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A randomized controlled trial comparing McKenzie therapy and motor control exercises on the recruitment of trunk muscles in people with chronic low back pain: a trial protocol☆

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Abstract

Objective To investigate if McKenzie exercises when applied to a cohort of patients with chronic LBP who have a directional preference demonstrate improved recruitment of the transversus abdominis compared to motor control exercises when measurements were assessed from ultrasound images.
Design A randomized blinded trial with a 12-month follow-up.
Setting The Physiotherapy department of Concord Hospital a primary health care environment.
Participants 70-adults with greater than three-month history of LBP who have a directional preference.
Interventions McKenzie techniques or motor control exercises for 12-sessions over eight weeks.
Main outcome measures Transversus abdominus thickness measured from real time ultrasound images, pain, global perceived effect and capacity to self-manage.
Discussion This study will be the first to investigate the possible mechanism of action that McKenzie therapy and motor control exercises have on the recruitment of the transversus abdominus in a cohort of low back pain patients sub-classified with a directional preference. Patients receiving matched exercises according to their directional preference are believed to have better outcomes than those receiving unmatched exercises. A better understanding of the mechanism of action that specific treatments such as motor control exercises or McKenzie exercises have on patients classified with a directional preference will allow therapist to make a more informed choice about treatment options.

Keywords: McKenzie; Muscle; Recruitment; Ultrasound; Protocol; Low back pain

Introduction

Low back pain (LBP) is a common complaint with 70% to 85% life time prevalence and an average point prevalence of 30% [1,2]. Recurrence of LBP is also high; 50% within one year, 60% within two years and 70% within five years [3]. Direct health care costs of LBP in the UK in 1998 were estimated to be £1632 million while indirect societal costs were estimated to be £10 668 million [4]. It has been estimated that between 17% and 37% total medical costs for LBP are attributable to allied health [5,6]. Therefore it is appropriate that health professionals provide treatments that promote independence from therapist reliance.

Treatment guidelines consistently recommend exercise in the management of chronic LBP. However, while some guidelines do not comment on the efficacy of different exercise approaches [7–9] others recommend specific exercises [10]. The American Physical Therapy Association

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(APTA) produced clinical practice guidelines that recommend trunk stabilization or endurance exercises for sub-acute and chronic LBP in patients that demonstrate impaired movement coordination [11]. Directional preference (based on the McKenzie approach) exercises utilizing repeated end range movements in a specific direction are also recommended in the APTA and Danish guidelines [10,11]. Efficacy for MDT and motor control exercises for treatment of chronic LBP has been demonstrated in systematic reviews of the literature [12–14].

Two specific types of exercises utilized by therapists for managing chronic LBP are Mechanical Diagnosis and Therapy (MDT) commonly known as the McKenzie method and motor control exercises. The commonality between these treatment strategies is that they are patient-centered approaches and emphasize patients' self-efficacy by requiring active patient participation. However, these interventions are based upon completely different rationale for achieving long term symptom relief.

The principle that underpins MDT is to identify the non-specific mechanical syndromes that spinal pain can be classified into from a thorough examination of the patient. Each of the three syndromes: derangement, dysfunction and posture syndrome have typical and distinctive mechanical presentations. Derangement syndrome is characterized by a varied clinical presentation and typical responses to loading strategies, which may consist of changes in pain location centrally or peripherally and in intensity. These findings guide the therapist to implement the most appropriate mechanical therapy according to the patient's classification [15].

Motor control exercises aim to restore optimum control of the spine to meet the functional demands of the trunk [16]. One of the strategies used to achieve spinal control is the retraining of the coordination of the trunk muscles such as transversus abdominus (TrA), obliquus internus (OI) and obliquus externus (OE). During the implementation of motor control exercises the therapist aims to integrate appropriate recruitment patterns of the trunk muscles with normal function of other systems such as respiration and pelvic floor control [16].

Despite the difference in theoretical rationale for how motor control exercises and MDT might help people with chronic LBP there is limited evidence that the mechanisms are specific to the approach and different to each other. The importance of TrA thickness is further underscored by findings that showed it to be reduced in patients with LBP while promising research showed that it can be increased after motor control training [17–19]. However, it is unclear if these changes are specific to motor control exercises. Studies using ultrasound measurements of TrA thickness as a prime outcome measurement have had varying results. One published case series found changes in TrA muscle thickness immediately after applying spinal manipulation therapy to LBP patients which suggests that TrA activation may be improved as pain and disability resolve with treatments that do not specifically aim to improve TrA thickness [20]. Conversely, Ferreira *et al.* found that patients who received general exercises or spinal mobilizations had a negative change in TrA thickness, while those who received motor control exercises had a 7% improvement in muscle thickness [19]. One study comparing MDT and motor control exercises in a heterogeneous cohort of patients with chronic LBP who received non-standard treatment found a greater increase in TrA thickness in patients receiving motor control exercises compared to McKenzie exercises [21]. The primary aim is to investigate if MDT results in similar changes to TrA thickness as motor control exercises in a cohort of patients with chronic LBP and a directional preference.

A secondary aim of this study is to compare the effectiveness of MDT to motor control exercises on short and long term disability in patients with chronic LBP and a directional preference. To do this we will recruit only people who demonstrate a directional preference. While previous studies have demonstrated centralization to be associated with a favorable prognosis [22,23], there is no strong evidence the presence of a directional preference identifies people who respond better to MDT than other exercise approaches including motor control exercises.

A tertiary aim of this trial is to compare the effectiveness of MDT to motor control on the number of flare-ups after discharge. This will provide a measure of the impact of these intervention on the ability of participants to self-manage their symptoms. A recent systematic review found moderate evidence to support self-management of LBP [24]. One study found patients with LBP treated with MDT sort less care than those managed by a general practitioner [25]. We are interested to explore if patients were able to use the skills provided to them to manage any exacerbation without the need to seek care from a health professional. Self-management is a core principle of MDT, while motor control exercise principles do not specifically address self-management as a formal part of the intervention. Therefore we will investigate if a greater proportion of people having an exacerbation, who were in the MDT group were able to manage a flare-up without seeking additional care (Fig. 1).

Methods

Design

This study will be a randomized blinded clinical trial.

Power analysis

A sample size of 70 will provide 80% power for detecting differences between groups of 7% in the recruitment of trunk muscles assessed with ultrasonography and based on the percentage of increase in muscle thickness as a function of resting thickness levels. The 7% effect size is based on our previous studies of ultrasonography for deep trunk muscles