sitting with use of lumbar roll was reinforced, as well as, proper body mechanics. Walking was encouraged as well.

Day Six

The patient returned three days later noting full resolution of symptoms. She had increased her walking to two miles/day. She was able to sit with a lumbar roll at her church for over an hour without increased pain. Lumbar spine range of motion was full and pain free in all directions. Recovery of flexion was tested as suggested by McKenzie. The patient was asked to perform one extension in lying. This was full and pain free. Then, the patient assumed supine position and performed 10 repetitions of flexion in lying, followed by return to prone extension in lying. The patient did not have any symptoms with performance of flexion in lying. The patient was educated on prophylaxis for low back pain, including detection of early warning signs of recurrence of derangement, interruption of prolonged positioning, balance between flexion and extension, as well as, performance of extensions in lying 10 to 15 times at least twice a day. The patient was advised to phone the therapist two weeks later to report on how she was doing. The patient called as directed, reporting return to normal activities without pain and was happy to be discharged from therapy.

Outcomes

The patient was seen for six visits with complete resolution of symptoms using the McKenzie Method of treatment. Her right lateral shift deformity was fully corrected. Full and pain free movements in the lumbar spine were restored as well. Neurological deficits, which were present during initial examination including L4/5 myotomal weakness, diminished Achilles reflex and decreased L4/5 pin prick and light touch sensation, were fully recovered upon reassessment on Day Five. Straight leg raise (SLR) was also full and pain free. The patient was able to return to all aspects of her activities of daily living without significant back symptoms.

Figure 1. Left sidelying with trunk rotation

Figure 2. Clinician overpressure

Figure 3. Left sidelying with increased trunk rotation and left hip extension

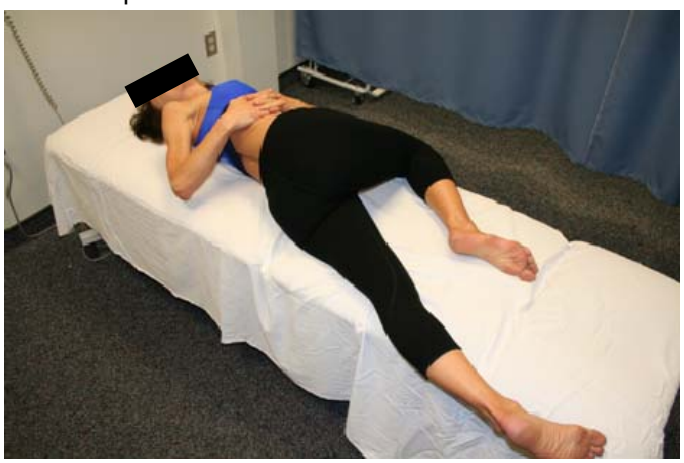
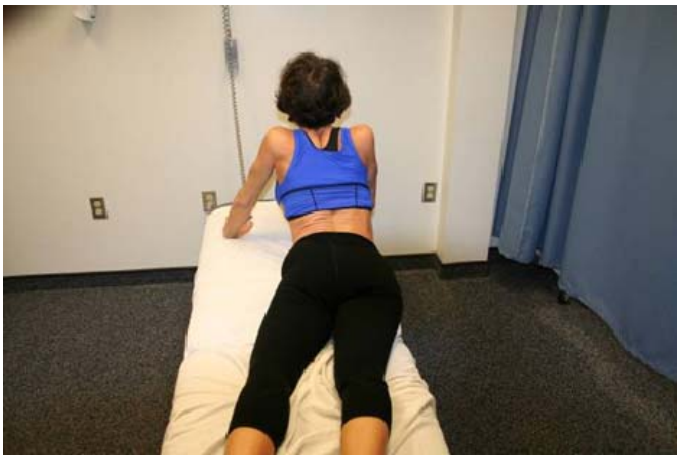


Figure 4. Extension in lying with hips off-center to the right



Discussion

This case highlights the importance of the clinical application of Mechanical Diagnosis and Therapy in the evaluation and treatment of back and leg pain. It is not uncommon to see patients who have findings of disc herniation with resultant leg pain respond rapidly to loading strategies. A number of studies have been published showing the relationship, or lack thereof, between MRI findings, especially in the lumbar vertebral discs and patient symptoms (Beattie 1996). It has been found that some form of single or multi-level disc degeneration or disc bulge is visible on the MRIs of between 28% and 85% of the adult population, without significant back symptoms. Although the MRI is a useful tool in identifying lesions in patients with symptoms, this study shows how critical it is to correlate patient's symptoms with MRI findings and not assume the prognosis before performing mechanical assessment. The patient's MRI showed a large disc herniation at L5/S1 level impinging upon the nerve root on the left. It may have appeared that the lesion was large enough for surgery. The patient nevertheless improved significantly with a few treatment sessions of physical therapy.

In this case, the patient was found to have responded favorably to left sidelying procedures when manual shift correction in standing failed to reduce the symptoms. The left sidelying procedure used in this case is a combined position/movement. The position is familiar to those who perform spinal manipulative thrust technique using combined movement therapy (Beeton 2003). However, in this case, manipulation was not necessary as the patient's symptoms centralized with gradual force progression. In contrast to the rotation mobilization in flexion (McKenzie and May 2003), which utilizes adjunct flexion with lumbar rotation, the addition of hip extension on the involved side may have been crucial in further reducing the postero-lateral component in this case. A combination of trunk rotation to the right with the patient in left sidelying accentuates left lateral shift, which was the direction needed to correct the patient's deformity. Although it is used less frequently than extension procedures in the treatment of derangements, it can be a powerful technique to reduce unilateral lumbar symptoms. An argument could be made for the earlier use of prone lying with hips off center to the right, but the clinician felt the facility for control of the lateral component in this case was better in left sidelying than prone.

This case demonstrates the importance of exploring force modifications when standard techniques fail to provide reduction or result to worsening of symptoms. Force alternatives used in this case involved changing the loading environment and utilizing combined sagittal and frontal plane positions. Likewise, sustaining the position rather than performing repeated movements may have been a factor in reducing the symptoms. The patient exhibited complete abolition of pain and neurological signs in six visits. Considering the severity of the patient's condition and the presence of a deformity along with neurological deficits, the response to the McKenzie Method in this particular patient was remarkable. Another salient point in this case is the importance of centralization in determining the patient's prognosis and success for treatment. The patient demonstrated centralization of symptoms on Day One with left sidelying procedures. Centralization has been shown to be a good predictor of patient outcomes and this was evident in this case (Aina et al 2004). Centralization can be considered part of the built-in safety mechanism in the method. This was critical in this particular case where the patient described a worsening condition prior to initial evaluation.

The conceptual model used by McKenzie to explain the behavior of derangements is the intervertebral disc dynamics. McKenzie theorized that the nucleus inside the disc can displace and that movement will be obstructed in the direction of displacement. Any position or movement that increases the displacement of the nuclear material will further increase, peripheralize and worsen the patient's symptoms, as well as, reduce range of motion. Conversely, movements or positions that reduce the displacement will decrease the symptoms and improve range of motion (McKenzie 1981).

Following this conceptual model, it would seem that the displacement for this case is postero-lateral to the left. It is thought that the lateral component on the left was reduced by left sidelying procedures. With reduction of the lateral component, the posterior component of the displacement was addressed by sagittal procedures. This was achieved on Day Five, during which the patient was able to perform straight extension in lying, without application of lateral force. i.e. shifting hips to the right. The patient's response to loading strategies in this case was correlated to the McKenzie conceptual model of internal disc mechanics. Research has been done to determine the validity of this conceptual model. Studies, including those by Fazey et al (2006) and Fredericson et al (2001) involving MRI, support the clinical assumptions about the effects of movements and positions on disc behavior. However, most of these studies were performed on normal subjects. Studies on the validity of the disc conceptual model involving degenerative discs, such as those done by Beattie et al (1994) and Schnebel et al (1988), showed less predictability of the effects of movement to the nucleus. A recent systematic literature review by Kolber et al (2009) suggests that there is limited and contradictory data to support this conceptual model in symptomatic and degenerated discs. Further research to validate the McKenzie conceptual model in symptomatic human subjects is lacking, and therefore warranted. In retrospect, it would have been interesting to see what changes took place in the patient's MRI findings following complete reduction of her symptoms, but due

to the cost of imaging studies, this was impractical. Ultimately, the goals to reduce the patient's pain and recover function were met.

Conclusion

Despite MRI findings, and with careful ruling out of contraindications to treatment, a thorough assessment and analysis of the patient's mechanical and symptomatic response to positions and movements should still be performed. This case report demonstrated a patient with chronic back and leg symptoms, along with a deformity of lateral shift, deemed to be a surgical candidate, but responded rather rapidly to conservative care. It highlights the McKenzie Method as an effective assessment and treatment tool utilizing patient response to loading strategies, rather than a rigid protocol. The application of force alternatives in left sidelying position was found to be effective in the resolution of unilateral symptoms in this case. It also emphasizes the value of centralization as a predictor of patient's prognosis.

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Relevance of carotid sinus hypersensitivity to MDT

Gabor Sagi, PT, Dip. MDT and David Vandeput, PT, Dip. MDT

THE McKENZIE INSTITUTE CERVICAL SPINE ASSESSMENT

Date 28/05/2009

Name Therese Sex M / (F)

Address

Telephone

Date of Birth Age 76

Referral: *GP / Orth / Self / Other*

Work: Mechanical stresses Retired

House-Keeping. Taking care of disabled husband

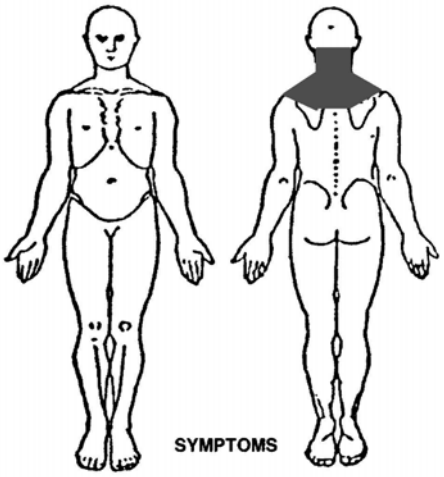
Leisure: Mechanical Stresses

Functional Disability from present episode Domestic work

uncomfortable, but able to do everything.

Functional Disability score

VAS Score (0-10) 8/10



HISTORY

Present Symptoms See diagram

Present since Pain for years. Became severe several months ago. *Improving / (Unchanging) / Worsening*

Commenced as a result of *Or no apparent reason*

Symptoms at onset: (neck) / *arm / forearm / headache*

Constant symptoms: (neck) / *arm / forearm / headache* Intermittent symptoms: *neck / arm / forearm / headache*

Worse (bending) ~~sitting~~ (turning) *lying / rising*

~~am / as the day progresses / pm~~ *when still / (on the move)*

other

Better *bending* ~~sitting~~ *turning* (lying)

~~am / as the day progresses / pm~~ (when still) / *on the move*

other

Disturbed Sleep *Yes / (No)* Pillows "orthopaedic" pillow

Sleeping postures *Prone / sup / (side R / L)* Surface (Firm) / *soft / sag*

Previous Episodes 0 1-5 6-10 11+ Year of first episode

Previous History Cervical spine never free of pain for years. Recurrent lower back pain with sciatica.

Previous Treatments

SPECIFIC QUESTIONS

Dizziness / tinnitus / nausea / swallowing / +ve / (-ve)

Gait / Upper Limbs: (normal) / *abnormal*

Medications: *Nil /* (NSAIDS) / (Analg) / *Steroids / Anticoag / Other* Medication for high blood pressure and cholesterol

General Health: (Good) / *Fair / Poor* High blood pressure, cholesterol

Imaging: (Yes) / *No* Very marked OA of the cervical spine

Recent or major surgery: *Yes /* (No) Night Pain: *Yes /* (No)

Accidents: *Yes /* (No) Unexplained weight loss: *Yes /* (No)

Other:

McKenzie Institute International 2005©

Relevance of carotid sinus hypersensitivity to MDT

EXAMINATION

POSTURE

Sitting: *Good / Fair /* (Poor) Standing: *Good /* (Fair) */ Poor* Protruded Head: (Yes) */ No* Wry Neck: *Right / Left /* (Nil)

Correction of Posture: *Better / Worse /* (No effect) Relevant: *Yes / No*

Other Observations:

NEUROLOGICAL

Motor Deficit Reflexes

Sensory Deficit Dural Signs

MOVEMENT LOSS	Maj	Mod	Min	Nil	Pain
Protrusion			✔		
Flexion				✔	+
Retraction			✔		
Extension		✔			++

	Maj	Mod	Min	Nil	Pain
Lateral flexion R	✔				++
Lateral flexion L	✔				++
Rotation R	✔				++
Rotation L	✔				++

TEST MOVEMENTS **Describe effect on present pain – During:** produces, abolishes, increases, decreases, no effect, centralising,peripheralising. **After:** better, worse, no better, no worse, no effect, centralised, peripheralised.

	Symptoms During Testing	Symptoms After Testing	Mechanical Response ↑Rom	↓Rom	No Effect
Pretest symptoms sitting:	**Neck pain bilateral**				
PRO	**NE**				
Rep PRO	**NE**	**NE**			✔
RET	**NE**				
Rep RET	**NE**	**NE**			✔
RET EXT	**Not tested**				
Rep RET EXT	**Not tested**				
Pretest symptoms lying:					
RET					
Rep RET					
RET EXT					
Rep RET EXT					
If required pretest pain sitting:					
LF - R	↑				
Rep LF - R	↑	**NW**			
LF - L	↑				
Rep LF - L	↑	**NW**			
ROT - R	↑				
Rep ROT - R	↑	**NW**			
ROT - L	↑				
Rep ROT - L	↑	**NW**			
FLEX					
Rep FLEX					

STATIC TESTS

Protrusion Flexion

Retraction Extension: *sitting / prone / supine*

OTHER TESTS

PROVISIONAL CLASSIFICATION

Derangement Dysfunction Postural (Other:) Chronic pain state. Severe OA

Derangement: Pain Location

PRINCIPLE OF MANAGEMENT

Education: **Correction sitting posture** Equipment Provided: **Lumbar roll**

Mechanical Therapy: (Yes) */ No*

Extension Principle: **Rep Retractions** Lateral Principle:

Flexion Principle: Other:

Treatment Goals: **Regain mobility. Decrease pain 50%.**

McKenzie Institute International 2005©

Relevance of carotid sinus hypersensitivity to MDT

Introduction

This paper was prompted by two reports of patients having a short-duration syncope during clinician over-pressure on cervical retraction in sitting. Both cases were reported a few months apart by Part C course participants in France.

Case One

The first case concerns a female patient, aged 76, who was treated by a physical therapist using the McKenzie Method of Mechanical Diagnosis and Therapy. The patient had very chronic (10+ years) symmetrical and diffuse bilateral symmetrical cervical pain and had no previous history of syncopes or unexplained falls. The patient's past medical history includes high blood pressure (controlled). A CAT scan revealed a very advanced, multi-level osteoarthritis (OA) of the cervical spine. An ultrasound of the anterior neck showed no abnormalities. No red flags were identified in the history. The patient had a history which was suggestive of posterior derangement (worse with bending and sitting, worse turning the head in both directions). She responded well, although partially, to retractions and retractions with patient over-pressure. She also responded favorably to retraction/extension in sitting, but again partially (decreased pain some symmetrical increase in ROM). When the therapist progressed to therapist over-pressure, the patient experienced a syncope that lasted about 30 seconds. The patient did not report any pain during the technique. She recovered rapidly, although she reported that it took her about an hour to feel completely "normal" after the loss of consciousness. Obviously after this incident, the therapist did not use clinician-over-pressure on retraction. At the end of treatment, the patient reported a 60% decrease in her symptoms and had recovered, what could be considered, good mobility in all directions, for her age, and with the existing advanced OA changes. The patient was satisfied with the overall outcome of the treatment.

Case Two

We do not have an initial examination form for the second patient. The course participant had just completed his Part B and tried to apply the McKenzie Method to this patient, who had started treatment prior to the participant attending the Part B. The patient was a 73 year old male. He had experienced two loss of consciousnesses prior to coming to physical therapy: once after a significant trauma to one of this fingers (presumably a vasovagal syncope) and once the day after undergoing a general anesthetic. He has no history of unexplained falls, but he reported experiencing some moments of "absence" (unable to concentrate for a minute or two) on a regular basis, and also complained of some unsteadiness. He had high blood pressure treated with beta blockers, and he was a borderline diabetic. He complained of bilateral, symmetrical cervical pain, with marked loss of motion in extension and in both rotations. According to the therapist, the patient's history and his response to repeated movement testing was strongly suggestive of posterior derangement, i.e. worse in protrusion, better with retraction and retraction/extension. The therapist started treatment with repeated retractions, and with postural correction. On day two, he progressed to patient overpressure, then to therapist overpressure. It was during therapist overpressure that the patient experienced a short syncope (<10 seconds). The patient was unaware that it had happened and was surprised when the therapist told him. He reported feeling completely back to normal immediately after it happened. The GP was informed, but no further investigations were ordered. The therapist stopped mechanical treatment of the neck because of what had happened.

Both participants were concerned that the short syncope, apparently induced by the technique, could be related to VBI. The literature regarding the pathophysiology of VBI states that upper cervical flexion (as produced with cervical retraction) slackens the vertebral artery, and should therefore, not induce VBI symptoms. Another alternative is that vasovagal syncopes can be induced by painful situations. Yet with both cases, the patients did not report any significant pain or distress when undergoing the retraction with clinician overpressure.

Can retraction mobilizations act on the carotid sinus? Subsequently, an abstract which described carotid sinus hypersensitivity provided an interesting, or at least possible, hypothesis that may be of interest to anyone practicing clinician techniques to the cervical spine. The hypothesis is as follows: The carotid sinus is a structure within the carotid artery, which is very dense in baroreceptors, and which plays a very important part in the neuro-vegetative control of cardiac rhythm and blood pressure. With age, and presumably as a result of arteriosclerosis, a number of patients develop a hypersensitivity of this sinus to mechanical stimulation and specifically to direct pressure. During cervical retraction, the upper cervical spine goes into flexion and the angle of the mandible moves back and may potentially, in some patients, apply pressure on the carotid artery. Given individual anatomical variations, if the carotid sinus happens to be close to the angle of the mandible, and if it is hypersensitive, cervical retraction may, in some individuals, trigger the related symptoms, especially when performed with clinician over-pressure.

Anatomical and physiological background

Anatomically, the carotid sinus is a localized dilatation of the internal carotid artery, located very close to its origin at the common carotid artery bifurcation (Querry et al 2001). It is innervated by the sinus nerve of Hering, which is a ramification of the ninth cranial nerve. The baroreceptors of the carotid sinus play an important role in the autonomic control of the heart and blood vessels, together with the aortic baroreceptors.

Relevance of carotid sinus hypersensitivity to MDT

Clinically, the carotid sinus can usually be found at the point of maximal carotid impulse, close to the upper border of the thyroid cartilage, therefore close to the angle of the mandible (also called the gonion). However, there are some significant variations between individuals. MRI studies confirmed that, in most individuals, it is located on average 3.2cm down from the gonion on the right side and 3.6cm on the left (close to the level of C4/C5). In some individuals, it can be as high as 0.5cm below the gonion (C3 level), and as low as 7cm from the gonion (C7 level) (Querry et al 2001).

Carotid sinus hypersensitivity

A number of individuals display signs of baroreflex abnormalities. This is known as Carotid Sinus Hypersensitivity (CSH), sometimes also called Carotid Sinus Syndrome. When the carotid sinus is stimulated mechanically, the patient may experience some prolonged asystole (cardioinhibitory CSH), some significant drop in blood pressure (vasodepressor CSH) or both (mixed CSH). This may happen when wearing a tight collar, or when pressing on the sinus region (shaving is often quoted as an example). Some patients don't know that they have this hypersensitivity until clinically tested (Bacon and Grunstein 2000).

Epidemiology

This hypersensitivity is not frequent in the general population, although no true epidemiological studies are available within the literature. However, the literature indicates that in specific subgroups the frequency can be significant. For example, in a healthy population of elderly people, the reported prevalence ranges from 0-13% (Davies et al 2001). This increases with advancing years, cardiovascular morbidity and dementia (Davies et al 2001). Bacon and Grunstein (2000) studied a group of elderly patients who attended an Accident and Emergency unit because of having experienced an episode of syncope, or because of unexplained falls. Among 75 consecutive patients, 22 were diagnosed as having CSH (14.7%). In a similar study, Davies et al (2001) diagnosed CSH in 12 out of 26 patients (46%). McIntosh et al (1993) reported an incidence of 45% of CSH, and Morillo et al (1999) reported an incidence of 60% in a group of 80 consecutive patients age 46-85, with a history of two or more syncopal episodes in the last six months. Patients with carotid sinus syndrome, who present with a history of falls rather than syncope, are more likely to be female (RR 0.59), have more frequent symptoms and have a higher prevalence (Pary et al 2005).

Clinical diagnosis

Clinically, the diagnosis is made by performing a Carotid Sinus Massage, with the patient lying supine, or preferably with the patient sitting at a 70° angle (Morillo et al 1999). The heart rate and blood pressure is monitored. A longitudinal massage is applied to the carotid sinus for five to six seconds on one side, then one minute later on the other side. The test is positive if it produces an asystole exceeding three seconds, a fall in systolic pressure of at least 50 mmHg or both. This test can only be performed in a medical setting. Complications are rare (0.12 to 0.35% according to Bacon and Grustein 2000), but potentially serious. These take the form of neurological complications as a result of cerebrovascular accidents, and exceptionally ventricular fibrillation has been reported (Bacon and Grustein 2000, Deepak et al 2005, Kenny et al 2000).

Clinical relevance to MDT

It cannot be completely ruled out that in some patients, clinician over-pressure (or even patient over-pressure) might produce compression to the carotid sinus to some degree, and potentially induce symptoms in patients who have a hypersensitivity. It has to be a very rare occurrence, since neither of the authors have witnessed this in their own practice, despite applying the technique to large numbers of patients and there are no other reports from International Faculty members. This situation may have occurred due to faulty/incorrect technique. Practitioners have to make sure that anteriorly the pressure is only applied to the chin, and that no contact is made with the anterior aspect of the neck. We have heard anecdotal reports of patients fainting during lateral flexion mobilizations from manual therapists. In these occurrences, it seemed that inadvertently some pressure had been applied with the thumb to the carotid sinus. When using McKenzie techniques, this has to be bore in mind, especially when performing side flexion mobilizations in supine. This is certainly a routine recommendation that we all give during courses.

Further investigations

Both patients featured in these case studies are no longer in treatment. It would have been useful if a carotid massage had been performed on them to test this working hypothesis.

Conclusion

We certainly don't want to over-emphasize the risks of inducing CSH symptoms during MDT applied to the cervical spine, but we feel that it is certainly useful for McKenzie therapists to have a basic knowledge and awareness about this. The clinical implications for McKenzie therapists would be that CSH should be considered in older patients (over 65), especially if they report any history of syncopes, near syncopes, unexplained falls or dizziness [Bacon and Grunstein 2000, Davies et al 2001). We should bear in mind that it is associated with cardiovascular disease. It should really be considered in the differential diagnosis of dizziness in this group of patients. Remember that CSH may be asymptomatic until pressure is applied to the sinus, so even if the patient has no history of related symptoms, it may still be clinically relevant . Any symptoms potentially related to CSH should be monitored. Patients, for whom we suspect CSH, should be referred for medical assessment if they have any history of syncopes or unexplained falls, as this

may require treatment. As an indication, patients suffering from cardio-inhibitory CSH may benefit from pacemakers, and patients suffering from vasodepressor CSH may benefit from medical treatment (Davies et al 2001). If anyone reading this article knows of any occurrence of syncopes occurring during over-pressure on cervical retraction, please contact the authors. Useful information may be gained for all of us from additional case histories. It may be a very rare event, but it is unlikely that it should happen only in France!

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McIntosh SJ, DaCosta D, Kenny RA (1993). Outcome of an integrated approach to the investigation of dizziness, falls and syncope in elderly patients referred to a "syncope" clinic. Age and Ageing 22:53-8.

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Pary SW, Steen N, Baptist M, Kenny RA (2005). Amnesia for loss of consciousness in carotid sinus syndrome: Implications for presentation with falls. Journal of the American College of Cardiology Vol. 45, No. 11.

Querry RG, Smith SA, Stromstad M, Ide D, Secher NH, Raven PB (2001). Anatomical and functional characteristics of carotid stimulation in humans. Am J Physiol Heart Circ Physiol 280;H2390-98.

International MDT Research Foundation

Greetings to all!

The Board of Directors of the International Mechanical Diagnosis and Therapy Research Foundation (IMDTRF) once again held a very productive annual meeting this November in Washington, DC.

We are pleased to announce that the Foundation has funded two new projects for the next year:

"Derangement Syndrome in OA Knees: An RCT of McKenzie Therapy" *under the direction of principle investigator, Richard Rosedale, PT, Dip.MDT.*

"Ultrasound imaging of lumbar spine flexion and extension" *under the direction of principle investigator, Gary Chleboun, PT, PhD.*

The full abstracts for these projects can be found on our website at www.mdtresearchfoundation.org. The Board members are really looking forward to the completion of these excellently presented proposals!

As with all groups, the bylaws and the policy and procedure manual were updated. The most significant change to the bylaws was the revision of terms to five years, up from three years. Under the old terms, two board members would be replaced on a yearly basis. The current Board members indicated that so much turnover would be disruptive to the functioning of the Board.

To meet our goals, the Board has implemented a plan to gradually replace the original members over the next five years. At this time, we are looking to replace the Vice-Chair's position. This person oversees the proposal submission and review process. According to the bylaws, this position must be filled by someone with a faculty appointment at a university or someone with considerable experience in the research arena – history of publications and grant applications/funding. If you, or someone you know, would be a good fit for this position, we encourage you to contact us at our website or to contact one of our officers.

A highlight of the meeting is the expansion of the Board structure. We have finally reached the time where we are able to develop and utilize committees. There will be two committees associated with the Board that will provide assistance with tasks: Finance and Communications. In addition, we are developing a Board of Counselors that will function to raise monies for the Foundation and as advisory council to the Board. All of these structures will be vital to the future functioning of the Foundation. If you are interested in being involved with this dynamic Foundation, *PLEASE* contact our website or one of our officers.

And finally, Ted Dreisinger submitted his resignation as Chair. The election of officers resulted in the following:

Betty Sindelar as Chair and temporary Vice-Chair, Stephen May as Secretary, Mark Werneke as Treasurer, Mary Sheid as Member (fund-raising) and Uffe Lindstrom as Member-at-large.

Ted has graciously agreed to remain as a consultant for one year during our transitional period. The current Board would like to take this opportunity to publicly thank Ted for his wise and patient leadership since the inception of the Foundation. We intend to forge ahead from this solid base that he has helped to create.

And a heart-felt thank you to the members of MII and its branches who have supported the Foundation in many ways, including financially, over the last four years. Truly, without this support, the Foundation would not have become a reality!!

The IMDTRF Board of Directors

Betty Sindelar (sindelar@ohio.edu)

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Mark Werneke (mwsurf75@verizon.net)

Mary Sheid (msheid@ptsconline.com)

Uffe Lindstrom (ul@fysiowork.dk)

Diploma - Expedition in MDT

Dagmar Hetterich, PT, Dip. MDT

If someone told me that I was going to study English until exhaustion and that a laptop was going to be my most important accessory, I would smile and think he or she had a nightmare. Finally, this nightmare was not as bad as I thought...

At my Part A in 2002, the instructor, Jürgen Schmid, asked if anyone had been to New Zealand. My finger was the only one rising. When Jürgen talked about his New Zealand study experience, I started dreaming and thought it would be a great thing to return to New Zealand as a student one day. However, in December 2003, my credentialing exam was a disaster and it showed me that McKenzie's clocks run in a different way. Time heals all wounds and I considered this attempt as a rehearsal. One year later, I returned from Freiburg with a bright smiling face and certification. An essential step was achieved and the diploma in Mechanical Diagnosis and Therapy became a real possibility.

The international head office provided all necessary information and was always supportive and helpful with additional questions. The following requirements had to be fulfilled:

Application: usual papers, English eligibility due to a test (TOEFL or ITELS), all documents in English and certified.

Study fee: $12,500(USD)

Study term: distance learning/3.5 months, clinical venue/9 weeks and a final examination

Although a lot of things had to be organized at my clinic for this journey, the study term was not a topic at all at this stage. The University of Otago requires an advanced English level from non-native English students. When I skimmed through my high school grades, sixteen years later it was obvious that my English was far from advanced.

Getting this language thing organized, I went with TOEFL books in my bag for a five week study trip to New Zealand in February 2006. My goal was to receive a realistic assessment regarding my English abilities and professional help to improve them. Besides language school, I hoped to observe at a McKenzie clinic and also to go for a visit to Dunedin, a possible clinical venue option. My plans ran well. The language school revealed to be perfectly equiped with excellent teachers to identify my weaknesses and to foster them. I started to enjoy studying! Fortunately, there was a McKenzie clinic as well, with Grant Watson on board. When I knocked on his door and talked about my purpose, he just smiled and said welcome. At this time, I did not know who Wattie really was, only that he must be a great guy.

Dunedin was also a nice visit and I could imagine to come back to this place for studies and to say hello again to the amazing albatross in this picture. This

study journey had a major impact on my determination to get ready for the Diploma program and to get ready for Otago, independent of time necessary to develop advanced test skills. Finally, it took another year of continuous studies after work, to pass the TOEFL (English entry level exam). In the meanwhile, the due date for 2007 had passed, so my place was settled for Diploma 2008. There was a lot of organizing to do at my clinic to compensate, as best as possible, my partial absence during the distance learning and my study time abroad.

All of a sudden, I had a student identification number, password and a log in. Despite my low level computer abilities, I logged into Blackboard, the University's distance learning website - which would be my classroom. I was excited, thrilled and overwhelmed at how perfect and easy this system worked. Twenty-one students from ten nations dove into a virtual world for the next 3.5 months, and the fact that Wattie was also on board as a teacher, gave me additional confidence on this extraordinary adventure.

Next was an introduction into the jungle of databases available to help find the literature for each module. This was too much for me to handle and I wondered how I could find my way in/out through this endless labyrinth. Fortunately, I was not alone and new

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friendships developed. We helped each other and gradually, I found the required literature.

We discussed:

- Different classification systems that we compared and contrasted with MDT
- Update of anatomy, patho-physiology, deg. disc and the effect of mechanical therapy
- Critical appraisal of the literature
- Patient management – education – empowerment
- Differential diagnosis and contraindication
- Preparing a case report

The class was separated into groups, in almost all modules, and each group discussed topics and literature through chat; participation was graded. In the second half of each module, we received a writing task, such as an essay, a report or an analysis. The different time zones made the discussion round difficult. Americans had already discussed by the time we Europeans attended; or we had to be patient until New Zealand could answer. It was ecstasy, always busy and I concentrated on not missing any important comments. Blackboard was the center of my life. I could not imagine spending hours in front of a computer, but since this is distance learning things have changed! We developed an amazing group dynamic and I was fascinated how we challenged and supported each other to win this computer game. Every module was a new challenge. Our adrenalin rose near each due date. It was a huge relief when papers were sent by a click. Nervousness when results and feedback were in the post box two weeks later.

I often missed a real classroom setting, because a lot of little things could be discussed in minutes, whereas the Blackboard required a lot of time. During the distance learning I also worked around 20 hours a week at my clinic. This was a pleasant bit of change, because my brain could relax from this extensive brainstorming in front of my screen and I did not lose track of “normal“ life. In addition, it was very interesting to observe how I unconsciously transferred theory into practice. There were many situations when I smiled after an assessment/treatment, because I realized that I would have handled this situation differently just a few weeks earlier. The fact that my study efforts were rewarded promptly resulted in further motivation to go straight back to my desk and continue with the studies.

The language was not a real problem as long as our native English speakers wrote in English and not in slang. Natives and non-natives got used to each other and after two weeks everything went fine. Additionally, the literature, in which language is a bit different, was also understood without major difficulties. On the contrary, I automatically learned many new words due to this intensive study. Stephen May’s module, *Critical Appraisal of the Literature,* awoke a lot of interest in me. As a research novice (before the distance learning, it was a lot when I had read five articles), I was naive enough to believe everything that was searched and written. I am really thankful that I received an insight of the real research world and some basics helpful not only in reading articles, but also in analysing them and forming my own opinion.

Preparing a case report was our last paper and I enjoyed this task the most. Although presenting an interesting case was not too difficult, to support it and to give it strength with appropriate literature was a great challenge. I realized that my search and research abilities were not advanced (smile…), however, my assessment/feedback from Stephen and Wattie was positive and the distance learning was passed and past.

From then on, the clinical venue became the central topic, because a lot had changed in New Zealand within the last two years and I did not know where to go. Returning to Dunedin to say hello to “my“ albatross was impossible, because this venue had closed. In the meanwhile, Wattie prepared his clinic to be a venue, but officials denied the request for international students to be able to attend there. My New Zealand dream was over and my alternative, Denmark, was impossible as well...

Finally, on the 28th of February 2009, I traveled with heavy luggage far away north to Dundee, Scotland instead of travelling far away to the south. Anyway, room number 95 at King’s Cross Hospital became the center of my/our journey. Yes, of course, I was excited and curious about my new unexpected adventure. How would the clinic be organized? How would I get along with my mentors and Pepé, whom I knew only online at this point? The guesthouse, country, people, food and in particular, the language? Germans, who knew about my Scottish experience, just said: “Scotland? You will have difficulties understanding them“. Only Mary, my English teacher gave me some hope, because Scottish pronunciation and German have similarities...?!?

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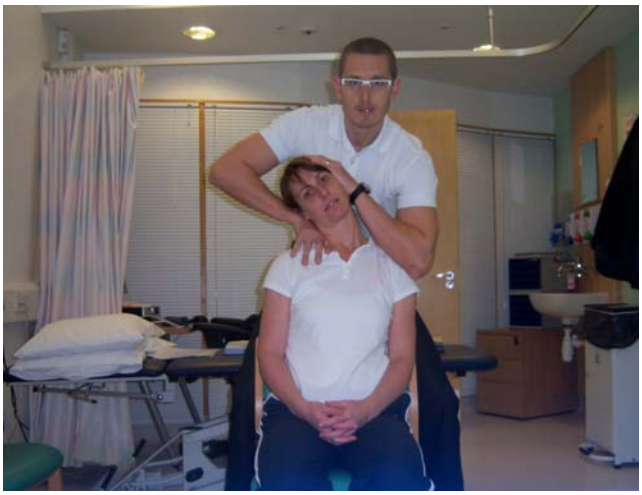
King's Cross Hospital is a government department with a dental clinic, physiotherapy, physicians, x-ray, CD and MRI. Physical therapists assess and treat patients. When further investigation is necessary, they can directly prescribe an x-ray or scan and, if they have appropriate qualifications, they are also allowed to give injections. The role of the physiotherapist has been expanded in the UK and the physiotherapy school curriculum expanded to ensure necessary qualifications for new practitioners, in particular, to identify a contraindication as soon as possible. I was impressed and I wondered if Germany would be able to make such a step one day, as well. Our mentors, Jenny Ross and John Thomson, are an interesting teaching team. Jenny is an impressive personality, with many years of clinical experience and excellent educational abilities, with which she stunned/amazed us over and over again. She challenged our clinical reasoning continuously and finally brought us further, further, further. On the other hand, John was our straight forward guy, which helped us enormously to organize our thoughts and to strengthen our MDT principles. It was fascinating how they identified each individual way of learning and how they fostered this. They are great teachers. My study fellow, Pepé, turned out to be a Spanish giant of around two metres height and I felt very secure in Dundee with him next to me (smile…).

Our clinic day started at 8.00am and we finished between 16.00 – 18.00pm. The first weeks we assessed/treated 40 minutes per patient and we discussed each patient before we continued with the next. On my first day, I thought it would be an easy job, because I am used to treating five patients in two hours at my clinic. However, this pace was totally filled, to my surprise. There wasn't a minute left. Besides the usual assessment form and follow up notes, there was more paper work to do, such as clinic forms and clinical reasoning forms, after each new patient. We regularly practiced techniques, precisely as the book indicated. Initially, we had difficulties finishing our assessment on time, because our brains were not thinking in English. Instead, we thought in our mother language and translated into English. Furthermore, we shared a treatment room and assessed and treated simultaneously, only separated through a curtain. The noise from five people was very difficult: both of us were use to enjoying privacy when treating a patient in our clinics at home. I really had to concentrate not to lose track, in particular, when Jenny or John observed and assessed me. We also had an overall assessment every three weeks, which was helpful to get a realistic view of our progress. I knew this was the way the clinical venue was run and I thought it was a great thing to have the opportunity to be assessed all the time. However, even as I experienced this great opportunity, I realized that I did not like it…



Finally, the diploma team needed around two weeks to get use to each other and until the initial tension subsided. During week three, our brains started to work in English, or should I say Scottish, and we started to enjoy our stay in room number 95 and we had a lot of fun with the Dundeenians coming in.

It was also ensured that we would not feel bored after the clinic, because there was some tutorial work required, too. The nine weeks practical period meant nine modules and each had a particular topic with appropriate literature. We gathered the provided material and summarized and presented it at our weekly discussion round. Depending on the topic, we also invited interested physios from the department to join us. In conclusion, our seven day week was perfectly organised, resulting in another dive into a full power, "real" MDT world.

Therefore, country and people, food and drinks were not a serious issue. Daily life as a postgraduate student was the main focus. The people we met, such as patients, clinic staff and our hosts were very friendly, supportive and cheerful. We also enjoyed the Scottish dishes, which were extensive and inexpensive. The weather turned out to be better than expected. I was able to enjoy running regularly without getting wet, but a scarf and woolen cap was with me most of the time throughout the whole nine weeks. Dundee is a nice

Diploma - Expedition in MDT

place, but for me, not a choice for holidays. We had some time to stroll through the beautiful city of Edinburgh and to enjoy a pleasant and funny day at Jenny's farm with haggis (Scottish traditional dish). My visitor from Germany after week five was like sweet cream and after that the time passed quickly. We had our final assessment in week nine and we passed. It was done!

Our clinical component was complete and the final examination in Mechanical Diagnosis and Therapy on the 26-27.08.2009 was waiting for us in Rio de Janeiro.

There were four months to go for Pepé and I until the final. It was plenty of time to digest our Scottish experience and to keep preparing for our final event with a clear mind. We kept in contact and exchanged experiences, particularly during the last weeks before the exam. Skype ran at full speed.

The theoretical course group from 2008 had met one day before the exam. This face to face meeting had been exciting and funny. It had been a pleasant distraction from the upcoming two exam days, which we finally finished with bright smiling faces and cocktails. The international conference was a perfect chance to experience well known people from the research arena, such as Peter Croft and Maurits van Tulder, and to enjoy a pleasant chat with one or more faculty and, and, and...

As a traveller, I have experienced a lot of interesting and adventurous journeys. But this diploma trip fascinated me due to the fact that I could combine and experience two passions, work and traveling, at the same time. Certainly, there were a lot of ups and downs over the last years and particularly the downs were crucial to be able to take a deep breath and to enjoy this amazing achievement at such an exotic place. And what has changed from my clinical perspective?

My classmate, Susan Bamberger, found the right words in her recently published report in the IJMDT Vol. 4, No.2, 2009:

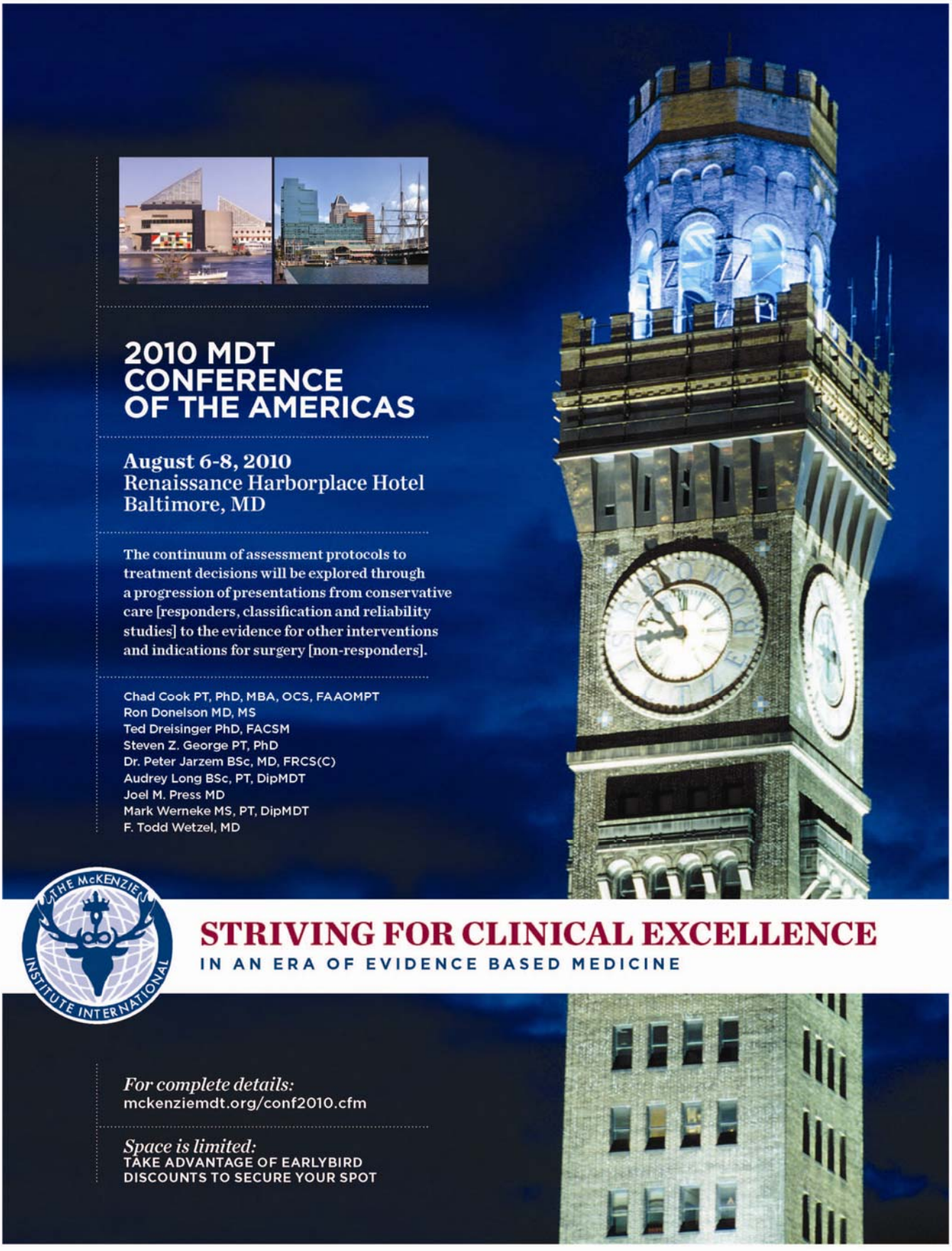
"*One common mistake diploma students make is that they are "form fillers". In other words, they make sure they get all the information on the McKenzie assessment form. However, when they get to the end of the form, they are not sure where to go".*

...and after the diploma, you get the big picture, you know where you have to go. And for those who want to be more than a form filler...JUST GO AND APPLY!

Thanks for your attention.

Kind regards,
Dagmar Hetterich

Upcoming Institute Conferences



Author Submission Guidelines

International Journal of MDT

The International Journal of Mechanical Diagnosis and Therapy® (IJMDT) is a collaborative effort of the worldwide branches of The McKenzie Institute® International (MII) emphasizing scientific study, clinical relevance and education related to Mechanical Diagnosis and Therapy® (MDT).

Information for Authors
Please submit an electronic version of your article to the Editor in Chief, Helen Clare at clare.ha@bigpond.com.

Your article will be reviewed by two (2) members of the Editorial Review Board and a decision with feedback will be given to you within one month. Reviewing Board members will act as mentors and provide advice and suggestions to improve submissions and will contact authors directly. There will be a maximum of two (2) review submissions. Authors whose material is included in the IJMDT will be provided a complimentary copy of the issue in which it appears.

All work submitted to the IJMDT will be reviewed for scientific content, appropriateness to Mechanical Diagnosis and Therapy, relevance, clarity and presentation. The decision will be one of the following:

- **accept**
- **revise**
- **reject - resubmission possible with major edits**
- **reject**

Word count
Eleven pages maximum

Presentation
Your article should be double-spaced with 12 pt, Arial.

Title Page
Give title, author, author details

Keywords
Up to 4 keywords (if appropriate)

Abstract
A structured abstract of no more than 200 words

Text
One sort of sub-heading should be used:

- bolded in lower case.

Do not use abbreviations at all. Do not use local acronyms unless they are fully spelled out initially.

Types of Articles
The IJMDT welcomes primary research papers, topical reviews, reviews of articles and case studies. See the following guidelines for submitting manuscripts.

Submission deadline:	Jan 15	May 15	Sep 15
Issue date:	Mar	Jul	Nov

Primary Research Guidelines
IJMDT is particularly interested in publishing original primary research. Papers should be as follows:

- title page (title, author, author details)
- abstract / key words
- introduction
- methods
- results
- discussion
- conclusion
- references
- tables

Topical Review Guidelines
Reviews on appropriate and relevant topics are also welcome. Papers should be as follows:

- title page (title, author, author details)
- abstract / key words
- introduction
- methods (if a systematic review)
- results
- discussion
- conclusion
- references
- tables

Review of article guidelines
Reviews of individual articles. Papers should be as follows:

- title
- objectives
- design
- setting
- patients
- intervention
- primary outcome measure
- main results
- conclusions
- comment (include implications for MDT)
- references

Author Submission Guidelines

International Journal of Mechanical Diagnosis and Therapy®

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Editor

Helen Clare, PhD, FACP, MAppSc,
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Editorial Review Board

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Case Study Guidelines

Case studies must be type written on the most current MII Assessment Form using the MDT standardized terminology. As the intent of different case studies may vary, a rigid structure is not indicated, but could include:

- introduction
- history
- physical examination
- conclusion
- management
- reviews *(history, physical examination, conclusion, management)*

References

Accuracy of references is the responsibility of the author. In the text, state the author's name and year of publication as follows:

- (Smith 1998)
- (Smith and Jones 1998)
- (Smith et al 1998)

References should be typed in alphabetical order: Author's surname and initial (year of publication). Full title of paper. Name of journal in full or accepted abbreviation volume. First and last page.

Examples:

Article:

Aina A, May S, Clare H (2004). The centralization phenomenon of spinal symptoms - a systematic review. Manual Therapy 9.134-143.

Book:

McKenzie RA, May S (2003). The Lumbar Spine, Mechanical Diagnosis and Therapy (2nd Edition). Spinal Publications Ltd, Waikanae.

Book chapter:

Twomey LT, Taylor JR (1994). Factors influencing ranges of movement in the spine. In: Boyling JD, Palastanga N (Eds). Grieve's Modern Manual Therapy (2nd Ed). Churchill Livingstone, Edinburgh.

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