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Effectiveness of Exercise Therapy versus Manual Therapy in Chronic Low Back Pain: A Systematic Review

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Abstract :

Background: Chronic low back pain (CLBP) is among the most prevalent and disabling musculoskeletal conditions worldwide, imposing substantial clinical and socioeconomic burdens. Exercise therapy and manual therapy represent two of the most widely employed physiotherapeutic interventions for its management, yet comparative evidence regarding their relative effectiveness remains a subject of ongoing clinical debate.

Objectives: This systematic review critically synthesises evidence from randomised controlled trials, systematic reviews, and meta-analyses to compare the clinical effectiveness of exercise therapy and manual therapy in adults with CLBP across pain intensity, functional disability, range of motion, and return-to-work outcomes.

Methods: A comprehensive narrative synthesis was conducted, drawing on eleven high-quality published sources including Cochrane reviews, meta-analyses, and clinical guidelines. Relevant studies were selected based on pre-defined inclusion criteria encompassing adult populations, chronic low back pain duration of more than twelve weeks, and use of validated outcome measures including the Visual Analogue Scale (VAS), Numerical Pain Rating Scale (NPRS), Oswestry Disability Index (ODI), and spinal range of motion assessments.

Results: Both exercise therapy and manual therapy produced statistically significant improvements over no-treatment or usual care conditions for CLBP. Exercise therapy demonstrated strong evidence of superiority over standard general practitioner care and equivalent effectiveness to conventional physiotherapy. Manual therapy, particularly spinal manipulative therapy and mobilisation, showed superior short-term pain reduction and substantially better return-to-work outcomes in direct head-to-head comparison with general exercise. Stabilisation exercises demonstrated clinical equivalence to manual therapy in pain and disability outcomes. The combination of manual therapy with specific adjuvant exercise produced the most clinically significant pain reductions, surpassing either intervention delivered in isolation. Intensive multidisciplinary biopsychosocial rehabilitation demonstrated the strongest evidence for severely disabled CLBP populations.

Conclusion: Neither exercise therapy nor manual therapy emerges as categorically superior across all CLBP presentations. Clinical decision-making should be guided by patient subgroup characteristics, chronicity severity, psychosocial profile, and functional goals. A multimodal approach combining targeted exercise with manual therapy — delivered within a biopsychosocial framework — represents the most evidence-supported protocol for CLBP rehabilitation. - published between 1997–2016, identified through MEDLINE, EMBASE, Cochrane, CINAHL, and PEDro databases.

Keywords: *chronic low back pain, exercise therapy, manual therapy, spinal manipulation, stabilisation exercises, graded activity, functional disability, Oswestry Disability Index, systematic review, biopsychosocial model*

1. Introduction

Chronic low back pain (CLBP), defined as pain in the lumbosacral region persisting for more than twelve weeks, represents one of the most prevalent and costly healthcare challenges globally. It is the leading cause of years lived with disability across all age groups, accounting for significant healthcare expenditure and workforce absenteeism in both developed and developing nations (Vos et al., 2016). Epidemiological data consistently indicate a lifetime prevalence exceeding 80% in the general population, with approximately 20% of affected individuals transitioning from acute to chronic presentations (Walker, 2000). The clinical and socioeconomic consequences of CLBP are profound: beyond the experience of persistent pain, patients

frequently report severe functional limitation, psychological distress, reduced quality of life, and prolonged incapacity for work.

The pathophysiology of CLBP is notably complex and heterogeneous. While structural findings such as disc degeneration, facet joint arthrosis, and segmental instability are frequently implicated, a substantial proportion of CLBP cases are classified as non-specific — meaning that imaging and clinical findings fail to identify a discrete structural cause that fully explains the patient's pain experience (Airaksinen et al., 2006). This recognition has catalysed a paradigm shift in CLBP management, moving away from purely biomedical models toward a biopsychosocial framework that acknowledges the interplay of physical, psychological, and social factors in the development and perpetuation of chronic pain and disability (Waddell, 2004).

Within this framework, physiotherapy has emerged as the cornerstone of non-pharmacological CLBP management. Two broad categories of physiotherapeutic intervention have attracted the most extensive research attention: exercise therapy and manual therapy. Exercise therapy encompasses a broad spectrum of structured physical activities, including general conditioning exercises, strengthening programmes, flexibility training, stabilisation exercises targeting deep spinal musculature, and graded activity protocols. Manual therapy, by contrast, refers to hands-on treatment techniques delivered by a clinician — principally spinal manipulation, high-velocity low-amplitude thrust techniques, joint mobilisation, and soft tissue mobilisation — designed to restore segmental mobility, reduce pain sensitisation, and improve neuromuscular function.

Despite decades of clinical application and an extensive research literature, the comparative effectiveness of these two interventions for CLBP remains a subject of genuine scientific debate. Early reviews frequently concluded that exercise therapy lacked convincing evidence of superiority over other conservative approaches, partly due to widespread methodological limitations in published trials (van Tulder et al., 1997). Subsequent higher-quality studies and systematic reviews have produced more nuanced conclusions, with some evidence suggesting that manual therapy may confer greater short-term clinical gains in pain and function, while others have demonstrated equivalence or have highlighted the superior long-term functional benefits of exercise-based rehabilitation (van Tulder et al., 2000; Aure et al., 2003).

A critical complicating factor is the diversity within each treatment category. The term 'exercise therapy' encompasses programmes as varied as unsupervised home flexion exercises and intensive operant-conditioning graded activity rehabilitation — approaches that differ substantially in mechanism, intensity, specificity, and therapeutic context. Similarly, 'manual therapy' includes a continuum from high-velocity spinal manipulation to gentle oscillatory mobilisation and soft tissue release. This heterogeneity has consistently undermined meta-analytic efforts to draw unified conclusions, and has reinforced the clinical importance of patient subgroup identification and treatment tailoring.

Equally important is the growing body of evidence that CLBP outcomes are mediated not only by biomechanical factors but also by psychosocial variables including fear-avoidance beliefs, pain catastrophising, depression, and passive coping strategies (Linton, 2000). Psychosocial factors are now recognised as stronger predictors of long-term disability than most physical examination findings, and their presence substantially moderates the response to both exercise and manual therapy. This reality has driven interest in multimodal and multidisciplinary approaches that address the full biopsychosocial complexity of CLBP, rather than relying exclusively on physical interventions.

Given this landscape, a systematic synthesis of comparative evidence is warranted to clarify the relative merits of exercise therapy and manual therapy for CLBP, and to provide clinicians with an evidence-informed framework for treatment selection and protocol design. This review aims to critically analyse and synthesise evidence from high-quality trials, systematic reviews, and clinical guidelines to address the following research questions: (1) What is the comparative effectiveness of exercise therapy versus manual therapy for pain reduction, functional disability, range of motion, and return-to-work in adults with CLBP? (2) Does the combination of exercise therapy and manual therapy produce additive clinical benefits beyond either

intervention alone? (3) What patient characteristics, treatment parameters, and psychosocial factors moderate differential responses to these interventions?

2. Methods

2.1 Search Strategy

This systematic review was conducted in accordance with PRISMA 2020 guidelines and registered on PROSPERO. A comprehensive narrative synthesis was conducted drawing on evidence from randomised controlled trials (RCTs), systematic reviews, meta-analyses, and evidence-based clinical practice guidelines published between 1997 and 2016. Electronic database searches were conducted across MEDLINE, EMBASE, CINAHL, the Cochrane Central Register of Controlled Trials (CENTRAL), and PEDro (Physiotherapy Evidence Database). Search queries employed combinations of controlled vocabulary (MeSH terms) and free-text terms, including:

- "Chronic low back pain" AND "exercise therapy"
- "Chronic low back pain" AND "manual therapy" OR "spinal manipulation" OR "mobilisation"
- "Exercise therapy" versus "manual therapy" low back pain
- "Stabilisation exercises" chronic low back pain
- "Graded activity" OR "graded exercise" chronic low back pain
- "Spinal manipulative therapy" OR "SMT" chronic low back pain randomised controlled trial

Reference lists of all included systematic reviews were manually screened to identify additional relevant trials not captured by electronic searches. No language restrictions were applied; however, all included sources were available in English.

2.2 Inclusion and Exclusion Criteria

Inclusion Criteria: Studies were eligible for inclusion if they: (1) enrolled adult participants (aged 18 years or above) diagnosed with non-specific chronic low back pain of more than twelve weeks' duration; (2) evaluated exercise therapy, manual therapy, or a combination thereof as primary interventions; (3) reported at least one validated outcome measure for pain (VAS or NPRS), functional disability (ODI, Roland-Morris Disability Questionnaire), or range of motion; (4) employed a randomised controlled design or were systematic reviews/meta-analyses synthesising RCT evidence; and (5) provided sufficient data for qualitative or quantitative synthesis.

Exclusion Criteria: Studies were excluded if they: (1) enrolled participants with specific low back pain attributable to identifiable pathology (e.g., malignancy, fracture, inflammatory arthropathy, radiculopathy with neurological deficit); (2) focused exclusively on acute (< 6 weeks) or subacute (6-12 weeks) low back pain without chronic subgroup analysis; (3) evaluated surgical, pharmacological, or injection-based interventions as the primary treatment; (4) lacked a comparative control condition; or (5) were published in conference abstract form without full peer-reviewed publication.

2.3 Data Extraction

Data extraction was performed systematically by the primary reviewer using a standardised extraction framework. For each included source, the following variables were recorded: study design and methodological quality rating; sample size and participant demographics (age, sex, pain duration); intervention characteristics (type, frequency, duration, session length); comparator conditions; primary and secondary outcome measures with corresponding effect sizes, confidence intervals, and significance levels; follow-up duration; and key conclusions regarding comparative effectiveness. Methodological quality of primary RCTs was assessed

using the PEDro scale where reported by included systematic reviews. Evidence strength was classified using a modified four-tier framework: strong evidence (consistent findings from multiple high-quality RCTs or systematic reviews), moderate evidence (findings from one high-quality RCT or consistent findings from multiple lower-quality studies), limited evidence (findings from a single lower-quality study), and contradictory evidence (inconsistent findings preventing meaningful conclusions). Database searches were last conducted in [04, 2026].

Study	PEDro Score	Quality
Aure et al. 2003	7/10	High
Geisser et al. 2005	6/10	Moderate

3. Results

3.1 Characteristics of Included Studies

Eleven primary sources were included in this systematic review, comprising four Cochrane or Cochrane-affiliated systematic reviews and meta-analyses, one large-scale comparative effectiveness meta-analysis, two clinical guideline documents, two RCTs, one updated systematic review with meta-analysis, and one narrative systematic review. Collectively, these sources synthesised evidence from over 150 randomised controlled trials involving in excess of 15,000 patients with low back pain, with the majority of included populations having chronic presentations. The combined evidence base spans from 1997 to 2016 and encompasses diverse geographic settings including Europe, North America, and Australia. Table 1 below summarises the characteristics of included studies.

Table 1: Characteristics of Included Studies

Study & Year	Study Design	Sample Size	Population	Intervention / Comparator	Key Outcome Measures
van Tulder et al. (1997)	Blinded review, 23 RCTs	N/A (review)	CLBP & acute LBP	Exercise therapy vs. manual therapy, NSAIDs, diathermy, no treatment	Pain (VAS), methodological quality score
Dutch Physiotherapy Guidelines (2003)	Evidence-based clinical guideline	Multiple RCTs	CLBP (>12 wks)	Exercise therapy, graded activity, behavioural treatment vs. usual GP care	Pain, function, disability, return to work
van Tulder et al. /	Cochrane SR & meta-	>3,500	Acute, subacute	Exercise therapy vs. usual care,	Pain, function, return-to-work

Cochrane (2000)	analysis, 39 RCTs		& CLBP adults	physiotherapy, manual therapy	(4-level evidence)
van Middelkoop et al. (2010)	SR & meta-analysis, 37 RCTs	n=3,957	Chronic nonspecific LBP adults	Exercise therapy vs. usual care, waiting list, spinal manipulation, behavioural therapy	Pain (WMD), disability (ODI)
Geisser et al. (RCT) (2005)	Single-blind RCT, 4-arm	n=58	CLBP >3 months (mean 76 months)	Manual therapy + specific exercise vs. sham MT, non-specific exercise	VAS, MPQ, ODI, fear-avoidance
Gomes-Neto et al. (2016)	SR & meta-analysis, 11 RCTs	N/A (review)	Chronic nonspecific LBP	Stabilisation exercises vs. general exercise vs. manual therapy	Pain (NRS), disability (ODI), function (PSFS)
Otoo, Hendrick & Ribeiro (2014)	SR, 4 RCTs	n=483	Chronic nonspecific LBP	Exercise therapy vs. advice/education	Pain (VAS), function, satisfaction
Menke (2014)	Comparative effectiveness meta-analysis, 56 studies	>8,400	Acute & chronic LBP	SMT vs. exercise vs. sham vs. usual care — multiple arms	Pain (standardised g), natural history, nonspecific effects
Hidalgo et al. (2014)	SR, 23 RCTs (low RoB)	N/A (review)	Acute-subacute & CLBP	MT1 (manipulation), MT2 (mobilisation), MT3 (combined) ± exercise vs. sham, usual care	Pain, function, ROM, return-to-work (1-yr)
Aure, Nilsen & Vasseljen (2003)	Multicenter RCT, 1-year	n=49	CLBP on sick	Manual therapy vs. general exercise therapy	VAS, ODI, COOP, Schober, return-to-work

	follow-up		leave 8-26 wks	(16 sessions / 8 weeks)	
Guzmán et al. / Cochrane (2001)	Cochrane SR, 10 RCTs	n=1,964	Disabling CLBP	Intensive multidisciplinary rehab (>100 hrs) vs. non-multidisciplinary / usual care	Function, pain, vocational outcomes

CLBP = Chronic Low Back Pain; SR = Systematic Review; RCT = Randomised Controlled Trial; MT = Manual Therapy; ODI = Oswestry Disability Index; VAS = Visual Analogue Scale; WMD = Weighted Mean Difference; SMT = Spinal Manipulative Therapy; RoB = Risk of Bias; PSFS = Patient-Specific Functional Scale

3.2 Thematic Analysis

3.2.1 Effectiveness of Exercise Therapy for Chronic Low Back Pain

The Cochrane review by van Tulder et al. (2000) provides the most methodologically rigorous foundational evidence on exercise therapy for CLBP, synthesising 39 RCTs through a four-tier evidence framework. Strong evidence confirmed that exercise therapy significantly outperforms standard general practitioner care across pain, functional disability, and return-to-work outcomes in CLBP patients. The clinical importance of this finding should not be understated: GP care in most systems defaults to advice, reassurance, and pharmacotherapy — a comparator that is both highly prevalent and frequently inadequate for chronic presentations. Notably, exercise therapy was found to be equally effective as conventional physiotherapy (comprising heat, massage, traction, mobilisation, and electrotherapy) for CLBP, suggesting that active rehabilitation delivers comparable outcomes to passive modality-centred approaches while offering the additional benefit of promoting patient self-efficacy and independence.

The meta-analysis by van Middelkoop et al. (2010) provides a more contemporary and statistically precise assessment, synthesising 37 RCTs involving 3,957 patients. Exercise therapy produced statistically significant short-term reductions in pain (Weighted Mean Difference [WMD] −9.23 on a 0-100 scale) and disability (WMD −12.35 on the ODI) compared to usual care. Disability improvements persisted at intermediate and long-term follow-up, representing a clinically meaningful finding for rehabilitation planning. However, the authors identified a critical limitation in the evidence base: exercise therapy demonstrated no statistically significant advantage over waiting list controls, back school, behavioural therapy, spinal manipulation, or psychotherapy. Furthermore, even the statistically significant differences observed were characterised by the authors as not meeting the threshold for clinical meaningfulness, raising important questions about the practical significance of these gains in a real-world therapeutic context.

The earlier blinded review by van Tulder et al. (1997) of 23 RCTs reached similarly cautious conclusions, finding that the majority of trials suffered from serious methodological shortcomings and that exercise therapy demonstrated no consistent superiority over other conservative treatments including manual therapy, NSAIDs, and short-wave diathermy. One important exception emerged from the highest-quality trial included (Deyo et al., methodological score 61/100): exercise therapy significantly outperformed no treatment for CLBP, though this benefit disappeared by the three-month follow-up point — a finding with substantial implications for treatment duration and maintenance protocols. The Dutch Physiotherapy Guidelines, grounded in an extensive evidence appraisal, reach a broadly consistent conclusion: strong evidence supports exercise therapy as a first-line physiotherapeutic intervention for CLBP, with patients demonstrating significantly better outcomes compared to standard GP care when exercise is delivered within a structured, supervised framework.

3.2.2 Effectiveness of Manual Therapy for Chronic Low Back Pain

Manual therapy for CLBP encompasses a heterogeneous group of clinical techniques, and the evidence for its effectiveness reflects this diversity. The systematic review by Hidalgo et al. (2014), examining 23 low-risk-of-bias RCTs, provides the most clinically differentiated assessment, categorising manual therapy into three distinct subtypes: high-velocity spinal manipulation (MT1), mobilisation and soft tissue techniques (MT2), and their combination (MT3). For CLBP, moderate-to-strong evidence demonstrated that MT1 produces clinically relevant improvements in pain and functional outcomes compared to sham manipulation. Critically, however, long-term benefits of MT1 for chronic presentations required maintenance treatment delivered at fortnightly intervals — an important practical consideration for programme design and cost-effectiveness analysis.

The Cochrane review by van Tulder et al. (2000) identified limited evidence suggesting that manual therapy may provide better short-term pain relief than exercise therapy alone in CLBP, representing one of the first systematic observations of a possible superiority of manual over exercise approaches in the short term. This finding was expanded significantly by the comparative effectiveness meta-analysis of Menke (2014), which synthesised 56 SMT studies comprising over 8,400 patients across 257 treatment arms. For CLBP, SMT demonstrated weak but positive evidential support over sham conditions, with physical therapist-delivered manipulation producing the largest effect sizes ($g = 2.48$) among provider types, though differences between providers were not statistically significant. Sham treatment itself outperformed waiting list controls for chronic pain ($g = 0.77$ versus $g = -0.13$), powerfully illustrating the role of therapeutic contact and patient expectation in CLBP outcomes.

The most direct RCT evidence comparing manual therapy to exercise therapy head-to-head was provided by Aure, Nilsen, and Vasseljen (2003) in a multicenter trial of 49 CLBP patients on sick leave. Both interventions were delivered at equivalent dose (16 sessions of 45 minutes over eight weeks), ensuring valid group comparison. While both groups demonstrated significant improvement from baseline, the manual therapy group showed statistically significantly greater improvements on all outcome measures — VAS pain, ODI disability, general health, and spinal range of motion (Schober test) — at every assessment point throughout the entire 12-month follow-up. Pain reduction was approximately twice as large in the manual therapy group (33mm versus 17mm VAS reduction), and the Oswestry disability improvement was similarly more pronounced (21% versus 9% reduction). The most clinically striking finding concerned vocational outcomes: 67% of manual therapy patients had returned to full-time work immediately post-treatment, compared to only 27% in the exercise group, with only 19% of manual therapy patients remaining on sick leave at 12-month follow-up versus 59% in the exercise group. These return-to-work differences carry profound socioeconomic implications and place the Aure et al. (2003) trial among the most influential direct comparisons in the CLBP literature.

3.2.3 Comparative Effectiveness: Stabilisation Exercise versus Manual Therapy

The meta-analysis by Gomes-Neto et al. (2016) introduces an important refinement to the exercise vs. manual therapy debate by distinguishing stabilisation exercises — which specifically target deep trunk musculature including the transversus abdominis, multifidus, diaphragm, and pelvic floor — from general exercise programmes. Stabilisation exercises demonstrated statistically significant advantages over general exercise in both pain reduction (WMD −1.03 on a 0-10 NRS, representing approximately 39% improvement) and disability (WMD −5.41 on the ODI). Crucially, the 39% pain improvement exceeded the minimally clinically important change threshold for CLBP, lending clinical as well as statistical significance to this finding.

When stabilisation exercises were directly compared to manual therapy across three included trials, however, no significant differences were found in either pain or disability outcomes. This equivalence finding has

important clinical and practical implications: stabilisation exercise and manual therapy appear to deliver comparable clinical benefit for CLBP, suggesting that the decision between these two approaches may appropriately hinge on patient preference, clinician skill set, resource availability, and specific clinical presentation rather than on evidence of categorical superiority. Functional outcomes assessed via the Patient-Specific Functional Scale also showed no significant differences between stabilisation and general exercise, suggesting that the advantage of stabilisation exercise over general programmes is primarily expressed through pain and structural disability rather than patient-perceived functional capacity.

3.2.4 Combination of Manual Therapy and Exercise: Additive Benefits

A critical theme emerging from this review is that the combination of manual therapy with targeted exercise consistently outperforms either intervention delivered in isolation, at least for pain outcomes in CLBP. Geisser et al.'s four-arm RCT directly examined whether manual therapy combined with dysfunction-specific adjuvant exercise was superior to sham manual therapy or non-specific exercise. The group receiving genuine manual therapy paired with specific exercise demonstrated statistically significant reductions in pain on both the VAS and McGill Pain Questionnaire — an outcome not replicated in any other treatment group, including those receiving manual therapy alone or specific exercise alone. This finding provides compelling evidence that the combination, rather than either component independently, drives the observed pain benefit.

The systematic review by Hidalgo et al. (2014) corroborates this conclusion at the population level: MT3 (manipulation plus mobilisation) combined with exercise or usual medical care showed moderate evidence of superiority over exercise alone and back school for CLBP across pain, function, and return-to-work at one-year follow-up. MT3 also significantly reduced pain recurrence and medication use at 12 months compared to back school and individual physiotherapy. A particularly informative sub-finding was that adding manipulation to extension exercises produced no additional benefit over extension exercises alone, suggesting that the additive value of manual therapy is contingent upon appropriate exercise selection — a consideration with direct clinical implications for protocol design.

Despite the pain benefits of combined treatment, Geisser et al. identified a critical dissociation: no significant improvements in perceived disability or functional status were observed in any treatment group, including the combined manual therapy and specific exercise group. This finding reinforces the principle — consistent across multiple studies in this review — that pain intensity and functional disability in CLBP are governed by partially independent mechanisms, and that physical interventions targeting pain through biomechanical pathways are insufficient to fully address the disability and participation restrictions that characterise chronic presentations.

3.2.5 The Role of Psychosocial Factors and Graded Activity

A consistent and clinically fundamental theme across included sources is the disproportionate contribution of psychosocial factors to CLBP-related disability. The Dutch Physiotherapy Guidelines explicitly identify fear-avoidance beliefs, passive coping strategies, and pain catastrophising as stronger predictors of long-term disability than any biomedical finding. This recognition has direct implications for the exercise-manual therapy debate: if disability is primarily driven by psychological rather than mechanical factors, the clinical goal of any physical intervention cannot be simply pain reduction or mobility restoration — it must encompass addressing the behavioural and cognitive contributors to functional limitation.

Graded activity, as described by the Dutch Guidelines and the Cochrane review by van Tulder et al. (2000), represents the exercise modality most explicitly designed to address these psychosocial drivers. Using an operant-conditioning framework, graded activity employs time-contingent activity progression — increasing exercise load according to a pre-planned schedule rather than in response to pain — to systematically challenge fear-avoidance behaviour and promote positive behavioural reinforcement. The Cochrane review

found that graded activity incorporating operant-conditioning principles led to significantly faster return to work in subacute and chronic patients compared to usual care. The comparative effectiveness meta-analysis by Menke (2014) similarly identified exercise combined with authoritative encouragement and monitored activity as broadly effective across pain types, reinforcing the importance of the therapeutic relationship and patient engagement as active ingredients of exercise-based rehabilitation.

3.2.6 Multidisciplinary Rehabilitation for Disabling Chronic Low Back Pain

For patients at the severe end of the CLBP spectrum — those with significant work disability, high psychosocial burden, and inadequate response to unimodal interventions — the Cochrane review by Guzmán et al. (2001) provides important evidence on the threshold of intervention intensity required for meaningful clinical benefit. Intensive multidisciplinary biopsychosocial rehabilitation programmes delivering more than 100 hours of structured therapy demonstrated strong evidence of superior functional improvement compared to non-multidisciplinary inpatient or outpatient treatments. Moderate evidence also supported these intensive programmes for pain reduction over usual care. In contrast, less intensive outpatient programmes providing fewer than 30 hours of therapy consistently failed to demonstrate meaningful improvements in pain, function, or vocational outcomes — a dose-response relationship with profound practical implications for resource allocation and programme design.

Table 2: Summary of Evidence — Key Comparative Findings

Comparison	Key Finding	Outcome Measures	Evidence Level	Source
Exercise therapy vs. GP usual care (CLBP)	Exercise significantly superior for pain, function, return-to-work	Pain, ODI, return-to-work	Strong	van Tulder et al. (2000)
Exercise therapy vs. conventional physiotherapy (CLBP)	No significant difference — equivalent effectiveness	Pain, function	Strong	van Tulder et al. (2000)
Exercise therapy vs. spinal manipulation (CLBP)	No statistically significant difference	Pain (WMD), ODI (WMD)	Moderate	van Middelkoop et al. (2010)
Manual therapy vs. exercise therapy — direct RCT (CLBP)	MT superior on all outcomes at all time points; 19% vs 59% sick leave at 1 yr	VAS, ODI, ROM, return-to-work	Strong (1 RCT)	Aure et al. (2003)
Stabilisation exercise vs. general exercise (CLBP)	Stabilisation superior: pain WMD −1.03; ODI WMD −5.41	NRS pain, ODI	Moderate	Gomes-Neto et al. (2016)

	(clinically significant)			
Stabilisation exercise vs. manual therapy (CLBP)	No significant difference — clinical equivalence	Pain, ODI	Moderate	Gomes-Neto et al. (2016)
MT + specific exercise vs. MT alone / exercise alone	Combined intervention produces superior pain reduction; disability unchanged in all groups	VAS, MPQ, ODI	Moderate (1 RCT)	Geisser et al.
MT3 (manipulation + mobilisation) + exercise vs. exercise alone (CLBP, 1-yr)	MT3 combination superior for pain, function, return-to-work; reduces recurrence	Pain, function, RTW	Moderate	Hidalgo et al. (2014)
Intensive multidisciplinary rehab (>100 hrs) vs. non-multidisciplinary (CLBP)	Strong evidence of superior functional improvement; moderate evidence for pain	Function, pain, vocation	Strong	Guzmán et al. (2001)
Graded activity (operant-conditioning) vs. usual care (subacute/CLBP)	Significantly faster return to work	Return-to-work, disability	Strong	van Tulder et al. (2000)

MT = Manual Therapy; ODI = Oswestry Disability Index; VAS = Visual Analogue Scale; WMD = Weighted Mean Difference; NRS = Numerical Rating Scale; RTW = Return to Work; MPQ = McGill Pain Questionnaire

4. Discussion

4.1 Interpretation of Principal Findings

The most clinically consequential finding of this review is that the exercise therapy versus manual therapy debate cannot be resolved by a single, universally applicable conclusion. Both interventions produce genuine therapeutic benefit for CLBP relative to no treatment or usual GP care. Both demonstrate clinical equivalence under certain conditions — most notably when stabilisation exercises are compared to manual therapy, or when exercise therapy is compared to conventional physiotherapy comprising multiple passive modalities. Yet in direct head-to-head comparison under equivalent treatment dose conditions, manual therapy delivered

with clinical specificity and segmental targeting produced markedly superior outcomes on all measured parameters — including the critically important vocational outcome of return to work — than a general exercise programme (Aure et al., 2003).

Reconciling these apparently conflicting observations requires attention to what is actually being compared. 'Exercise therapy' in the CLBP literature encompasses a broad continuum: from unsupervised home flexion exercises of minimal therapeutic intensity to intensively supervised stabilisation programmes targeting specific neuromuscular impairments, and from passive stretching to operant-conditioning graded activity rehabilitation. The evidence consistently suggests that treatment specificity — whether the exercise is precisely matched to the patient's functional impairment and psychosocial profile — is a more powerful determinant of outcome than the choice of exercise modality per se (Hidalgo et al., 2014; Gomes-Neto et al., 2016). This principle applies equally to manual therapy: MT3 (manipulation combined with mobilisation) outperforms either technique alone, and the addition of manual therapy to appropriately selected specific exercise amplifies pain outcomes beyond what either achieves independently (Geisser et al.; Hidalgo et al., 2014).

A critical insight from this review concerns the dissociation between pain and disability outcomes. Multiple studies across both intervention categories demonstrated that improvements in pain intensity frequently occur in the absence of meaningful improvement in functional disability and participation (Geisser et al.; van Middelkoop et al., 2010). This finding is not merely a statistical observation — it reflects a fundamental pathomechanical principle: in chronic pain presentations, the neurobiological drivers of perceived pain intensity and the psychosocial-behavioural drivers of functional limitation and avoidance operate through partially independent mechanisms. Interventions targeting the musculoskeletal system through mechanical or exercise-based pathways are inherently limited in their capacity to address the fear-avoidance beliefs, catastrophising cognitions, and maladaptive pain behaviours that maintain disability in CLBP. This explains why even the most effective physical interventions in this review — intensive manual therapy and stabilisation exercise — failed to produce disability improvements commensurate with their pain benefits.

4.2 Comparison with Existing Literature

The findings of this review are broadly consistent with contemporary evidence-based guidelines for CLBP management. The National Institute for Health and Care Excellence (NICE) guidelines for low back pain and sciatica (2016) recommend exercise as a first-line treatment, while acknowledging that manual therapy should be offered alongside exercise but not as a standalone treatment. European guidelines for CLBP similarly recommend supervised exercise therapy and spinal manipulation, with the recognition that no single modality is universally superior and that treatment choice should be informed by patient preference, clinical presentation, and practitioner expertise. These recommendations align well with the evidence synthesised in this review — particularly the finding that combination approaches outperform either intervention in isolation.

The comparative effectiveness meta-analysis by Menke (2014) introduces a provocative but important perspective: for both exercise therapy and manual therapy, the observed clinical benefits may be mediated substantially through nonspecific mechanisms — patient expectation, therapeutic alliance, regression to the mean, and natural history — rather than through treatment-specific biomechanical effects. The finding that sham treatment outperformed waiting list controls for chronic pain ($g = 0.77$ versus $g = -0.13$) quantifies the magnitude of the placebo and therapeutic contact effect in CLBP, and should give pause to confident claims about the specific efficacy of any physical intervention. This does not diminish the clinical value of exercise or manual therapy, but it does reframe the goal of treatment: rather than asking which intervention most effectively corrects the underlying biomechanical dysfunction, the more relevant clinical question may be which approach best facilitates patient engagement, self-efficacy, positive health beliefs, and sustained behaviour change.

The observation by van Middelkoop et al. (2010) that exercise therapy shows no statistically significant advantage over spinal manipulation for CLBP is particularly noteworthy given the broader context of this review. If exercise therapy is equivalent to manipulation in pain and disability outcomes, and manipulation is equivalent to stabilisation exercise (Gomes-Neto et al., 2016), these findings collectively suggest that the active ingredients of effective CLBP rehabilitation may transcend the specific physical technique being applied and may instead reside in the quality of the therapeutic interaction, the structure of the rehabilitation programme, the patient's engagement with active self-management, and the degree to which the intervention addresses psychosocial contributors to disability.

4.3 Clinical Implications

The clinical implications of this review are significant and multifaceted. For physiotherapists managing CLBP in primary and secondary care settings, several evidence-based principles emerge. First, the clinical assessment of each CLBP patient should incorporate systematic evaluation of psychosocial factors — fear-avoidance beliefs, catastrophising, depression, and passive coping strategies — alongside physical examination, as these variables are the strongest predictors of long-term disability and will substantially moderate the response to any physical intervention. Patients with high psychosocial burden should receive psychologically informed physiotherapy incorporating behavioural and cognitive strategies, regardless of whether the primary physical modality is exercise or manual therapy.

Second, the evidence supports a treatment sequencing approach for CLBP in which manual therapy — particularly spinal manipulation or mobilisation combined with targeted mobilisation techniques — is used in the early phase to achieve rapid, clinically meaningful pain reduction and improve segmental mobility, thereby enabling more effective engagement with subsequent active exercise rehabilitation. The superior short-term pain outcomes demonstrated by manual therapy (Aure et al., 2003; van Tulder et al., 2000) suggest that it may serve as an effective adjunct that 'primes' the patient for exercise engagement by reducing the pain barrier to movement. This sequenced approach is consistent with the MT3 protocol described by Hidalgo et al. (2014), which produced the most favourable long-term outcomes in the included studies.

Third, exercise programmes for CLBP should be structured, progressive, and supervised — with stabilisation exercise targeting specific neuromuscular impairments preferred over non-specific general conditioning for most chronic presentations. The evidence from Gomes-Neto et al. (2016) demonstrates that the superiority of stabilisation exercise over general exercise is clinically significant, exceeding the minimally important change threshold. However, not all patients will respond optimally to stabilisation programmes, and identification of appropriate patient subgroups — including those with movement control impairment, structural instability, or predominant motor control deficits — remains an essential clinical skill.

Fourth, treatment intensity matters. The dose-response relationship identified by Guzmán et al. (2001) — in which less intensive programmes (<30 hours) failed to produce meaningful benefit while intensive programmes (>100 hours) demonstrated strong evidence of functional improvement — should inform resource allocation decisions and programme design. While intensive multidisciplinary rehabilitation is not indicated or accessible for all CLBP patients, the principle that treatment dose must be sufficient to produce clinically meaningful neuroplastic and behavioural change applies across rehabilitation contexts. Inadequately dosed exercise programmes, in particular, may generate false negative conclusions about the effectiveness of exercise therapy.

5. Limitations

This systematic review is subject to several limitations that should be considered when interpreting its findings. First, the substantial heterogeneity across included studies in terms of exercise type, manual therapy technique, treatment dose, session frequency, follow-up duration, and outcome measurement tools limits the comparability of findings and prevents formal meta-analytic pooling of effect estimates. The exercise therapy literature, in particular, encompasses a spectrum of programmes ranging from single-session home exercise instructions to twelve-week intensive supervised stabilisation protocols — a variation in therapeutic content so broad as to render the label 'exercise therapy' almost clinically meaningless without further specification.

Second, blinding of participants and therapists in exercise and manual therapy trials is inherently constrained, as the physical and interpersonal nature of these interventions precludes the conventional double-blind design achievable in pharmacological research. This limitation inflates the risk of performance and detection bias across almost all included trials, and may either exaggerate or attenuate treatment effects depending on the direction of the therapeutic expectation. The Menke (2014) meta-analysis explicitly quantified the magnitude of nonspecific treatment effects in CLBP, and the finding that sham conditions outperform waiting list controls suggests that nonspecific effects constitute a substantial and non-trivial proportion of the observed benefit from both exercise and manual therapy.

Third, the majority of included trials enrolled relatively homogeneous chronic low back pain populations and reported aggregate group-level outcomes. This approach obscures the treatment response variability that is clinically ubiquitous in CLBP — a heterogeneous condition with multiple distinct pathophysiological, psychosocial, and neurobiological subtypes. Without systematic subgroup analyses stratified by pain mechanism, psychological profile, prior treatment history, and comorbidity burden, it is impossible to determine from current evidence which specific patient characteristics predict differential response to exercise versus manual therapy. This represents perhaps the most clinically important unresolved question in the CLBP rehabilitation literature.

Fourth, the majority of included studies assessed short-term and intermediate follow-up outcomes (three to twelve months), with limited evidence on long-term outcomes beyond one year. Given the chronic and frequently recurrent nature of CLBP, treatment approaches that produce early clinical gains without addressing the underlying risk factors for relapse may generate misleadingly optimistic effect estimates. The finding that exercise therapy benefits disappear by three-month follow-up in several studies (van Tulder et al., 1997) highlights the critical importance of maintenance and self-management strategies in long-term outcome sustainability.

Fifth, this review synthesises evidence primarily from published peer-reviewed sources, which introduces the risk of publication bias toward positive findings. Manual therapy trials, in particular, have been noted to have a higher proportion of positive results relative to the proportion of null findings that might be expected from the overall quality of the evidence base. While this limitation cannot be fully corrected in the absence of a formal funnel plot analysis, the inclusion of methodologically rigorous Cochrane reviews and large meta-analyses — which employ systematic bias assessment procedures — mitigates this concern to some degree.

6. Future Scope

The most urgent research priority in the exercise versus manual therapy debate for CLBP is the systematic development and validation of clinically actionable patient subgroup classification systems. Current evidence strongly suggests that neither exercise therapy nor manual therapy is universally superior, and that differential treatment response is moderated by patient characteristics that are inadequately captured by aggregate population-level analyses. Future research should prioritise pragmatic RCTs employing pre-specified subgroup analyses that identify which patient profiles — defined by pain mechanism, movement impairment

pattern, psychosocial risk profile, and prior treatment trajectory — respond most favourably to specific exercise modalities, specific manual therapy techniques, or their combination. The Treatment-Based Classification system and the STarT Back screening tool represent promising frameworks for this endeavour, but require further validation in RCTs powered to detect subgroup-level treatment interactions.

There is a compelling need for high-quality RCTs examining the long-term effectiveness (two years or more) of exercise therapy and manual therapy for CLBP, particularly with respect to disability, recurrence rates, medication use, and healthcare utilisation. The current evidence base is dominated by short-term follow-up data, and the finding that some exercise therapy benefits disappear by three months (van Tulder et al., 1997) raises important questions about treatment durability that are unresolvable with existing data. Trials should incorporate active maintenance components — including self-management education, graded home exercise progression, and periodic booster sessions — and examine the conditions under which post-treatment gains are sustained versus eroded over time.

The mechanisms through which exercise therapy and manual therapy exert their clinical effects in CLBP remain incompletely understood, and mechanistic research represents an important complement to clinical effectiveness trials. Neuroimaging studies examining central sensitisation and cortical reorganisation, biomarker analyses assessing inflammatory and nociceptive pathway activity, and neurophysiological assessments of pain modulation could substantially advance understanding of why some patients respond to one intervention but not the other. This mechanistic knowledge would not only refine treatment selection but could also identify biological predictors of treatment response that might ultimately guide personalised rehabilitation prescriptions.

The comparative cost-effectiveness of exercise therapy and manual therapy for CLBP has been inadequately studied and warrants dedicated investigation. Given the substantial economic burden of CLBP and the increasing pressure on healthcare systems to demonstrate value for money, future research should incorporate comprehensive health economic analyses alongside clinical outcome assessment. The substantially superior return-to-work outcomes demonstrated by manual therapy in the Aure et al. (2003) trial suggest that higher short-term treatment costs associated with clinician-delivered manual therapy may be offset by reduced long-term productivity losses — a hypothesis that requires rigorous health economic modelling across different healthcare system contexts.

Finally, the integration of technology-enabled rehabilitation tools — including app-based exercise monitoring, wearable sensors for movement analysis, and telehealth platforms for remote supervised physiotherapy — presents exciting opportunities to enhance the dosing, adherence, and personalisation of exercise programmes for CLBP. Future research should examine whether technology-augmented exercise therapy can close the effectiveness gap observed between supervised and unsupervised exercise programmes, and whether digital delivery models can democratise access to evidence-based rehabilitation for the large proportion of CLBP patients who currently receive inadequate treatment.

7. Conclusion

This systematic review synthesises evidence from eleven high-quality published sources to evaluate the comparative effectiveness of exercise therapy and manual therapy in the management of chronic low back pain. The evidence collectively demonstrates that both interventions confer genuine clinical benefit over no treatment or standard general practitioner care, but that neither approach consistently dominates the other across all patient populations, outcome domains, and time horizons.

Manual therapy — particularly spinal manipulation delivered by a skilled clinician — produces superior short-term pain reduction and substantially better return-to-work outcomes in direct comparative trials with general exercise therapy. In the most methodologically robust head-to-head RCT identified, manual therapy produced pain reductions approximately twice as large as general exercise, and the proportion of patients remaining on sick leave at one year was more than three times higher in the exercise group than in the manual therapy

group. These findings carry significant clinical and socioeconomic implications, particularly for work-disabled CLBP patients where vocational outcomes are a primary rehabilitation goal.

Exercise therapy, however, demonstrates equivalent effectiveness to manual therapy when the comparison involves stabilisation exercise rather than general conditioning programmes. The clinical equivalence of stabilisation exercise and manual therapy, combined with the well-established long-term benefits of exercise for self-efficacy, physical conditioning, and disability prevention, strongly supports the role of targeted active rehabilitation in CLBP management. The evidence consistently indicates that treatment specificity — matching the exercise protocol to the patient's specific neuromuscular impairment and functional goals — is at least as important as the choice of modality.

The most compelling evidence in this review supports a multimodal approach in which manual therapy and specific targeted exercise are delivered in combination, within a biopsychosocial framework that explicitly addresses psychosocial contributors to disability through behavioural and educational strategies. Combined manual therapy and specific exercise produced the greatest pain reductions in direct comparative trials, and combination protocols including MT3 (manipulation plus mobilisation) with exercise demonstrated the best long-term outcomes for pain, function, and return to work. The therapeutic alliance, patient expectations, and the encouragement of active self-management also emerge as important non-specific treatment components that amplify the benefit of both exercise and manual therapy across patient populations.

For severely disabled CLBP patients where unimodal interventions have proven insufficient, intensive multidisciplinary biopsychosocial rehabilitation programmes delivering more than 100 hours of structured therapy remain the most evidence-supported option, demonstrating strong evidence of functional improvement. The principle that treatment intensity must be commensurate with the complexity and severity of the clinical presentation is one of the most clinically important and frequently violated principles in CLBP rehabilitation practice.

In conclusion, clinicians managing CLBP should resist the temptation to advocate for a single universally preferred modality and should instead develop the assessment skills to identify each patient's dominant pain mechanisms, disability drivers, and psychosocial risk factors — and to prescribe appropriately specific combinations of exercise and manual therapy tailored to that individual profile. Future research should prioritise subgroup-level effectiveness analyses, long-term outcome data, and health economic assessments to build the evidence base required for truly personalised CLBP rehabilitation.

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