

REVIEW

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## The Effectiveness of Physical Therapy and Rehabilitation Approaches in Low Back Pain on Pain Severity and Disability; A Systematic Review

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### Abstract

The objective of this study was to review the efficacy of physical therapy and rehabilitation approaches for low back pain, focusing on pain intensity and disability.

A survey of the literature was done in PubMed and Web of Science databases up to January 30, 2024. English studies were required, using keywords: “low back pain,” “pain intensity,” “pain severity,” “disability,” and “physical therapy.” Pain intensity was measured using the Visual Analog Scale and Numeric Rating Scale, including the 11-point Pain Intensity Numerical Rating Scale. Disability was assessed using Activities of Daily Living, Instrumental Activities of Daily Living scales, Roland Morris Disability Questionnaire, and Oswestry Disability Index. Seven studies met the inclusion criteria from 665 initial records. Interventions included osteopathic manipulative treatment, core muscle exercise with interferential current, cognitive functional therapy, dry cupping therapy, high-intensity machine-based core muscle resistance training, heat therapy, transcutaneous electrical nerve stimulation, pelvic traction, Reiki, dynamic muscular stabilization technique, and McGill Big 3. Sample sizes ranged from 30 to 1090 participants. Interferential current combined with core muscle exercises significantly reduced pain intensity compared to each method alone, though not statistically significant ( $p > 0.05$ ). The high-intensity machine-based core muscle resistance training program group had greater pain relief ( $P < .001$ ) and reduced disability ( $P = .002$ ) compared to online integrated multidisciplinary therapy. No significant differences were found between dynamic muscular stabilization technique and McGill Big 3 groups ( $p > 0.05$ ). Dry cupping did not outperform sham cupping. Cognitive functional therapy reduced absenteeism in the first two years but not later. Reiki showed significant improvement in pain and Activities of Daily Living compared to drug therapy, but not to physiotherapy. Physical therapy interventions effectively alleviate symptoms and enhance results for low back pain. However, variability in interventions and outcome measures necessitates cautious interpretation. Further research with standardized protocols is essential to understand the effectiveness and optimal duration of physical therapy for Low Back Pain.

**Keyword:** low back pain; pain intensity; pain severity; disability; physical therapy

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## INTRODUCTION

The term "low back pain" (LBP) refers to many types of pain, including nociceptive pain, neuropathic (radicular) pain that travels down the legs, and nociplastic pain on occasion, which is frequently classified as non-specific low back pain and is brought on by an exaggeration of pain in the central nervous system. These pain subtypes often overlap; for instance, a patient presenting with back pain due to a ruptured disc may concurrently experience radicular pain along with other diffuse symptoms, which are not necessarily correlated with pathoanatomical referral patterns (1).

In many parts of the world, the main reason for activity restriction and productivity loss is low back discomfort (2), and it has a significant financial impact on people, families, communities, businesses, and governments (3, 4). It is hypothesized that a considerable portion of the psychological factors associated with pain and disability stem from maladaptive beliefs concerning low back pain (5). For

instance, prevailing perceptions regarding the vulnerability of the back and the necessity for its protection have been associated with heightened levels of fear related to pain and avoidance behaviors (6). The perspectives of healthcare professionals are particularly significant to consider, as research has indicated that they influence patients' attitudes and pose challenges to the implementation of standards for low back pain (7). Physiotherapists are among the medical practitioners who spend the most time with patients and are most responsible for educating them about lower back pain (8). Therefore, further investigation into the perceptions of physiotherapists regarding low back pain is warranted, given the critical priority of employing evidence-based knowledge in low back pain care (9).

There are various approaches to treating low back pain (10). Pharmacologic therapy includes nonsteroidal anti-inflammatory drugs (NSAIDs), opiates, muscle relaxants, and over-the-counter drugs such as acetaminophen or ibuprofen (11). In addition, there are nonpharmacologic treatments such as osteopathic manipulative treatment (OMT), exercise therapy, behavioral therapy, acupuncture, and physical therapy. The treatment of low back pain may also involve more intrusive

procedures such as epidural, facet, and steroid injections (12).

This study's primary goal was to evaluate the effectiveness of physical therapy and rehabilitation techniques for treating low back pain, as well as how they affect the degree of pain and disability.

The PRISMA checklist and guidelines for preferred elements to report on in systematic reviews and meta-analyses (PRISMA) were utilized in this work to conduct the systematic review (Fig.1)

### ***Review Issue***

The review question was developed using the PICOS framework (Participants, Intervention, Comparison, Outcome, Study design). “Do physical therapy and rehabilitation approaches improve the intensity of pain intensity, pain severity and disability in patients with low back pain?” (P: Patients with low back pain; I: Techniques used in physical treatment and rehabilitation. C: Group of comparison (healthy or placebo); O: Intensity and severity of pain and disability; S: This systematic review examines randomized controlled trials comparing the impact of physical therapy and rehabilitation techniques on low back pain severity, pain intensity, and disability.)

### ***Search Approach***

A comprehensive analysis of the literature covering the time from the databases' creation to January 30, 2024, was conducted using the

databases PubMed and Web of Science. English language studies were mandatory. The search approach made use of particular keywords, which are; “low back pain” and “pain intensity” and “pain severity” and “disability” and “physical therapy”. The data required for the study began to be collected on March 10, 2024.

### ***Eligibility Criteria***

We evaluated human randomized controlled trials (RCTs) among patients at least 18 years and older diagnosed with low back pain, including non-specific, acute, and chronic cases, for inclusion in this systematic review. A number of materials were excluded from consideration: research on animals, studies on minors under the age of 18, abstracts, individual cases or series, letters to the editor, published articles in journals without peer review, retrospective-prospective cohort studies, case-control research, review articles, conference proceedings, theses, dissertations, and studies on conditions other than low back pain.

### ***Selection of Studies***

There were two steps in the study selection process. First, using the pre-established inclusion and exclusion criteria, the research articles that were found through the literature search were filtered according to their titles and abstracts. All of the remaining papers' texts were then evaluated in order to decide if they might be included in the review.

### ***Evaluation of Methodological Accuracy***

A methodological quality scale, available at <https://pedro.org.au/>, was used to evaluate the included RCTs using the Physiotherapy Evidence Database (PEDro). Ten items make up the PEDro scale, and each has a binary response that can be either YES (positive rating) or NO (negative rating) (Table.1). The quality rating is based on the total score on the scale, where a score of less than 4 signifies poor quality, a score of 4-5 signifies acceptable quality, a score of 6–8 signifies good quality, and a score of 9–11 signifies exceptional quality (13).

Seven RCTs were determined to be eligible for narrative review after our inclusion criteria were applied to a total of 665 data that were first screened for this systematic review. Every study that was included was written in English. The PRISMA flowchart graphic (Fig. 1) illustrates the research selection process and gives a visual depiction of the procedure. The chosen studies differed in terms of the interventions, length of treatment, sample size, recruitment country, study methodology, and outcome measures.

The included trials examined various ways to use physical therapy and rehabilitation with the purpose of rehabilitating people with low back pain. These studies evaluated the following specific interventions: osteopathic manipulative treatment (14) (OMT), a core muscle exercise and interferential current (15)

(IFC), cognitive functional therapy (16) (CFT), dry cupping therapy (17), a high-intensity machine-based core muscle resistance training program (18) (C-IPU), transcutaneous electrical nerve stimulation, heat therapy, pelvic traction and Reiki (19), dynamic muscular stabilization technique (DMST) and transcutaneous electrical nerve stimulation (20) (TENS). Between 30 and 1090 patients made up the sample sizes in each of the study's many arms. However, in most of the studies included in the review, the gender density of the participants was not specified. Table 1 provides a comprehensive overview of the study features, detailing the interventions employed, sample sizes, the countries where the studies were conducted, and the treatment durations.

These studies evaluated a range of outcomes and used various scales to measure the effectiveness of physical therapy and rehabilitation methods. Various scales were used in the research to determine the intensity of low back pain. Two studies used the Visual Analog Scale (VAS) to measure pain intensity (15,19), while the remaining studies preferred the Numeric Rating Scale (NRS)(14,16,17,18,20). Among the studies that used the NRS, one preferred (14) the 11-question version known as the 11-point Pain Intensity Numerical Rating Scale (PI-NRS).

Only one study (19), measured disabilities related to low back pain using the assessment instruments for gauging Activities of Daily

Living (ADL) and Instrumental Activities of Daily Living (IADL) scales, while two studies (14,20) used the Roland Morris Disability Questionnaire (RMDQ) . The remaining four studies utilized the Oswestry Disability Index (ODI) to assess disability in low back pain (15,16,17,18).

### ***Core Muscle Exercises***

Core muscle exercises aim to boost the function of local stabilizing muscles, such as the transversus abdominis and lumbar multifidus, setting them apart from traditional exercise methods (21,22). Three studies utilized core muscle exercises as a treatment (15,18,20). One of these, conducted by Zuo et al. (15), aimed to investigate the effects of combining IFC with specific core muscle exercises versus using each method alone. The study included three groups: one receiving both core muscle exercises and IFC (Control Group, n = 19), one receiving only core muscle exercises (Exercise Group, n = 19), and one receiving only IFC (Interferential Group, n = 15). All groups underwent therapy sessions five times a week for a duration of 12 weeks. The main outcomes assessed were pain intensity, ODI score, and SF-12 health-related quality of life scores. Following the 12-week intervention, significant enhancements were observed in all health parameters across the three groups. Notably, the control group (CG) demonstrated a notably greater decrease in pain intensity compared to both the exercise group (EG) ( $p = 0.013$ ) and

interferential group (IG) ( $p = 0.000$ ) groups. Although core muscle function parameters notably improved in both the CG and EG groups by the study's end, between these two groups, there were no statistically significant differences ( $p > 0.05$ ).

### ***In-Clinic and Web-Based Multidisciplinary Spinal Treatment Programs***

Raiszadeh et al. compared the results of in-clinic and web-based exercise-centered multidisciplinary spinal treatment programs provided via an integrated practice unit (IPU)(18). To achieve this, they divided a total of 1022 participants into two groups: one received the in-clinic IPU (C-IPU) model (n=927) and the other received online integrated multidisciplinary therapy (O-IPU) (n=95). The C-IPU program consisted of an intense core muscle resistance training regimen utilizing machines, whereas the O-IPU program entailed core strengthening exercises directed by a therapist and conducted at home through a web-based platform. The study measured changes in LBP symptom severity using the NRS and disability using the ODI. The C-IPU group experienced higher pain alleviation ( $p<0.001$ ) and decreased disability ( $p=0.002$ ) compared to the O-IPU group. Conversely, the O-IPU group demonstrated more significant enhancements in the Patient-Specific Functional Scale. ( $p<0.001$ ).

### ***Core Stability Exercises***

Chan et al., examined two core stability methods, the progressive Dynamic Muscular Stabilization Training (DMST) and the traditional McGill Big 3 (MB3), aiming to rehabilitate nonspecific chronic low back pain (20). Thirty patients underwent these treatments alongside standard pain management. The evaluated outcomes encompassed pain severity during movement, standing, and sitting, functional disability, trunk endurance, lumbopelvic control, and body balance. Assessments occurred at baseline, the 3rd week, and the 6th week. No significant differences were found between the DMST and MB3 groups across all outcomes ( $p > 0.05$ ). In summary, both the progressive DMST and conventional MB3 core stability exercise programs proved effective for rehabilitating nonspecific chronic low back pain.

Core stability exercise programs are recognized as essential in physical therapy for chronic LBP. Nonetheless, it remains uncertain whether progressive or conventional core stability programs are more effective. Research frequently combines core stabilization exercises with electrotherapy (23-25).

Considering the results of these three studies on low back pain, more research is needed in the literature to definitively conclude that core stability exercises are an effective and advanced treatment option for LBP.

### ***Cupping Therapy***

In recent years, cupping therapy has gained popularity among treatments for LBP to improve pain and disability levels. To investigate the effectiveness of this treatment modality, Almeida Silva et al., conducted a study with ninety participants suffering from chronic non-specific LBP (17). The experimental group, consisting of 45 participants, received dry cupping therapy, with cups placed bilaterally aligned with the L1 to L5 vertebrae, while the control group, also comprising 45 participants, received sham cupping therapy. These treatments were given weekly for 8 weeks, with evaluations conducted before and after the initial session, as well as after 4 and 8 weeks of treatment. The primary outcome assessed was pain intensity, measured using a numerical pain scale during rest, brisk walking, and trunk flexion.

The research findings indicated that dry cupping therapy didn't show superiority over sham cupping in enhancing pain levels, physical function, mobility, quality of life, psychological symptoms, or medication usage among individuals with nonspecific chronic LBP ( $p>0,05$ ) (17).

### ***CFT***

CFT is an innovative, individual-focused behavioral intervention designed to address various aspects of non-specific chronic LBP. This approach integrates a functional

behavioral aspect aimed at normalizing challenging favorable postures and movements while discouraging behaviors associated with pain, alongside cognitive reconceptualization of non-specific chronic LBP (26). Clinical trials involving CFT have shown promising results (27-29). Consequently, Van Hoof et al. conducted a case-series pilot study involving 33 nurses with persistent LBP (16). In the initial baseline phase (A), no interventions were administered, and outcome measures were gathered twice, with a six-month interval between assessments (A1 and A2). Subsequently, in phase B, participants underwent a 14-week personalized CFT intervention. Following this, in phase C (another non-intervention phase), outcomes were evaluated immediately after the intervention and at 3, 6, 9, 12, and 36 months post-intervention. The primary outcomes were LBP-related work absenteeism, pain intensity (NRS), and disability (ODI).

The results showed that absence from work due to low back pain notably decreased during the initial ( $p=0.005$ ) and second years ( $p=0.045$ ) following the CFT intervention, although this reduction was not sustained in the third and fourth years. Disability levels showed a significant decrease quickly following the intervention and at 3, 9, and 12 months post-intervention ( $p<0.001$ ). Pain intensity also significantly decreased soon after the intervention ( $p<0.001$ ) and at 3 ( $p<0.001$ ), 9

( $p=0.005$ ), and 12 months post-intervention ( $p=0.007$ ).

However, the study noted a limitation in the absence of a control group, emphasizing the need for high-quality randomized controlled trials to thoroughly assess the effectiveness of CFT.

### **Reiki**

Reiki has gained approval from the National Center for Complementary and Alternative Medicine as a method for pain relief and is classified as a biofield treatment (30). Reiki works by balancing and aligning the energy chakras and auras, thereby promoting health (31). Energy therapists employ either direct touch or distance healing to realign the energy fields of individuals, promoting recovery on physical, emotional, mental, and spiritual levels (32). Reiki energy therapy has been utilized to address various physical, emotional, and psychological conditions, including hypertension, pain, headaches, mood disorders, anxiety, osteoarthritis, wound healing, and sleep disturbances (33). The utilization of complementary therapies for chronic pain management is increasing, with Reiki being one such therapy. Jahantiq et al. conducted a study to compare the efficacy of distance Reiki compared to physiotherapy in alleviating lower back pain and improving ADL in patients with intervertebral disc herniation (IDVH) (19). Sixty patients with IDVH were randomly divided into three groups: Reiki, physiotherapy,

and drug therapy. The severity of pain and ADL were evaluated before and after the intervention using the VAS for pain and the ADL-Instrumental ADL questionnaire.

The research revealed a notable contrast in pain intensity and enhancement in ADL between the Reiki and drug therapy groups. Nevertheless, there wasn't a significant distinction observed between the Reiki and physiotherapy groups concerning pain management ( $p=0.44$ ) and enhancement of ADL ( $p=0.29$ ).

While there was no significant difference in the improvement of daily activities between the Reiki and physiotherapy groups, the Reiki group exhibited a notable difference compared to the drug therapy group. Specifically, Reiki was more effective in improving activities compared to drug therapy. Furthermore, pain relief was greater in the Reiki group compared to both the physiotherapy and drug therapy groups, suggesting that Reiki is more effective in pain management and enhancing daily activities in patients with IVDH (19).

### **OMT**

In OMT, a variety of manual techniques are typically used. These treatments may include visceral technique, soft tissue stretching, spinal manipulation, resisted isometric "muscle energy" stretches, or the prescription of exercises. OMT can be applied to different bodily parts and tissues, sometimes far from the problematic area and depending on the

practitioner's clinical judgment. Treatment is characterized by a holistic approach to the patient (34,35). The first systematic review of OMT for LBP was published by Licciardone et al. (36), who found that OMT significantly decreased LBP. Supporting this outcome, research by Cooley et al. (14) observed reductions in pain and disability when OMT was applied in conjunction with Standart Care Treatment (SCT) in patients with LBP. Both the RMDQ and PI-NRS indicated that pain reduction was similar in both groups after four months. This study highlighted that OMT is an effective non-drug approach for alleviating pain in patients with chronic LBP. Fundamentally, OMT addresses biomechanical problems (somatic dysfunctions), which in chronic LBP can encompass issues with the innominate bones, sacrum, lumbar spine, and functional leg length discrepancies. The study also noted limitations, such as the limited number of patients treated with OMT and the small pool of patients with low back pain who did not receive OMT for comparison.

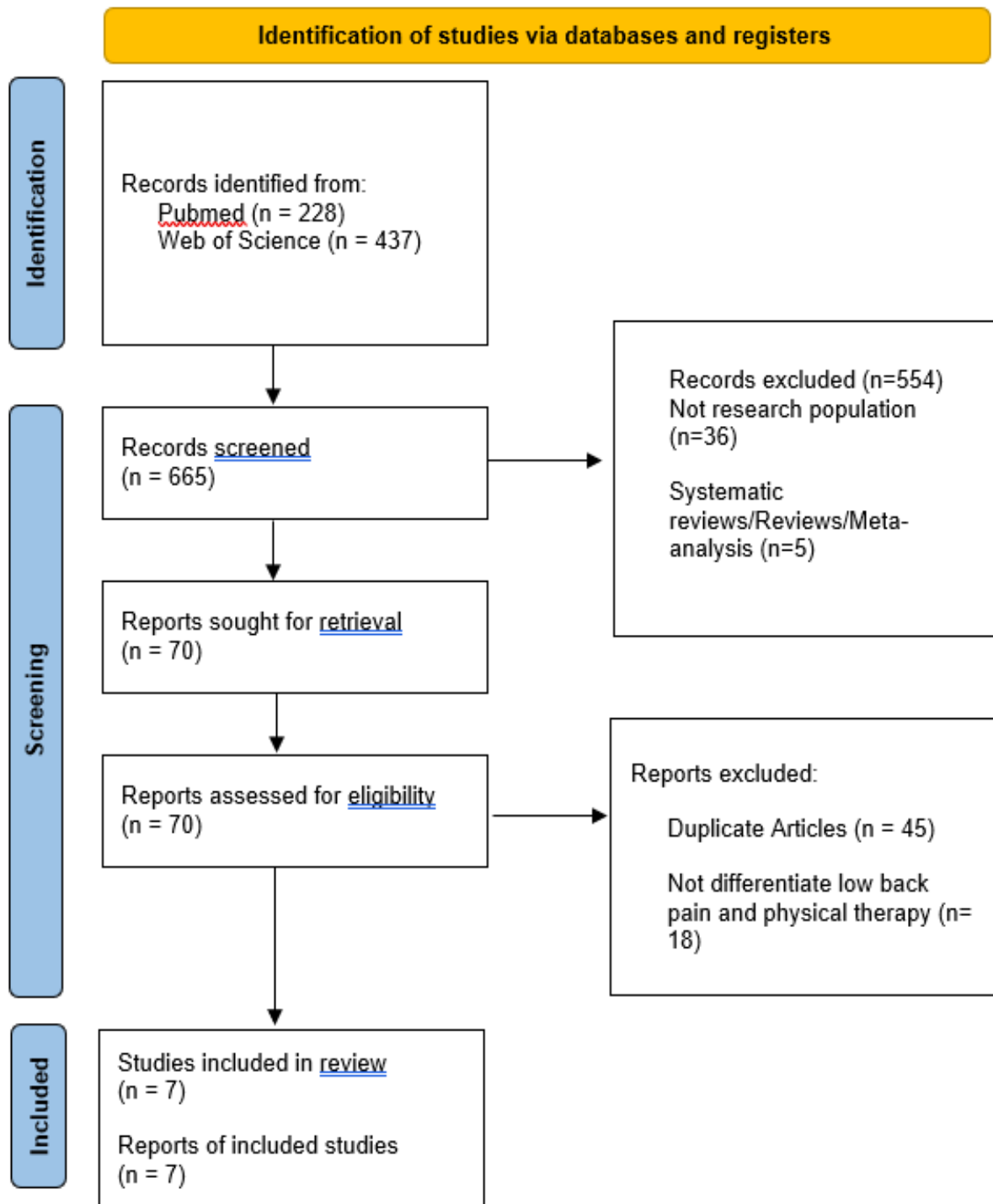
All of these findings indicate that physical therapy interventions can effectively alleviate symptoms and enhance outcomes in low back pain. However, caution is necessary when interpreting the results due to differences in the interventions and outcome measures utilized across various studies. The limited number of studies employing recommended outcome measures according to international guidelines



**Table1.** Characteristics of included studies.

<i>Reference,year</i>	<i>Country</i>	<i>Disease diagnosis</i>	<i>Groups</i>	<i>Intervention duration</i>	<i>Outcome measures</i>
<i>Cooley et al (14),2021</i>	USA	CLBP	Standart Care Group (n=75) Standart Care+Osteopathic Manipulative Treatment (n=71)	Both groups received 4 months of treatment	Pain; (PI-NRS) (p>0,05). Disability; (RMDQ) (p>0,05).
<i>Zuo et al.(15),2024</i>	China	Non-specific CLBP	One combining core muscle exercise with IFC (CG, n = 19), another with just core muscle exercise (EG, n = 19) and a third with only IFC (IG, n = 15)	All groups recieved 5 times a week for 12 weeks treatment.	Pain;(VAS) (p<0.05), Disability; (ODI) (p>0,05),
<i>Van Hoof et. Al(16), 2020)</i>	Belgium	CLBP or PLBP for more than 3 months.	Phase A;(no intervention), Phase B; (an individualized CFT intervention for 14 weeks), Phase C;(no intervention). Phases applied with 33 nurses.	CFT sessions; The initial session lasted 60 minutes, while each of the subsequent eight individual follow-up sessions lasted approximately 30 minutes.	Pain; (NRS) (p<0.05), Disability; (ODI) (p<0.05).
<i>Almeida Silva et al.(17), 2021</i>	Brazil	Non-specific CLBP	EG; dry cupping therapy, (n = 45), CG; sham cupping therapy, (n = 45)	EG; Once a week for 8 weeks, each session lasting 10 minutes. CG; Once a week for 8 weeks, each session lasting 10 minutes.	Pain;(NRS) (p>0,05), Disability; (ODI) (p>0,05).
<i>Raiszadeh et al.(18), 2021</i>	USA	<i>Any kind of LBP</i>	In-clinic program;(n=927), Web based program;(n=95)	C-IPU; Resistance training for the core muscles using a high-intensity machine program, O-IPU; With a web-based platform, therapist-directed at-home core strengthening activities. One session per week for 12 weeks.	Pain; (NRS)(p<0.05), Disability; (ODI)(p<0.05).
<i>Jahantigh et al.(19), 2018</i>	Iran	<i>LBP with intervertebral disc hernia</i>	Reiki Group;(n=20), Physiotherapy Group; (n=20), Drug Therapy Group;(n=20)	Reiki Group; three daily, 15-minute distant energy healing sessions for a week, Physiotherapy Group; lasting 60 to 90 minutes, conducted 7 to 10 times over the course of a week, involved heat therapy, transcutaneous electrical nerve stimulation, pelvic traction, and physical exercises. , Drug Therapy Group; 75 mg capsule of Indomethacin and a 500 mg tablet of methocarbamol every 8 hours daily for a week,as well as other two groups.	Pain; (VAS) (p>0,05), Disability (ADL-IADL) (p>0,05).
<i>Chan et al.(20), 2020</i>	Malaysia	Non-specific CLBP	Dynamic Muscular Stabilization Technique (DMST) Group; (n=15), McGill big 3 (MGB3) Group; (n=15)	DMST group; progressive DMST training, heat treatment using hydro collator (15 min), TENS(10 min). MGB3 group; conventional core stability training, heat treatment using hydro collator (15 min), TENS(10 min). 6 weeks duration.	Pain; (NPRS) (p > 0.05), Disability; (RMDQ) (p > 0.05)

Chronic Low Back Pain (CLBP), Interferentisl Current (IFC), The 11 Point Paint Intesity Numerical Rating Scale (PI-NRS)(NRS), Rolland Morris Disability Questionnaire (RMDQ), Oswestry Disability Index (ODI), Numerical Rating Scale (NRS), CG; Control Group, EG: Experimental Group, Cognitive Functional Therapy (CFT), Clinic-Based Multidisciplinary Therapy in an Integrated Practice Unit (C-IPU), Online Integrated Multidisciplinary Therapy (O-IPU), Assessment Tools to Evaluate Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Dynamic Muscular Stabilization Tecnique (DMST), McGill Big 3 (MGB3), Transcutenous Electrical Nerve Stimulation (TENS)



**Figure 1.** The study's PRISMA flowchart diagram.

**Table 2.** methodological evaluation of the studies' quality.

Author, year	1	2	3	4	5	6	7	8	9	10	11	Total
Cooley et al.(14),2021	YES	NO	YES	YES	NO	NO	NO	YES	YES	YES	YES	7
Zuo et al.(15),2024	YES	YES	NO	YES	NO	NO	YES	YES	YES	YES	YES	8
Van Hoof et.al(16), 2020	YES	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	5
Almeida Silva et al.(17), 2021	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	10
Raiszadeh et al.(18), 2021	YES	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	5
Jahantigh et al.(19), 2018	YES	YES	NO	YES	NO	NO	NO	YES	YES	YES	YES	7
Chan et al.(20), 2020	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	9

Take note that the presence of the item is indicated by "YES." "NO" indicates that the item is not present.

1. Specified eligibility requirements were provided.
2. The individuals were divided into groups at random (in a crossover trial, the subjects were randomly assigned to receive treatments regardless of order).
3. Allocative information was hidden.
4. The most significant prognostic factors were similar among the groups at baseline.
5. Every subject was blinded.
6. Every therapist who delivered the therapy was blinded.
- 7: Blinding was applied to all assessors who measured at least one significant outcome.
- 8: When the participants were first split into groups, measurements were obtained for more than 85% of the significant outcomes.
- 9: All subjects for whom outcome measures were available were assigned to the treatment or control condition; if this was not the case, the "intention to treat" technique was used to analyze data for at least one significant outcome.
- 10: The results of statistical comparisons between groups are reported for at least one significant outcome.
- 11: The study provides both point estimates and measurements of variability for at least one significant outcome.

underscores the importance of future research aligning with these standards. Ensuring uniformity in outcome measures will enhance the ability to compare and apply study results broadly, thus aiding in stronger evidence synthesis and informed clinical choices. Additional research employing standardized protocols and consistent outcome measures is crucial for gaining deeper insights into the effectiveness and ideal duration of physical therapy interventions for low back pain

## CONCLUSION

This systematic review underscores the limited evidence regarding the effectiveness of physical therapy and rehabilitation approaches in alleviating pain severity and disability

associated with low back pain. The studies analyzed employed a variety of intervention methods, including techniques such as IFC, CFT, C-IPU, DMST, MGB3, TENS, heat therapy, and osteopathic manipulative treatment. While these interventions generally yielded better outcomes compared to control groups, the variability in the outcome measures used across the studies complicates direct comparisons. To strengthen the evidence base, future research should prioritize the standardization of outcome measures and the implementation of high-quality clinical trials.

## Limitations

Limited studies: The systematic review identified only seven studies that fulfilled the

inclusion criteria, indicating a lack of extensive investigation on the topic. This limitation could hinder the broader applicability and reliability of the findings.

Heterogeneity among studies: Variability existed in the study designs, sample sizes, interventions, treatment durations, and outcome assessments across the included studies. This heterogeneity may lead to fluctuating results, posing challenges in drawing definitive conclusions.

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