Effects of McKenzie Exercise and other Treatment Techniques in Reducing Pain & Disability in Chronic Nonspecific Low Back Pain

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Abstract

Background: Low back pain (LBP) is rising globally due to increase in population and ageing. In adults below 45 years of age, work-related injury leads to nonspecific pain resulting in disability. Exercise therapy has proven to be effective in reducing pain and associated disability in these patients. McKenzie exercises focus on repeated end-range movement and posture correction, thereby reducing pain and disability. This study aims to compare the effectiveness of McKenzie exercise with other techniques in reducing pain and disability in nonspecific chronic LBP (NSCLBP).

Objectives: To compare the effect of alternate treatment approaches and McKenzie exercises in nonspecific chronic low back pain.

Methods: Studies that satisfied the inclusion and exclusion criteria for the review were found by searching databases like Google Scholar, Pub Med and Cochrane CENTRAL. This study comprised randomized controlled trials that compared McKenzie treatment with other therapeutic approaches for treating NSCLBP. Two independent reviewers extracted the data and evaluated the trials’ quality. Forest plots were used to display the results.

Results: Eleven full-text articles were included in this study for review in order to conduct a meta-analysis and qualitative analysis. The meta-analysis of pain and functional impairment related to back pain comprised ten studies each. When comparing patients undergoing McKenzie treatment to other treatment techniques, there was a slight overall decrease in the intensity of low back pain (SMD: -0.83 [95% CI: -1.11, -0.55], I²= 80.8%; p< 0.000). After doing McKenzie exercises, low back patients’ functional impairment did not improve in comparison to other therapy methods (SMD: 0.07 [95% CI: -0.54, 0.68], I²= 71.5%; p< 0.000).

Conclusion: McKenzie exercise is equally effective to other manual therapy techniques but slightly effective than passive treatments in decreasing pain & disability in NSCLBP.

Keywords: Low back pain, Nonspecific low back pain, McKenzie exercises in low back pain, manual therapy for chronic low back pain.

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Introduction

Low back pain (LBP) impacted 619 million people worldwide in 2020. It is predicted that by 2050, the number of cases will rise to 843 million, mostly due to aging and population growth. The majority of cases occur in the 50–54 age bracket, with the prevalence rising up to 80 years of age.\textsuperscript{10,21} In India, the cumulative, yearly, and pooled point prevalences of lower back pain are 48\%, 51\%, and 66\%, respectively.\textsuperscript{19} The number of years spent as disabled is on the rise particularly in low- and middle-income nations. LBP has been linked to smoking, obesity, sedentary work, and low socioeconomic level.\textsuperscript{20}

Pain between the buttock and lower edge of the ribs is referred to as low back pain, and it can be classified as acute, sub-acute, or chronic depending on how long it lasts. Acute pain lasts less than four weeks, sub-acute pain lasts more than four but less than twelve weeks and if pain lasts for more than 12 weeks it is chronic LBP.\textsuperscript{10,16} LBP without any recognized anatomical aetiology is known as non-specific LBP (NSLBP).

It is one of the most common causes for disability in people under 45 and is typically linked to work-related injuries.\textsuperscript{4} It is a non-malignant disorder that frequently resolves on its own. Patients look for therapeutic interventions to lessen the severity of their symptoms.\textsuperscript{14}

For non-specific low back pain, guidelines suggest using physical exercise and non-pharmacological, non-invasive treatment. In order to rule out major diseases, patients should be checked for warning signs and undergo diagnostic testing. For worse results, psychosocial risk factors (yellow flags) should be evaluated. Exercise is thought to be beneficial for those with subacute or chronic LBP but useless for those with acute LBP. Through therapy, tertiary prevention of LBP seeks to lessen the detrimental effects of pain, disability, and functional loss.\textsuperscript{16} According to a recent meta-analysis, exercise reduced the risk of LBP by 33\% when done alone. Exercise is now the first line of treatment for NSCLBP and needs to be done regularly. In patients with persistent low back pain, a regular exercise program improves balance and decreases pain and impairment.

In a recent meta-analysis of the literature, it was discovered that McKenzie exercises were more effective than other rehabilitation techniques in reducing pain and functional disability in people with CNSLBP.\textsuperscript{20}

Several randomized controlled trials (RCTs) have investigated the comparative effectiveness of different manual therapy interventions for LBP, including the McKenzie Method, orthopaedic manual therapy, and other exercise-based approaches. These trials have assessed various outcomes, including pain intensity, functional status, and disability, to provide evidence-based guidance for clinical decision-making in LBP management. Given the growing body of literature on manual therapy interventions for LBP, there is a need for comprehensive synthesis and analysis of the available evidence to guide clinical practice and inform future research directions. Therefore, this meta-analysis aims to systematically review and synthesize the findings of relevant RCTs to provide a comprehensive assessment of the effectiveness of the McKenzie Method and other manual therapy interventions for LBP.

Method

PRISMA (Preferred Reporting Items of Systematic reviews and Meta-Analysis) criteria were followed in the preparation of the protocol, which was then registered at the International Prospective Register of Systematic Reviews (PROSPERO) with Registration ID 512087.

Search strategy

The study comprised randomized controlled trials that examined the efficacy of McKenzie and other physical therapy approaches for NSCLBP. Numerous clinical trial registries, including Google Scholar, PubMed-MEDLINE, and the Cochrane Central Register of Controlled Trials (CENTRAL), have been searched for this review. Clinical trials, experimental, preclinical, comparative, case reports, case series, reviews, commentary, quasi-experimental, observational, with case controls, cohorts, correspondence to the editor, conference abstracts, editorials, methodological papers, dissertations, and studies were not included in this review. MeSH terms and key terms were used to find the studies.
Participants

Inclusion criteria:

a. Only RCTs that examine the effects of McKenzie exercise in treating NSCLBP were selected.

b. Studies with participants over 18 years old and less than 80 years who suffered from NSCLBP for more than three months.

c. Patients who could comprehend native language were included in the study.

Exclusion Criteria:

a. Patients suffering from any kind of congenital, neurological, cardiovascular, psychiatric, or gynaecological disorder.

b. LBP with particular cause (disc herniation, trauma, nerve root injury)

c. Patients with spinal or lower-limb surgery.

d. Patients suffering from spinal deformities, cancer, or autoimmune diseases.

Interventions

The trials were assigned either to a control group or an experimental group. The experimental group received McKenzie exercises and control group received any one -segmental stability, mobilization, Pilates exercises, or motor control exercises

Primary outcomes

The main findings were

i) intensity of pain (MPQ, NPRS, VAS)

j) functional disability (RMDQ, FSQ, ODI, FRI).

Screening and reviewing of studies

Zotero software was used to eliminate duplicates after searching the databases. Independently, two reviewers (RR, SS) went over the abstracts and titles of the studies that were chosen from the database search. We discovered and extracted the publications that qualified for a full text review. After conducting independent reviews, we (RR, SS) chose which full-text articles to include. Any difference during the process was settled through conversation between the reviewers (RR, SS). The articles that satisfied the inclusion and exclusion criteria served as the foundation for creating the final list.

Data collection and extraction

Using Microsoft Excel (Version 2021), a data extraction form (DEF) was created, and the necessary data was recorded. This table contained information about the study’s design, sample size, mean age, back pain score at baseline and at the end of treatment, functional disability score at baseline and at the end of treatment, tools for measuring pain intensity and functional disability, and study specifics like author name, journal, and year of publication. From the included studies, the reviewers (RR, SS) independently collected information on the number of participants, the intensity of the pain (mean, standard deviation), and functional disability (mean, standard deviation). [Table 1]

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Journal Name</th>
<th>Author</th>
<th>Study Design</th>
<th>Study Setting</th>
<th>Participants</th>
<th>Intervention</th>
<th>Outcome</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The New England Journal of Medicine</td>
<td>Cherkin et al (1998)</td>
<td>RCT</td>
<td>Group Health Cooperative of Puget Sound, Washington</td>
<td>321</td>
<td>McKenzie group for 1 month (n=133)</td>
<td>Botherness of symptoms</td>
<td>The McKenzie method and chiropractic manipulation had similar effects and were marginally better than education booklet.</td>
</tr>
<tr>
<td>Page</td>
<td>Journal/Media</td>
<td>Authors/Study Type</td>
<td>Setting</td>
<td>Sample Size</td>
<td>Intervention Details</td>
<td>Outcome Measurements</td>
<td>Findings</td>
<td></td>
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<tr>
<td>2</td>
<td>The Journal of Manual &amp; Manipulative Therapy</td>
<td>Schenk et al. (2003)</td>
<td>Hospital-based outpatient clinic, western New York state</td>
<td>25</td>
<td>McKenzie group (n=15) • Mobilization group (n=10) • Postural correction &amp; ambulation on treadmill for 20 minutes for both groups with 5 sets of 10 repetitions of exercise or mobilization for 3 visits</td>
<td>Pain (VAS) • Perceived level of function (Oswestry Low Back Pain Disability Questionnaire)</td>
<td>McKenzie exercises were more beneficial in reducing pain and in recovery of function than mobilization in early stages of recovery.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The Journal of Manual &amp; Manipulative Therapy</td>
<td>Miller (2005)</td>
<td>Outpatient Physical therapy clinic, New York</td>
<td>30</td>
<td>McKenzie group (n=15) for 6 weeks • Stabilization group (n=15) for 6 weeks • Patients prescribed 10-15 mins of home exercises</td>
<td>Pain (short-form McGill Pain Questionnaire) • Disability (Functional status questionnaire) • SLR test</td>
<td>Both groups demonstrated improvement in pain scores and disability. No statistical improvement between groups noted.</td>
<td></td>
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<tr>
<td>4</td>
<td>Journal of Rehabilitation Medicine</td>
<td>Paatelma et al. (2008)</td>
<td>Occupational health care centre, Finland</td>
<td>134</td>
<td>McKenzie (n=52): maximum 7 sessions of 30-45min each • Orthopedic Manual therapy (n=45): maximum 7 sessions of 30-45 mins each • Advice-only (n=37): 1 session of 60mins</td>
<td>Pain (VAS) • Disability (Roland-Morris Disability Questionnaire)</td>
<td>No differences between OMT &amp; McKenzie groups in pain and disability-scores.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Spine</td>
<td>Petersen (2011)</td>
<td>Primary care specialist center, Copenhagen, Denmark</td>
<td>350</td>
<td>McKenzie group (n=175) • Manipulation group (n=175) • Exercises to continue at home or gym for minimum 2 months after completion of treatment.</td>
<td>Pain • Disability (Roland Morris Disability Questionnaire, Danish version)</td>
<td>McKenzie method slightly better than manipulation when used with advise &amp; information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical Therapy</td>
<td>Garcia et al (2013)</td>
<td>RCT</td>
<td>Outpatient Physical therapy clinic, Brazil</td>
<td>• 148</td>
<td>The 4-week treatment program (one session/week) • Back School (n=74) group exercises • McKenzie (n=74) individually exercises • The participants also were instructed to perform a daily set of home exercises.</td>
<td>• Pain (Numeric Pain rating Scale) • Disability (Roland-Morris Disability Questionnaire) • Quality of life (World Health Organization Quality of Life–BREF instrument)</td>
<td>Greater improvement in disability at 1 month in McKenzie group.</td>
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<tr>
<td>7</td>
<td>Journal of Physical Therapy Science</td>
<td>Hosseinifar (2013)</td>
<td>RCT</td>
<td>Physiotherapy clinic, School of Rehabilitation, Tehran University of Medical Sciences, Iran</td>
<td>• 30</td>
<td>• McKenzie group (n=15) • Stabilization group (n=15) 18 sessions for both groups performed 3 times per week for 6 weeks</td>
<td>• Pain (VAS) • Disability (Persian version of Functional Rating Scale) • Ultrasound imaging (TrA &amp; MF muscle thickness)</td>
<td>Stabilization exercises are more effective than McKenzie exercises in decreasing pain &amp; disability scores</td>
</tr>
<tr>
<td>8</td>
<td>International Journal of Prevention and Treatment</td>
<td>Kuppusamy (2013)</td>
<td>RCT</td>
<td>Modern Physiocare Rehabilitation Centre, Hyderabad</td>
<td>• 30</td>
<td>• McKenzie group (n=15) 2 sessions of 50-60 mins per week for 6 weeks • Mat based Pilates exercise (n=15) 2 session of 60 minutes each twice a week for 6 weeks</td>
<td>• Pain intensity (NPRS) • Functional Disability (Roland-Morris disability questionnaire) • Trunk flexion &amp; extension (Modified Schober’s index)</td>
<td>Both treatments equally effective but McKenzie group demonstrated more patient satisfaction (statistically significant)</td>
</tr>
<tr>
<td>9</td>
<td>Journal of Back and Musculoskeletal Rehabilitation</td>
<td>Murtezani et al (2015)</td>
<td>RCT with 3 months follow-up</td>
<td>OPD at Deptt of Physical &amp; Rehabilitation medicine, Obilq</td>
<td>• 271</td>
<td>• McKenzie (n=134) 30-45 min sessions for 4 weeks (maximum seven sessions) • Electrophysical agents (n=138) 50 mins session for 4 weeks (10 sessions)</td>
<td>• Pain (VAS) • Functional disability (Oswestry questionnaire)</td>
<td>McKenzie reduces pain &amp; disability. It is more effective than EPA group.</td>
</tr>
<tr>
<td>10</td>
<td>Journal of Orthopedic &amp; Sports Physical Therapy</td>
<td>Halliday (2016)</td>
<td>RCT</td>
<td>Physiotherapy department of Concord Repatriation General Hospital, Sydney</td>
<td>• McKenzie exercises (n=35) • Motor Control Exercise (n=35) daily home exercise for 30 mins; clinic visit twice a week for 4 weeks &amp; once per week for next 4 weeks</td>
<td>Primary outcome • Ultrasound images for recruitment of trunk muscles. Secondary outcomes • Patient’s perception of function (Patient-specific Functional scale) • Global improvement (Global perceived effect questionnaire) • Pain intensity (VAS)</td>
<td>Greater improvement in perceived recovery in McKenzie group. No significant improvement in deep trunk muscle recruitment in either groups.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Indian Journal of Palliative Care</td>
<td>Dehkordi (2017)</td>
<td>RCT</td>
<td>Physiotherapy Clinic in the School of Rehabilitation of the Shahrekord University of Medical Sciences, SouthWest Iran</td>
<td>• McKenzie group (n=12) • Pilates (n=12) • Control (n=12) 18 sessions with 3 sessions per week for weeks</td>
<td>Pain (McGill Pain Questionnaire)</td>
<td>McKenzie and Pilates, both treatment reduced pain but general health improved more with Pilates.</td>
<td></td>
</tr>
</tbody>
</table>

**Assessment of risk of bias in included studies**

The risk of each study was evaluated using Cochrane risk-of-bias tool for randomized trials (RoB2) 2.0, based on criteria that were separately defined by the two reviewers. Based on the criteria provided in the Cochrane handbook, studies were classified as low risk, some concerns, or high risk. Any difference was settled by mutual conversation between the two reviewers or by involving a third assessor.

**Statistical analysis**

The forest plots, Cochrane-Q test and I² statistic were inspected to assess heterogeneity between the studies. Heterogeneity was considered if I² value was greater than 50% or Cochrane-Q >0.1. Heterogeneity was graded as low, moderate, and high for I² values of 25%, 50%, and 75%. In case of heterogeneity, random effect model was used. The sources of the heterogeneity were explored by sensitivity analysis according to the risk of bias of included studies. Statistical analyses were performed by Strata version 13 software. Two-sided P 0.05 was considered statistically significant except for the sub-group analysis and heterogeneity test, in which P value of 0.10 was considered significant.

To evaluate the degree of heterogeneity among the studies, I² statistic, forest plots, and Cochrane-Q test were examined. I² value more than 50% and Cochrane-Q larger than 0.1 were regarded indicators of heterogeneity. Heterogeneity at 25%, 50%, and 75% I² values was categorized as low, moderate, and high. The random effect model was applied in the situation of heterogeneity. By using sensitivity analysis, the sources of the heterogeneity were investigated in relation to the included studies’ risk of bias. The statistical studies were carried out using the software Strata version 13. With the exception of the sub-group analysis and heterogeneity test, when a P value of 0.10 was deemed significant, two-sided P 0.05 was regarded as statistically significant.
Results

After 51 articles in total were searched across several databases, 17 of them were determined to be suitable for full-text selection. In the qualitative and quantitative synthesis or meta-analysis, only 11 papers were included since they satisfied the inclusion and exclusion criteria.

Outcomes

1. Pain intensity

Of the eleven articles, pain was assessed in ten articles, wherein 6 articles used visual analog scale (VAS), 2 studies each used numerical pain rating scale (NPRS) and McGill Pain Questionnaire (MPQ) for pain evaluation. When compared to other treatment, patients undergoing McKenzie exercise had significant decrease in pain severity. (SMD: -0.83 [95% CI: -1.11, -0.55], I² = 80.8%; p < 0.000). [Figure 1]

2. Functional disability

Ten articles evaluated functional disability; five of them used the Roland Morris Disability Scale (RMDQ), two used the Oswestry Disability Index (ODI), and the remaining three used the Functional Status Questionnaire, the Patient Specific Functional Scale, and the Functional Rating Index. After doing McKenzie exercises, low back patients’ functional impairment did not improve in comparison to other therapy techniques. (SMD: 0.07 [95% CI: -0.54, 0.68], I² = 71.5%; p < 0.000). [Figure 2]
Risk of bias assessment

Figure 3 describes the risk of bias assessment for the papers that are part of this meta-analysis. Six of the 11 included studies had low risk of bias, whereas the remaining five studies had some concerns or high risk in composite evaluation. All of the studies used random allocation in accordance with the Cochrane criteria, however five of them went into great depth on the allocation concealment technique. Due to the intention-to-treat approach used in the majority of studies, bias resulting from missing data has been addressed. The majority of the eleven investigations raised issues with the significant likelihood of bias in participant, experimenter, and outcome assessment blinding. Therefore, overall risk of bias is some concerns in this study. [Figure 3]

<table>
<thead>
<tr>
<th>Study</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>Overall</th>
</tr>
</thead>
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<tr>
<td>Cherkin et al (1998)</td>
<td>-</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Schenk et al (2003)</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Miller (2005)</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>X</td>
<td>-</td>
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<tr>
<td>Peterson et al (2011)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>X</td>
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<td>Garcia et al (2013)</td>
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<td>Hosseinifar (2013)</td>
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<td>Kuppusamy (2013)</td>
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<tr>
<td>Halliday (2016)</td>
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<td>Dehkordi (2017)</td>
<td>-</td>
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</table>

**Figure 3: Risk of Bias summary of individual studies**

Discussion

To determine if McKenzie exercises are superior to alternative treatment plans in terms of lowering pain and functional impairment in people with NSCLBP, a total of 11 RCTs were examined in this investigation. The Cochrane risk-of-bias instrument for randomized trials (RoB2), version 2.0, has been utilized to assess each article’s bias.

We conclude that a 4–6-week McKenzie exercise training is effective in reducing pain intensity when compared to other alternatives for the treatment of nonspecific low back pain. But for functional disability the other treatment techniques fare better or they are equally effective to McKenzie exercises. This result is consistent with studies that have compared McKenzie with other manual therapy techniques where both techniques yielded similar results. Hosseinifar concluded that pain decreased in both McKenzie and spinal stabilization group but disability reduction was significant in stabilization group. As there were no changes in seen in abdominal muscle thickness post- McKenzie treatment, posture correction resulting from repeated or sustained posture might have resulted in pain reduction.8

Pergolizzi and Paatelma concluded concluded in their review that both McKenzie & intensive strength training or manual therapy had similar results in terms of pain relief and disability.15,16 In their comparative trial, Kuppusamy & Dehkordi concluded that Pilates was as effective as McKenzie exercise. There was improvement in all outcomes but pain index was statistically significant. Moreover, patient satisfaction
with McKenzie was better than Pilates because of “hands-on” approach. Halliday also observed that participants who got the McKenzie approach had a better sense of perceived recovery compared to those who received motor control exercises, even though pain and function scores were not statistically different.

It has been demonstrated that the relief of pain in the McKenzie group is due to the pain control theory of gating mechanism. McKenzie approach for treating low back pain utilizes repeated movement, which could possibly lead to decrease in pain.

The authors discovered that improvements in trunk range of motion in every manual therapy group are associated with improvement in trunk range of motion. Petersen concluded that in both the treatment techniques, McKenzie method and spinal manipulation it was intended to mobilize intervertebral spinal joints. Since both treatments are likely to influence the same pain mechanism, it might explain the relatively modest difference between treatments. In his pilot study, Bid discovered that while McKenzie exercises are beneficial in lowering pain, pain sensitization, disability, and fear avoidance beliefs, they do not increase the endurance of the trunk flexors and extensors in NSCLBP patients. Researchers have found that McKenzie is more effective in decreasing pain and disability as compared to passive treatment like electrophysical agents or advice-only treatment in their study respectively.

The limitation of present study is that a subgroup analysis for heterogeneity was required. Publication bias for pain and functional disability has not been done. The studies with different follow-up time points have been included which may resulted in higher heterogeneity. Studies included have seen short term effect of McKenzie whereas some studies report better results with long term McKenzie therapy, thereby explaining statistically insignificant improvement with other manual therapy techniques. Major issue with all studies is that complete blinding is difficult, thus compromising on reliability and generalizability.

Conclusion

When compared to similar manual therapy interventions, McKenzie exercises are as successful in reducing pain and functional impairment scores in 4- to 6-week interventions, but they outperform passive therapies in this regard. We need articles that have long term intervention of McKenzie or similar intervention time.

Source of funding: Self

Conflict of Interest: Nil

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References


