Efficacy of Directional Preference Management for Low Back Pain: A Systematic Review

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Efficacy of Directional Preference Management for Low Back Pain: A Systematic Review

Luke D. Surkitt, Jon J. Ford, Andrew J. Hahne, Tania Pizzari, Joan M. McMeeken

Background. Providing specific treatment based on symptom response for people with low back pain (LBP) and a directional preference (DP) is a widely used treatment approach. The efficacy of treatment using the principles of directional preference management (DPM) for LBP is unclear.

Objective. The purpose of this study was to determine the efficacy of treatment using the principles of DPM for people with LBP and a DP.

Methods. Computer databases were searched for randomized controlled trials (RCTs) published in English up to January 2010. Only RCTs investigating DPM for people with LBP and a DP were included. Outcomes for pain, back specific function, and work participation were extracted.

Results. Six RCTs were included in this review. Five were considered high quality. Clinical heterogeneity of the included trials prevented meta-analysis. GRADE quality assessment revealed mixed results; however, moderate evidence was identified that DPM was significantly more effective than a number of comparison treatments for pain, function, and work participation at short-term, intermediate-term, and long-term follow-ups. No trials found that DPM was significantly less effective than comparison treatments.

Conclusions. Although this systematic review showed mixed results, some evidence was found supporting the effectiveness of DPM when applied to participants with a DP, particularly at short-term and intermediate-term follow-ups. Further high-quality RCTs are warranted to evaluate the effect of DPM applied to people with LBP and a DP.
Low back pain (LBP) is a common problem that has reached epidemic levels. Contrary to previous reports of a favorable prognosis, it has been reported that an average of 62% of patients with LBP still experience pain at 12 months. The economic burden of LBP on individuals and the community is high and increasing, with annual costs in the United States estimated to be at least $100 billion.

Despite the wide variety of treatment options available, the LBP problem continues to escalate. Numerous randomized controlled trials (RCTs) have investigated the efficacy of treatment for LBP, showing small treatment effects of questionable clinical meaningfulness. Conflicting results among RCTs also are common. It has been proposed that a factor contributing to these findings is the heterogeneity of the populations investigated in many LBP trials, reducing the proportion of the sample receiving appropriate treatment. In addition, most clinicians believe that LBP is a heterogeneous condition and classify patients into a variety of subgroups that subsequently directs the provision of specific treatment.

Mechanical loading strategies (MLS) are used in the classification and specific treatment of LBP and include repeated movements and sustained postures. The McKenzie method, also referred to as mechanical diagnosis and therapy (MDT), is a commonly used approach for management of LBP involving the use of MLS that guide specific treatment based on subgroup membership. Assessment of LBP incorporating MLS may identify the presence of centralization, defined as the proximal movement or abolition of distal symptoms originating from the spine in response to the application of MLS. Associated with centralization is the concept of directional preference (DP), which is the direction of MLS that results in centralization, with movement into extension the most prevalent DP identified in the lumbar spine. A DP also can decrease pain intensity or improve restricted spinal movement without producing an associated change in pain location. Although the use of MLS in the assessment and treatment of LBP is hypothesized to influence the hydrostatic properties of the lumbar intervertebral disk by applying a reduction force to displaced disk material, the classification of patients is based predominantly on symptomatic and mechanical responses to these MLS. For the purposes of this review, the specific treatment of LBP with a DP has been defined as directional preference management (DPM).

There is a significant body of literature supporting LBP with a DP as a valid subgroup. The lumbar intervertebral disk has significant biological plausibility as a source of LBP, given it is innervated, capable of causing clinically observed pain, and affected by pathological processes known to cause pain. Centralization is a commonly observed physical examination finding, with a systematic review identifying the phenomenon as occurring in 65% of patients with LBP. Centralization is consistently associated with good outcomes, and its presence has been shown to predict the results of diagnostic reference tests, including lumbar discography. Given the literature demonstrating significant face, predictive, and concurrent validity, it is reasonable to hypothesize that RCTs evaluating DPM specifically applied to LBP with a DP would result in large and clinically meaningful treatment effects.

Two recent systematic reviews evaluating the effect of the McKenzie method for LBP have been completed. These reviews demonstrated mixed results, including some evidence of small and short-term treatment effect sizes favoring McKenzie treatment. However, these reviews did not differentiate trials where DPM was provided for patients with LBP with a DP from those where the McKenzie method was applied more nonspecifically.

Another recent systematic review attempted to evaluate the efficacy of physical therapist–provided exercises, including DPM, more specifically. This review showed that exercises based on the symptom response of the participant produced better outcomes in 4 out of 5 included trials. However, not all participants in the included trials were classified exclusively with a DP, and as there was no calculation of effect sizes, the magnitude of treatment effects could not be stated.

Given the substantial ongoing and rising costs of LBP, the potential for sample heterogeneity to dilute effect sizes in RCTs, and the limitations with the existing review literature, a new systematic review with stringent criteria is needed. The purpose of this investigation was to undertake a systematic review of RCTs to evaluate the effectiveness of DPM specifically applied to patients with LBP with a DP compared with no treatment, a placebo treatment, or other treatments.
Method
Prior to the commencement of this review, we developed a systematic review protocol that is summarized in the methods below.

Data Sources and Searches
Computer-aided database searching for relevant trials was undertaken by one reviewer (L.D.S.) accessing: MEDLINE (1950 to January 3, 2010), EMBASE (1980 to January 3, 2010), Cochrane Central Register of Controlled Trials (to January 3, 2010), CINAHL (1982 to January 4, 2010), and PEDro (to January 5, 2010). The search method used key words for RCTs and the condition based on sensitive search strategies as recommended by the Cochrane Back Review Group and empirical studies.35–38 Key words for the intervention were determined by the reviewers and cross-checked against previous relevant systematic reviews.32–34 The search terms used for searching MEDLINE were adapted for each database and are presented in eAppendix 1 (available at ptjournal.apta.org).

Additional search strategies included screening of the reference lists of relevant systematic reviews, eligible RCTs, the Web site of the McKenzie Institute International, and the most recent MDT textbook.17 Citation tracking of included RCTs was performed via the ISI Web of Science for each included trial.38 Citations were obtained and exported to bibliographic software by one reviewer (L.D.S.). Two reviewers (L.D.S. and J.J.F.) independently applied the predetermined inclusion and exclusion criteria to identify potentially relevant trials, initially based on title and abstract.38 Full-text copies of relevant trials then were obtained and independently evaluated by the reviewers. Disagreements were resolved through discussion among the reviewers, with input from a third reviewer (T.P.) if required.

Study Design
Only RCTs published in full by peer-reviewed, English-language journals were included.

Participants
Trials involving male and female participants aged ≥18 with lumbar ± leg symptoms described as having LBP with a DP were included. If a mixed sample of participants with LBP was identified in an otherwise relevant trial, the authors were contacted for additional information. Outcome data on all participants classified with a DP, allowing between-group comparisons, needed to be provided for the trial to be included. Participants with symptoms of any duration were included; however, for subgrouping purposes, acute (<6 weeks), subacute (6–12 weeks), and chronic (>12 weeks) categories of symptom duration were recorded.38 Trials involving participants who were pregnant or who had pain associated with serious spinal pathology such as spondylolisthesis, spinal canal stenosis, and inflammatory conditions were excluded.

Types of Intervention
Only trials evaluating the effect of DPM on LBP with a DP compared with no therapy, placebo, or other conservative treatments were included. Directional preference management was defined as individualized treatment based on the response to MLS. Trials were included where DPM was used with cointerventions.

Outcome Measures
The outcomes of primary interest for this systematic review were measures of pain intensity, low back–specific function, and work participation.39,40

Data Extraction and Quality Assessment
Data were independently extracted from the included trials by the 2 reviewers and recorded on a standardized computer spreadsheet.41 This spreadsheet was designed and has been used by several of the coau-
thors in a previous systematic review. Extracted information included sample sizes, trial settings, population characteristics (eg, age, duration of symptoms, inclusion criteria), details of the interventions, and outcome data (mean scores, standard deviations, and confidence intervals [CI]). When insufficient information was available from individual trials, the authors were contacted. If present, the documentation of adverse effects related to treatment was recorded. Follow-up data were recorded at short-term (defined as less than 3 months following the date of randomization), intermediate-term (between 3 and 12 months), and long-term (12 months or more) time periods.

The reviewers independently assessed the methodological quality of each included trial using the PEDro scale. This 10-item rating scale was developed for quality assessment of RCTs by Delphi consensus and has demonstrable reliability (Tab. 1). Trials with a rating of at least 6/10 on the PEDro scale were rated as high quality, consistent with previous systematic reviews.

Each reviewer independently evaluated the clinical relevance of included trials using the 5 criteria recommended by the Cochrane Back Review Group:

1. Are the patients described in detail so that you can decide whether they are comparable to those you see in your practice?
2. Are the interventions and treatment settings described well enough so that you can provide the same for your patients?
3. Were all clinically relevant outcomes measured and reported?
4. Is the size of the effect clinically important?
5. Are the likely treatment benefits worth the potential harms?

### Data Synthesis and Analysis

Treatment effects and 95% CIs for continuous data were calculated using the Hedges adjusted g standardized mean difference (SMD), as this statistic allows comparisons of studies using different outcome measures. These measures were calculated using group mean scores for each group and the pooled standard deviations of the groups at the follow-up time point of interest using the computer spreadsheet. Treatment effects favoring DPM were assigned positive SMD values, with values of 0.2, 0.5, and 0.8 considered to represent small, moderate, and large effect sizes, respectively. The clinical relevance of pain and function treatment effects was determined by comparing the between-group differences with published values of the minimal clinically important difference. In trials where only median data were presented, these values were applied as the best estimate for the mean. If standard deviations were unavailable, they were estimated from related statistics such as medians and the standard error. For dichotomous data, the effect size was calculated using relative risk and 95% CIs.

The pooling of data in a meta-analysis was planned if 2 or more trials were considered clinically homogeneous, with sufficiently similar participant characteristics, interventions, outcome measures, and follow-up timing. A qualitative analysis using the GRADE approach also was planned. The GRADE approach evaluates the quality of evidence for individual outcomes based on domains including limitations of study design and risk of bias, inconsistency of results, indirectness, imprecision of results, and publication bias. Using the GRADE approach, the following definitions for assessing the quality of evidence were applied to each individual outcome:

#### Table 1.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Were eligibility criteria specified?</td>
</tr>
<tr>
<td>2</td>
<td>Were participants randomly allocated to groups?</td>
</tr>
<tr>
<td>3</td>
<td>Was allocation concealed?</td>
</tr>
<tr>
<td>4</td>
<td>Were the groups similar at baseline regarding the most important prognostic indicators?</td>
</tr>
<tr>
<td>5</td>
<td>Were all participants blinded?</td>
</tr>
<tr>
<td>6</td>
<td>Was there blinding of all therapists who administered the therapy?</td>
</tr>
<tr>
<td>7</td>
<td>Was there blinding of all assessors who measured at least one key outcome?</td>
</tr>
<tr>
<td>8</td>
<td>Were measures of at least one key outcome obtained from more than 85% of the participants initially allocated to groups?</td>
</tr>
<tr>
<td>9</td>
<td>Did all participants for whom outcome measures were available receive the treatment or control condition as allocated or, where this was not the case, were data for at least one key outcome analyzed by intention to treat?</td>
</tr>
<tr>
<td>10</td>
<td>Were the results of between-group statistical comparisons reported for at least one key outcome?</td>
</tr>
<tr>
<td>11</td>
<td>Did the study provide both point measures and measures of variability for at least one key outcome?</td>
</tr>
</tbody>
</table>

*a Only items 2 to 11 are included in the calculation of the PEDro scale score.*
Results
Study Selection
Figure 1 outlines the number of references considered at each stage of the selection process prior to confirming the included trials. Thirteen authors were contacted for further information to clarify eligibility and provide outcome data. A response was received from 4 authors. Six trials randomizing 474 participants were identified as being eligible for inclusion, with details of excluded trials shown in Figure 1.

Quality Assessment
All trials except one scored 6 or more on the PEDro methodological quality assessment and were deemed high quality (Tab. 2). The most common methodological limitation was a failure to blind assessors or treating therapists, although it should be noted that it is not possible to blind therapists providing specific treatment.

Trial Characteristics
The characteristics of the included trials are described in Table 3. Two trials reported on participants with LBP and associated leg symptoms, and 4 trials included participants with LBP with or without leg symptoms. Two trials also included some participants with a positive neurological sign. One trial involved participants with a mixture of acute and subacute symptoms, one trial involved participants with subacute and chronic symptoms, and the remaining trials reported on participants with a mixed duration of symptoms. There was some variation in the type of DPM described (Tab. 3). Two trials involved the use of DPM with cointerventions. One of these trials described an “extension-oriented treatment approach” involving the use of passive lumbar spine mobilization techniques to promote extension in addition to sustained and repeated lumbar extension tech-

Figure 1.
Flowchart showing progression of randomized controlled trials (RCTs) through the selection process. DPM=directional preference management, DP=directional preference.
A variety of comparison interventions were used, including a combination of strengthening and stabilization exercises, a lumbar stabilizing program with progression to a general exercise program, orthopedic manual therapy (OMT) including self-mobilization and stretching exercises, manipulation with progression to a general exercise program, exercises performed in the opposite direction from the identified DP combined with advice to remain active, “evidence-based care” incorporating multidirectional mid-range lumbar exercises and hip and thigh stretches combined with advice to remain active, advice to remain active alone, and passive spinal mobilization. There were no trials involving no treatment or placebo treatment.

The precise timing of collecting outcome measure data varied among trials and in some trials was not specifically reported. All 6 trials presented data at short-term follow-up. 2 trials presented data at intermediate-term follow-up, and 2 trials collected long-term follow-up data. Various outcome measures were used in the eligible trials, with all reporting on back-specific function (Functional Status Questionnaire, Oswestry Disability Questionnaire, and Roland-Morris Disability Questionnaire) and 5 reporting on pain intensity (visual analog scale and numeric rating scale). Work participation data relating to pain interference at work were presented in one trial.

Adverse effects were reported in one trial where 36 out of 230 participants (15.7%) withdrew from the comparison treatments (exercises provided in the opposite direction from the participant’s DP with advice and the second comparison treatment of multidirectional mid-range lumbar exercises, stretches, and advice) due to reporting no improvement, worsening, or increased distal radiation of symptoms.

Based on the information presented above, the trials were determined by the reviewers to be clinically heterogeneous, and meta-analysis was not performed. The mean differences, treatment effect sizes, and associated 95% CIs for the individual trials are presented grouped according to comparison treatments followed by outcome (Fig. 2). A qualitative evaluation of the quality of the evidence was made for each comparison outcome using the GRADE results. In some trials, follow-up data were collected at multiple time points within the predetermined time periods. In such cases, available at ptjournal.apta.org, the data were reported from the follow-up time point closest to 6 weeks (short term) and 6 months (intermediate term). The GRADE quality of evidence was downgraded for various reasons, including limitations of study design, inconsistency due to conflicting results, imprecision due to sparse data, and indirectness due to clinical heterogeneity, the inclusion of a cointervention, or the comparison group receiving treatment expected to be less effective than standard treatment.

Full details of methodological assessment and the GRADE quality of evidence for all outcomes and comparisons are presented in eAppendix 2.

### DPM Versus Stabilizing or Strengthening Exercise Programs

Three trials compared DPM with a lumbar stabilization or strengthening exercise program (Fig. 2). Two of these trials involved DPM provided with cointerventions. One high-quality trial (N=48) showed that extension-based DP exercises combined with passive lumbar mobilization were significantly better than a strengthening program at improving function at 4 weeks (SMD=0.6, CI=0.1 to 1.2) and intermediate-term follow-up (SMD=0.7, CI=0.1 to 1.3), with
### Table 3. Characteristics of Included Trials

<table>
<thead>
<tr>
<th>RCT</th>
<th>Participant Characteristics, Sample Size, Symptom Duration, and Inclusion Criteria</th>
<th>Interventions</th>
<th>Comparison Interventions</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paatelma et al&lt;sup&gt;60&lt;/sup&gt; PEDro=7 Clinical=4</td>
<td>Referred by occupational physician to occupational health care centers (Finland) Mean age = 44 y N=119* Mean symptom duration: unknown Inclusion criteria: LBP with or without pain radiating to 1 or both legs, age 18–65 y, employed, acute or chronic duration, first or recurrent episodes, centralization present at initial assessment</td>
<td>McKenzie method involving an educational component supported with McKenzie’s book titled Treat Your Own Back&lt;sup&gt;60&lt;/sup&gt; and 10–15 repetitions of exercises according to symptom response performed each 1–2 hours, with or without clinician generated forces. Clinic and home exercise program. Mean of 6 visits (range=1–7).</td>
<td>OMT involving spinal manipulation if required, specific mobilization, muscle stretching, and lumbar stabilization exercises. Mean of 6 visits (range=1–7). Advice to stay active with educational booklet (one 30- to 45-min session)</td>
<td>Leg pain (VAS), LBP (VAS), and function (RMDQ) after treatment (OMT and McKenzie groups only) and at 3, 6, and 12 mo (all groups)</td>
</tr>
<tr>
<td>Browder et al&lt;sup&gt;61&lt;/sup&gt; PEDro=6 Clinical=5</td>
<td>Consecutive patients with LBP at medical centers and small outpatient practices, mostly within US Department of Defense Mean age = 39 y N=48 Median symptom duration= 59.5 d Inclusion criteria: LBP extending distal to buttocks in at least 1 leg, centralization with lumbar extension movements, age 18–60 y, OSW score &gt;30%, symptoms of any duration</td>
<td>Extension-oriented treatment approach involving MDT extension strategies to promote lumbar extension with the goal of achieving centralization, including sustained positioning and repeated lumbar extension exercises (prone lying, elbow props, repeated prone press-ups, and repeated extension in standing) as well as passive posterior to anterior lumbar mobilization. Clinic exercise program involved performing up to 3 sets of 10 repetitions of exercises. Home exercise program involved 1 set of 10 repetitions of exercises each 2–3 waking hours. Six treatment sessions over 4 wk.</td>
<td>Lumbar spine strengthening exercise program to improve isolated contractions of deep abdominal muscles and strengthen primary spine stabilizers. Home program performed once daily. Six treatment sessions over 4 wk.</td>
<td>Pain (NPRS) and function (OSW) at 1 wk, 4 wk, and 6 mo</td>
</tr>
<tr>
<td>Brennan et al&lt;sup&gt;62&lt;/sup&gt; PEDro=6 Clinical=2</td>
<td>Patients with LBP referred to physical therapy clinics (US) Mean age = 37.7 y N=34* Mean symptom duration= 16 d Inclusion criteria: LBP &lt;90 d, age 18–65 y, with or without referral into the lower extremity, OSW score ≥25%, classified in “specific exercise” category (including the presence of centralization with lumbar flexion or extension)</td>
<td>“Specific exercise” group: repeated movement exercises in the direction of centralization/DP. Progression to general exercise program if OSW score reduced to &lt;20% or a reduction of 33% from initial score during treatment, consisting of low-stress aerobic exercise on bike or treadmill, exercises for any muscle strength or flexibility impairments, followed by stabilization exercises. Eight sessions over 4 wk.</td>
<td>Immobilization group: lumbar stabilization exercise program involving abdominal bracing exercises and exercises to strengthen lumbar extensor and oblique abdominal muscles before progression to general exercise program as per “specific exercise” group. Eight sessions over 4 wk. Manipulation group: thrust manipulation or low-amplitude lumbosacral mobilization procedures and lumbar mobilizing exercise before progression to general exercise program as per “specific exercise” group. Eight sessions over 4 wk.</td>
<td>Function (OSW) at 4 wk and 1 y</td>
</tr>
<tr>
<td>Miller et al&lt;sup&gt;63&lt;/sup&gt; PEDro=5 Clinical=4</td>
<td>Referred by physician to outpatient physical therapy clinic (US) Mean age = 47 y N=18* Mean symptom duration=26.4 mo Inclusion criteria: chronic LBP (&gt;7/52), presence of derangement</td>
<td>McKenzie approach involving McKenzie treatment principles for derangement classification. Treatment may have included posture correction, end-range spinal repeated movements, or use of manual techniques to reduce or eliminate signs and symptoms. Ten to 15 min of daily home exercise.</td>
<td>Six-week specific lumbar stabilizing program involving isolated contractions of lumbar multifidus and transversus abdominis muscles before progressing to a progressive stabilizing exercise program. Ten to 15 min of daily home exercise.</td>
<td>Pain (VAS) and function (FSQ) after 6 wk of treatment</td>
</tr>
</tbody>
</table>

(Continued)
Directional Preference Management for Low Back Pain

Table 3. Continued

<table>
<thead>
<tr>
<th>RCT</th>
<th>Participant Characteristics, Sample Size, Symptom Duration, and Inclusion Criteria</th>
<th>Interventions</th>
<th>Comparison Interventions</th>
<th>Outcome Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long et al64</td>
<td>Consecutive patients with LBP presenting to outpatient departments and physical therapy clinics (Canada, US, Germany, UK, and Kuwait) Mean age=42.2 y N=230 Mean symptom duration=15.3 wk† Inclusion criteria: nonspecific LBP with or without leg symptoms, with or without 1 neurological sign, demonstrating a DP during mechanical assessment, age 18–65 y, symptoms of any duration</td>
<td>Matched group: exercises and education consistent with MDT were provided matching the DP established at assessment and progressed according to signs and symptom response. Five to 10 min of exercise every 2 waking hours. Mean of 4.08 sessions over 2 wk.</td>
<td>Opposite group: exercises provided in the opposite direction from participant’s DP with advice. Five to 10 min of exercise every 2 waking hours. Mean of 2.81 sessions over 2 wk.</td>
<td>Pain (VAS), function (RMDQ), and work participation at 2 wk</td>
</tr>
<tr>
<td>Schenk et al65</td>
<td>Referred by physician to hospital-based outpatient clinic (US) Mean age=43 y N=25 Mean symptom duration: unknown Inclusion criteria: participants referred with a diagnosis of lumbar radiculopathy (defined as symptoms of disk origin peripheral to lumbar region), with or without neurological signs, with lumbar posterior derangement, symptom duration between 7 d and 7 wk</td>
<td>3 sessions of postural correction, walking on a treadmill for 20 min, and McKenzie method lumbar extension exercises with or without hips offset based on repeated movements examination (5 sets of 10 repetitions performed each session)</td>
<td>3 sessions of postural correction, walking on a treadmill for 20 min, and passive lumbar mobilization based on active, repeated, and passive movement testing and palpation findings (5 sets of 10 repetitions performed each session)</td>
<td>Pain (VAS) and function (OSW) after 3 visits</td>
</tr>
</tbody>
</table>

†Calculated from the average of the 3 treatment groups; the authors excluded 22 participants who reported a symptom duration of >100 weeks.

*Refers to sample size of participants with centralization or a DP. †Calculated from the average of the 3 treatment groups; the authors excluded 22 participants who reported a symptom duration of >100 weeks.

Moderate effect sizes demonstrated. However, there were no significant differences between treatments for pain at all follow-ups and function at 1 week. One high-quality trial62 (N=34) showed no significant differences between DPM and a stabilizing program (with a proportion of participants in both groups progressing to a general exercise program) for function at short-term and long-term follow-ups. No pain outcomes were presented in this trial. A low-quality trial (N=18) showed that DPM was significantly more effective at reducing short-term pain than a stabilization program (SMD=1.1, CI=0.0 to 2.1), but there was no significant difference between treatments for short-term functional outcomes (SMD=0.5, CI=−0.5 to 1.5).63 In summary, there is low-quality evidence from one trial (imprecision, indirectness due to a cointervention) that DPM is more effective than a stabilizing or strengthening exercise program at improving intermediate-term function; however, there is no significant difference in intermediate-term pain and long-term function outcomes. There is conflicting evidence from heterogeneous trials regarding the effectiveness of DPM versus stabilizing or strengthening programs for short-term pain (2 trials) and function (3 trials). No evidence was found for long-term pain outcomes comparing DPM and strengthening or stabilizing programs.

DPM Versus Manual Therapy

Three trials investigated the effect of DPM with manual therapy.60,62,65 One high-quality trial65 (N=25) showed that DPM consisting of McKenzie treatment was significantly better at reducing pain than passive lumbar mobilization techniques following the completion of 3 treatment sessions (SMD=1.1, CI=0.3 to 2.0); however, there was no significant difference between treatments for function. Another
Table 1: Comparison Treatments versus Outcome Measures

<table>
<thead>
<tr>
<th>Comparison Treatment</th>
<th>Outcome Measure</th>
<th>Follow-up</th>
<th>Mean Difference</th>
<th>Effect Size (SMD) and 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilizing/strengthening exercise programs</td>
<td>Pain (NPRS)</td>
<td>Short-term (1 wk)</td>
<td>0.9</td>
<td>0.4 (-0.2 to 1.0)</td>
</tr>
<tr>
<td></td>
<td>Pain (NPRS)</td>
<td>Short-term (4 wk)</td>
<td>0.7</td>
<td>0.3 (-0.3 to 0.9)</td>
</tr>
<tr>
<td></td>
<td>Pain (VAS)</td>
<td>Short-term (6 wk)</td>
<td>2.2</td>
<td>1.1 (0.0 to 2.1)</td>
</tr>
<tr>
<td></td>
<td>Function (OSW)</td>
<td>Short-term (1 wk)</td>
<td>4.4</td>
<td>0.3 (-0.3 to 0.8)</td>
</tr>
<tr>
<td></td>
<td>Function (OSW)</td>
<td>Short-term (4 wk)</td>
<td>9.8</td>
<td>0.6 (0.1 to 1.2)</td>
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<tr>
<td></td>
<td>Function (OSW)</td>
<td>Short-term (6 wk)</td>
<td>3.7</td>
<td>0.2 (-0.6 to 1.0)</td>
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<tr>
<td></td>
<td>Function (FSQ)</td>
<td>Short-term (6 wk)</td>
<td>10.1</td>
<td>0.5 (-0.5 to 1.5)</td>
</tr>
<tr>
<td></td>
<td>Pain (NPRS)</td>
<td>Intermediate-term (6 mo)</td>
<td>0.6</td>
<td>0.2 (-0.3 to 0.8)</td>
</tr>
<tr>
<td></td>
<td>Function (OSW)</td>
<td>Intermediate-term (6 mo)</td>
<td>10.0</td>
<td>0.7 (0.1 to 1.3)</td>
</tr>
<tr>
<td></td>
<td>Function (OSW)</td>
<td>Long-term (12 mo)</td>
<td>2.2</td>
<td>-0.1 (-0.9 to 0.7)</td>
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<td>Manual therapy</td>
<td>Pain (VAS)</td>
<td>Short-term (after third visit)</td>
<td>2.0</td>
<td>1.1 (0.2 to 2.0)</td>
</tr>
<tr>
<td></td>
<td>Back pain (VAS)</td>
<td>Short-term (after treatment)</td>
<td>0.6</td>
<td>0.4 (0.0 to 0.8)</td>
</tr>
<tr>
<td></td>
<td>Leg pain (VAS)</td>
<td>Short-term (after treatment)</td>
<td>0.2</td>
<td>0.2 (-0.2 to 0.6)</td>
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<tr>
<td></td>
<td>Function (OSW)</td>
<td>Short-term (after third visit)</td>
<td>10.6</td>
<td>0.6 (-0.2 to 1.4)</td>
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<tr>
<td></td>
<td>Function (OSW)</td>
<td>Short-term (4 wk)</td>
<td>10.4</td>
<td>0.5 (-0.3 to 1.4)</td>
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<tr>
<td></td>
<td>Function (RMDQ)</td>
<td>Short-term (after treatment)</td>
<td>1.7</td>
<td>0.4 (0.0 to 0.9)</td>
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<tr>
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<td>Back pain (VAS)</td>
<td>Intermediate-term (3 mo)</td>
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<td>0.5 (0.1 to 0.9)</td>
</tr>
<tr>
<td></td>
<td>Leg pain (VAS)</td>
<td>Intermediate-term (3 mo)</td>
<td>1.0</td>
<td>0.7 (0.3 to 1.1)</td>
</tr>
<tr>
<td></td>
<td>Back pain (VAS)</td>
<td>Intermediate-term (6 mo)</td>
<td>0.6</td>
<td>0.5 (0.1 to 0.9)</td>
</tr>
<tr>
<td></td>
<td>Leg pain (VAS)</td>
<td>Intermediate-term (6 mo)</td>
<td>0.3</td>
<td>0.4 (-0.1 to 0.8)</td>
</tr>
<tr>
<td></td>
<td>Function (RMDQ)</td>
<td>Intermediate-term (3 mo)</td>
<td>0.8</td>
<td>0.2 (-0.2 to 0.6)</td>
</tr>
<tr>
<td></td>
<td>Function (RMDQ)</td>
<td>Intermediate-term (6 mo)</td>
<td>1.6</td>
<td>0.6 (0.2 to 1.0)</td>
</tr>
<tr>
<td></td>
<td>Back pain (VAS)</td>
<td>Long-term (12 mo)</td>
<td>0.2</td>
<td>0.1 (-0.3 to 0.5)</td>
</tr>
<tr>
<td></td>
<td>Leg pain (VAS)</td>
<td>Long-term (12 mo)</td>
<td>0.2</td>
<td>0.1 (-0.3 to 0.6)</td>
</tr>
<tr>
<td></td>
<td>Function (RMDQ)</td>
<td>Long-term (12 mo)</td>
<td>1.0</td>
<td>0.3 (-0.1 to 0.8)</td>
</tr>
<tr>
<td></td>
<td>Function (OSW)</td>
<td>Long-term (12 mo)</td>
<td>7.1</td>
<td>0.4 (-0.5 to 1.2)</td>
</tr>
</tbody>
</table>

Figure 2.
Results of treatment effects for directional preference management (DPM) versus comparison treatments for all included trials. Treatment effects favoring DPM assigned positive Hedges standardized mean difference (SMD) values. Results in bold type represent statistically significant comparisons based on the 95% confidence interval (CI) of the SMD. Values presented in forest plots are effect sizes (SMD) and 95% CI. VAS=visual analog scale, OWS=Oswestry Disability Questionnaire, RMDQ=Roland-Morris Disability Questionnaire, RAI=Rating of Activity Interference, FSQ=Functional Status Questionnaire.
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high-quality trial62 (N=34) showed no significant differences between DPM and manipulation (with a proportion of participants in both groups progressing to a general exercise program) for function at short-term and long-term follow-ups. There were no pain outcomes presented in this trial. One high-quality trial60 (N=119) compared DPM with OMT and exercise. In this trial, the participants in the OMT and exercise group received treatment consisting of lumbar spine manipulation if required, specific mobilization, muscle stretching, and stabilization exercises. There were variable results in this trial dependent on the timing of follow-up, with 6 of the 12 estimates of effect demonstrating a statistically significant effect favoring DPM.

Directional preference management was significantly more effective than OMT and exercise at improving back pain in the short term (SMD=0.4, CI=0.0 to 0.8), at 3 months (SMD=0.5, CI=0.1 to 0.9), and at 6 months (SMD=0.5, CI=0.1 to 0.9), but the effect was not maintained at long-term follow-up. Significant differences were found for reduction of leg pain at 3 months (SMD=0.7, CI=0.3 to 1.1) and function at short-term follow-up (SMD=0.4, CI=0.0 to 0.9) and 6-month follow-up (SMD=0.6, CI=0.2 to 1.0). There were no significant differences between treatments for leg pain at short-term, 6-month, and long-term follow-ups and function at 3-month and long-term follow-ups.

In summary, there is low-quality evidence from 2 trials (imprecision, indirectness due to clinical heterogeneity) that DPM is more effective than manual therapy at improving short-term back or overall pain, but there is no significant difference in long-term function. There is moderate-quality evidence from one trial (imprecision) that DPM is more effective than manual therapy for reduction of back pain and improvement of function at intermediate-term follow-up, but there is no significant difference between treatments for reduction of long-term back pain or any leg pain outcomes. There is conflicting evidence from heterogeneous trials regarding the effectiveness of DPM versus manual therapy for short-term function (3 trials).

DPM Versus Multidirectional Mid-Range Lumbar Exercises, Stretches, and Advice
One high-quality trial64 (N=230) showed that DPM involving McKenzie treatment matching a participant’s DP was significantly more effective than multidirectional mid-range lumbar exercises, stretches, and advice for each short-term pain, function, and work participation outcome. Large effect sizes were evident for reducing back pain (SMD=0.8, CI=0.5 to 1.2) and leg pain (SMD=0.8, CI=0.3 to 1.2), with moderate effect sizes demonstrated for improving function (SMD=0.5, CI=0.2 to 0.9) and reducing interference at work (SMD=0.6, CI=0.3 to 1.0). In summary, there is moderate-quality evidence from one trial (imprecision) that DPM is more effective at reducing low back and leg pain and improving function and work participation than multidirectional mid-range exercises with advice at short-term follow-up.

DPM Versus Advice
One high-quality trial (N=119) investigated the effect of DPM versus one session of advice and showed a significant difference favoring DPM for 7 of the 9 back pain, leg pain, and functional outcomes.60 Directional preference management was significantly better at reducing leg pain at the 3-month follow-up (SMD=0.5, CI=0.0 to 0.9), the 6-month follow-up (SMD=1.1, CI=0.6 to 1.6), and the long-term follow-up (SMD=0.6, CI=0.1 to 1.1). There was a significant difference favoring DPM for reducing back pain at 3 months (SMD=0.7, CI=0.2 to 1.1) and 6 months (SMD=1.4, CI=0.9 to 1.9), but improvements were not maintained at long-term follow-up. There was no difference in function between treatments at the 3-month follow-up; however, DPM was found to be significantly better at improving function at the 6-month follow-up (SMD=1.2, CI=0.7 to 1.6) and the long-term follow-up (SMD=0.7, CI=0.2 to 1.1). In summary, there is moderate-quality evidence from one trial (imprecision) that DPM is more effective than advice for reducing back pain and leg pain and improving function at intermediate-term follow-up and for reducing leg pain and improving function at long-term follow-up.
Clinical Importance

The clinical relevance scores for each of the trials averaged 3.5, with a range from 2 to 5 (Tab. 2). The most common issue identified in the clinical relevance scores was the lack of description of interventions limiting reproducibility in the clinical setting and for future RCTs.60,64,65 A minimal clinically important effect is of particular importance to clinical relevance and, regarding pain and function, can be defined as 2 points for the numeric pain rating scale,54 1.5 out of 10 points for the visual analog scale,54 10 points for the Oswestry Disability Questionnaire,54 and 2 to 3 points for the Roland-Morris Disability Questionnaire.53,55 Several individual effect sizes of pain and function were considered clinically important, all favoring DPM (Tab. 2). Clinically important effects favoring DPM were demonstrated in one trial for short-term back pain, leg pain, and function outcomes compared with exercises provided in the opposite direction from a participant’s DP with advice and evidence-based care64 (Fig. 2). Other findings of clinical importance included short-term reduction in pain when compared with passive mobilization65 and a stabilization exercise program,63 improvement in function at 6 months compared with a strengthening program,61 and reduced back pain and leg pain and improved function at 6 months compared with advice60 (Fig. 2).

Discussion

It has been proposed that RCTs evaluating treatment specific to a LBP subgroup may lead to more consistently positive and larger effect sizes than previous more nonspecific research.14,66 In this systematic review, 6 trials investigating the efficacy of DPM for people with LBP and a DP were identified.50–65 Due to the clinical heterogeneity, we were unable to conduct a meta-analysis. However, preliminary evidence was found supporting the effectiveness of DPM for people with LBP and a DP. Twenty-five of the 43 pain, function, and work participation outcomes demonstrated a significant difference favoring DPM over comparison treatments, with 12 of these outcomes identifying clinically important effects. In addition, no trials showed that DPM was significantly less effective than any of the comparison treatments at any follow-up.

We grouped the results by comparison group treatment and reached qualitative conclusions based on the GRADE quality of evidence scores. There was moderate evidence that DPM was more effective for reducing back pain and improving function compared with manual therapy in the intermediate term60 and for improving short-term pain, function, and work participation outcomes compared with multidirectional mid-range lumbar exercises combined with stretches and advice64 and that DPM was more effective than advice for the majority of intermediate and long-term pain and function outcomes.60 Low-quality evidence was found that DPM was more effective for reducing back pain and overall pain compared with manual therapy in the short term,50,65 for improving function compared with a stabilizing exercise program in the intermediate term,61 and for improving pain, function, and work participation outcomes than exercises provided in the opposite direction from a participant’s DP with advice in the short term.64

In contrast, however, this review found conflicting evidence of the effect of DPM on pain61–63 and function61–63 compared with strengthening or stabilizing exercise programs at short-term follow-up and of the effect of DPM on function compared with manual therapy at short-term follow-up.50,62,65 In addition, no significant difference in effect was demonstrated between groups for several outcomes. There is moderate evidence of no difference between DPM and strengthening or stabilizing programs for improving long-term function,62 between DPM and manual therapy for reducing leg pain and long-term back pain,60 and between DPM and advice for reducing long-term back pain.60 Low-quality evidence was found that there is no significant difference between DPM and strengthening or stabilizing programs for reducing intermediate-term pain61 and between DPM and manual therapy for improving long-term function.60,62

Despite the mixed results in the RCTs identified, a potentially important observation from this systematic review is the large effect sizes that were evident in some high-quality trials60,64,65 and one low-quality trial.63 Large effects favoring DPM were demonstrated compared with exercise with advice as well as exercises in the opposite direction from the participant’s identified DP with advice,64 passive mobilization,65 advice,60 and a stabilization program.63 However, there are some methodological issues that need to be considered when reviewing the included trials. These issues include a limited follow-up of 2 weeks combined with a large number of dropouts and withdrawals64; a comparison group treatment expected to be less effective than standard treatment in most clinical settings64; DPM being provided by a single practitioner, thus limiting generalizability60,65; and small sample sizes with associated wide CIs.63,65

It is our view that future research should consider replicating the DPM protocols and comparison groups of trials where preliminary evidence of large effect sizes was demonstrated. If the methodological limitations described above were rectified in
replication trials, the quality of evidence supporting DPM would have the potential to increase. Unfortunately, replication of most of these trials may be difficult given the inadequate description of explicit participant inclusion criteria and reproducible classification and treatment protocols. Future research on DPM should include well-defined operational definitions that can be replicated in RCTs and by practitioners in a clinical setting.

There is variability in the literature regarding the operational definitions of centralization and DP, which was evident in the trials included in this review. This variability complicates the process of practitioners identifying patients likely to respond to DPM. Given the lack of accepted operational definitions, trials were eligible for this review if the authors stated that they included participants who exhibited either centralization or a DP. Implementing a standardized operational definition for centralization may improve consistency of clinical practice and patient outcomes.

A number of related systematic reviews on the efficacy of McKenzie treatment and treatment based on symptom response following subgroup classification according to the patient response method have been published. This review provides an updated systematic search of relevant literature up until January 2010 compared with the most recent search date of May 2005. In addition, the current review included only trials that recruited participants with LBP with a DP. Given the current emphasis on evaluating the efficacy of treatment targeted to specific subgroups rather than the potentially heterogeneous population with nonspecific LBP, this approach to RCT selection was considered important. The concept of treatment targeted to a specific subgroup is inherent to DPM, and we believe our approach is consistent with this clinical emphasis. Because of the inclusion and exclusion criteria, this review also included a different set of trials compared with previous systematic reviews. In comparison only 1 of 5, 1 of 13, and 2 of 54 of the trials from previous reviews were included in this article, with 4 additional RCTs being identified.

Limitations

A meta-analysis was not undertaken in this review based on heterogeneity within and among the identified trials. This position can be justified based on a number of factors. Although all trials included participants with mixed symptom durations, there was considerable variability among trials regarding the proportion of participants with less than or more than 12 weeks of symptoms. Patients with persistent LBP were known to be less responsive to treatment. Pooling data from trials where the majority of participants had a symptom duration of less than 12 weeks with trials where persistent LBP was predominant was considered to be inappropriate. There also was significant heterogeneity among trials regarding the DPM protocols, with number of treatment sessions varying from 3 to 8. Several trials used DPM involving manual techniques, whereas others used only patient-generated forces through exercise. Some trials used a pragmatic approach to provision of DPM, whereas others attempted to have a prescribed treatment regimen. Considerable variability also was evident among the comparison groups. There were differences in follow-up time points, including imprecise timing of data collection within individual trials. Given the variability among trials across a range of factors, it was not possible to conclude that any 2 trials were sufficiently homogenous to conduct a meaningful meta-analysis.

We decided to include in this review trials that had cointerventions in addition to DPM. This pragmatic approach has been undertaken in recent systematic reviews and represents common clinical practice. It is unclear whether the implementation of DPM with a co-intervention is more or less effective than DPM alone, and future research evaluating this question with specific comparison groups would be of value. An additional limitation of this review was the exclusion of RCTs not published in English due to limited resources and funding. Despite some evidence stating that excluding non-English trials does not appear to affect estimates of effectiveness in systematic reviews, the effect of this restriction on this review is uncertain.

Conclusion

Providing specific treatment based on symptom response for patients with a DP is a widely used treatment approach. A number of trials were identified in this review that investigated the effect of DPM on people with LBP and a DP. Due to clinical heterogeneity, a meta-analysis could not be conducted. A GRADE description of the quality of the body of evidence was presented. Some evidence was found supporting the effectiveness of DPM when applied to participants with a DP, particularly at short-term and intermediate-term follow-ups. However, the evidence, in general, was mixed, with a number of trials conflicting or showing no effect.

Further high-quality RCTs are warranted to evaluate the effect of DPM applied to people with LBP and a DP. Future research should consider replication of existing trials that showed large effects and detailed operational...
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definitions of classification and treatment protocols.

Mr Surkitt, Dr Ford, Dr Hahne, and Dr Pizzari provided concept/idea/research design. All authors provided writing. Mr Surkitt and Dr Ford provided data collection. Mr Surkitt, Dr Ford, and Dr Hahne provided data analysis. Ms McMeeken provided project management and facilities/equipment. Dr Hahne and Ms McMeeken provided consultation (including review of manuscript before submission).

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References


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