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Effect of Motivational Interviewing and Exercise on Chronic Low Back Pain: A Systematic Review and Meta-Analysis

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ABSTRACT

Background: The prevalence of chronic low back pain (CLBP) and its concomitant cost implications have continued to rise across the globe. Currently, there is no effective treatment for CLBP that leads to long-term improvement. Hence, there is growing recognition of the need for behaviour techniques including motivational interviewing (MI) to address CLBP.

Objective: To determine the effect of MI and exercise on pain in individuals with CLBP.

Method: We searched for trials in seven databases from inception to April 2024. Trials were included if MI was used alone or in addition to an exercise programme for improving CLBP in adults aged (≥ 18 years).

Results: From 3062 records retrieved, we included three randomized controlled trials (RCTs). Only one study was rated as having a low risk of bias. There is no evidence to support the benefit of MI and exercise on improving pain (SMD-0.23, 95% CI-0.55 to 0.09, $I^2 = 0\%$, $p = 0.16$), disability (MD-1.80, 95% CI-4.55 to 0.94, $I^2 = 85\%$, $p = 0.20$) and physical functioning (SMD 0.00, 95% CI-1.31 to 1.32, $I^2 = 93\%$, $p = 0.99$).

Conclusion: There is insufficient evidence to support the effect of MI and exercise on pain in individuals with CLBP. More large-scale RCTs are needed in evaluating the effectiveness of MI and exercise in individuals with CLBP.

1 | Introduction

Chronic low back pain (CLBP) is one of the most prevalent musculoskeletal conditions in both developing and developed countries (Hoy et al. 2014). The lifetime prevalence of CLBP in developed countries ranges from 30% to 80% and is associated with increase in age (Hoy et al. 2010; Todd et al. 2019). The prevalence of CLBP is also rising in developing countries, with 47% of adults reported as having CLBP throughout their lifetime (Morris et al. 2018). In 2020, about 619 million individuals (10% of the global population) worldwide were affected by CLBP and as a result of the increase in population expansion and ageing worldwide, projections suggest that by 2050, about 843 million individuals will be affected (Ferreira et al. 2023). CLBP stands as the primary cause of activity limitations, decreased productivity and absenteeism from work, leading to substantial medical burdens and economic costs (Hartvigsen et al. 2018). The combined direct medical and indirect costs of CLBP exceed US$50 billion

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annually, potentially reaching as high as US $100 billion in extreme cases (Hoy et al. 2014). Recent evidence shows that the estimated average annual direct costs per population for CLBP ranged between US$ 3.4 billion and US$ 3.6 billion (Fatoye et al. 2023).

Several approaches have been used to manage CLBP, including physical therapy, exercise, pharmacological, behavioural, complementary, surgical, and psychological interventions (Chou et al. 2017; Foster et al. 2018; Hayden et al. 2021; Vitoula et al. 2018). A recent systematic review showed that compared to the control group, there is moderate-certainty evidence that exercise treatment reduces the pain intensity in CLBP (Hayden et al. 2021). However, exercise did not lead to a clinically important difference in pain level after six-month follow-up. Behavioural interventions have continued to gain attention as an option for managing CLBP due to the assumption that the underlying causes of pain and disability are not only influenced by changes in the somatic structures but also psychological and social factors (Alhowimel et al. 2018; Martinez-Calderon et al. 2020). Behavioural interventions have demonstrated effectiveness in the short-term management of CLBP as compared to usual care (Ho et al. 2022). A systematic review by Richmond et al. (2015) found that compared to waiting list or usual care, cognitive behavioural interventions showed a small and significant reduction in pain and disability. This suggests that employing behavioural strategies can offer tangible benefits in addressing the challenges associated with CLBP. Emerging evidence shows that there is a growing recognition of the need for a more comprehensive, patient-centred and behavioural-changing approach (Hilton 2023). However, there is limited evidence of the effect of behavioural interventions including motivational interviewing (MI) on CLBP.

Motivational interviewing (MI) is a client-centred approach used for strengthening intrinsic motivation for change (Miller and Rollnick 2013). It is conceptualised as a guiding style of counselling where the counsellor listens carefully, reflects, and offers expert opinions at the appropriate time (Miller and Rollnick 2002; Miller and Rose 2015). MI helps resolve ambivalence about behaviour through a non-judgemental and supportive environment (Miller and Rose 2015). There are four underlying spirits of MI: partnership, acceptance, compassion, and evocation (Miller and Rollnick 2013). These describe the core set of attitudes a counsellor must possess to effectively engage and enhance behavioural self-efficacy.

Evidence has supported MI for promoting health behaviours including physical activity (Akinrolie et al. 2024; O'Halloran et al. 2014), weight loss (Barnes and Ivezaj 2015), eating disorder (Macdonald et al. 2012), and smoking cessation (Lindson et al. 2019). MI may be useful in increasing motivation for exercise, thereby promoting adherence to prescribed exercises in individuals with CLBP (Arkkukangas et al. 2018). However, evidence is lacking regarding the effect of MI and exercise in reducing pain in individuals with CLBP. MI could play a significant role in enhancing the management and treatment outcomes for individuals with CLBP. To our knowledge, there is no systematic review of the effect of MI and exercise in individuals with CLBP. Therefore, the aim of the systematic review is to synthesise evidence on the effect of MI and exercise on pain among individuals with CLBP.

2 | Methods

This review was conducted following the guidelines of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al. 2023), and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guideline (Page et al. 2021). A review protocol was developed and registered with the International prospective register for systematic reviews (PROSPERO) (Registration ID: CRD42023444806).

2.1 | Study Criteria and Selection

Our inclusion criteria included parallel or crossover randomized controlled trials (RCTs) that examined the effect of MI only or in addition to exercises for managing CLBP. Trials with adults aged ≥ 18 years with CLBP were included. The comparator was either exercise, education, or usual care. Our primary outcome was pain, and secondary outcomes included physical function and disability. We excluded conference abstracts, letters, commentary, and trials not published in English.

2.2 | Search Strategy

The following electronic databases were searched to identify relevant studies: Cochrane Central (Ovid), MEDLINE (Ovid), CINAHL (EBSCOhost), PsycINFO (Ovid), Web of Science Core Collection (Clarivate), Scopus (Elsevier), and PEDro from inception to 17 April, 2024. The search strategy was conducted by review author NA, a librarian experienced in systematic reviews. The search strategy employed controlled vocabulary and free-text terms related to motivational interviewing, low back pain, and randomized controlled trials, adapted as appropriate to the syntax of each specific database. See Supporting Information S1: Appendix I for the MEDLINE search strategy. The reference lists of all included studies were hand searched for other eligible studies.

2.3 | Study Selection and Data Extraction

Citations were imported to the Covidence to screen for eligible studies. Review authors UA, OA HF and FK screened the titles and abstracts for eligible studies. Conflicts were resolved in consultation with either the review authors OA or HF. For the full text screening, we piloted the screening to minimise conflicts among the reviewers. Full-text screening was done in duplicate. The review authors met to discuss and resolve conflicts through consultation with the OA. Two review authors (UA and HF) extracted the following information independently from all included studies using a pre-piloted data extraction form: name of author, year of publication, design, sample size, number of participants in the intervention and control group, participant characteristics, duration of CLBP, primary and

secondary outcomes, intervention, and comparator description (types, dosage, and frequency) and interviewer's details. Discrepancies were resolved through consultation with the OA.

2.4 | Risk of Bias and Grading of Evidence

Two reviewers (UA and HF) independently assessed the risk of bias of the included trials. We used the Cochrane Collaboration's tool for assessing the risk of bias for parallel (Sterne et al. 2019). It assesses the following biases: sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, and selective reporting bias. Each risk of bias was rated as 'high', 'low' and 'unclear'. In cases where the two reviewers were unable to reach a consensus after discussion, a third reviewer OA was consulted. The two reviewers independently conducted a pilot test of the risk of bias assessment to familiarise themselves with the tool and ensure consistency.

The quality of evidence was rated using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) (Guyatt et al. 2008). Evidence was rated as 'high', 'moderate', 'low' and 'very low' using five factors: study design, inconsistency of results, indirectness of evidence, imprecision and publication bias.

2.5 | Statistical Analysis

We performed a meta-analysis using Review Manager (RevMan version 5.4.1 Cochrane). We took a critical look at the interventions, sample size and level of heterogeneity, and determined that meta-analysis was feasible. Theoretically, we need at least two studies to perform meta-analysis (Myung 2023). Standard mean difference (SMD) with 95% confidence interval (95% CI) was used to summarise the effect estimates for pain and physical function. This was because all the studies used different outcome measures (Deeks, Higgins, and Altman 2023). For disability, all the studies used the Roland-Morris Disability Questionnaire; hence, mean difference (MD) was used to summarise the effect estimates. The random effect model was used based on the assumption that the effect estimates of the different studies varied and distributed around an average of the effects (Higgins and Green 2011). Statistical heterogeneity was quantified using the I^2 statistic, which is the estimation of the variability in the effect estimates of the different studies (Deeks, Higgins, and Altman 2023). Publication bias could not be performed due to the small number of included studies.

3 | Results

3.1 | Characteristics of Studies

From the 3062 citations retrieved, we included three trials (Kasimis et al. 2024; Shimo et al. 2021; Vong et al. 2011) with a total of 175 participants. PRISMA flow diagram details the excluded studies and reasons for exclusion (see Figure 1). The trials were conducted in Japan, China, and Greece between 2021 and 2024. The mean age of the participants enrolled in the trials ranged from 41 to 47 years. All the trials included participants with CLBP with symptoms lasting at least 12 weeks. The trials combined MI with either exercises, manual therapy, or conventional physiotherapy treatment. In the study by Kasimis et al. (2024), in addition to MI, the intervention group received spinal mobilisation and exercise. Similarly, the intervention group received home exercise in addition to MI in the study by Shimo et al. (2021). Lastly, the trial by Vong et al. (2011) utilised motivational enhancement therapy (MET), an adaptation of MI techniques. In addition to the MET, the intervention group received a back exercise programme and interferential therapy. The components of exercises in the trials included core stability, stretching, and proprioception neuromuscular facilitation. The number of MI sessions ranged from 4 to 12, with participants receiving at least one session of MI per week. Typically, a session lasted between 15 and 30 min. In all the trials, MI was delivered face-to-face and sessions were delivered by both physical therapists and occupational health nurses (Shimo et al. 2021) and only physical therapists (Kasimis et al. 2024; Vong et al. 2011). Table 1 provides detailed information on the study interventions and control.

3.2 | Risk of Bias

The risk of bias for each study is presented in Figure 2. Only Vong et al. (2011) was rated as having a 'low risk of bias' for the overall risk of bias. Kasimis et al. (2024) was judged as having 'high risk of bias' due to lack of blinding of the participants and personnel, while Shimo et al. (2021) was rated as 'unclear risk of bias' due to the possibility of not blinding the participants, personnel and assessors.

3.3 | Meta-Analysis of Intervention Effects

Compared to the control group, MI combined with exercises showed a non-significant reduction in the intensity of pain among individuals with CLBP (SMD −0.23, 95% CI −0.55 to 0.09, $I^2 = 0\%$, $p = 0.16$) with a low level of evidence (Figure 3). The quality of evidence was downgraded due to the risk of bias and indirectness. The effect of the intervention compared to the control group showed very low evidence of a non-significant reduction in the level of disability (MD −1.80, 95% CI −4.55 to 0.94, $I^2 = 85\%$, $p = 0.20$) (see Figure 4). For physical function, there was no difference between the intervention and control groups with high heterogeneity (SMD 0.00, 95% CI −1.31 to 1.32, $I^2 = 93\%$, $p = 0.99$) (Figure 5).

4 | Discussion

The aim of this systematic review was to investigate the effect of MI and exercise on pain among individuals with CLBP. Our a priori inclusion criteria were to include studies using MI or MI in conjunction with exercise. We did not find any studies that used MI as a standalone intervention for the management of CLBP. This is not surprising because there is evidence to support the great benefit associated with exercise in CLBP (Hayden

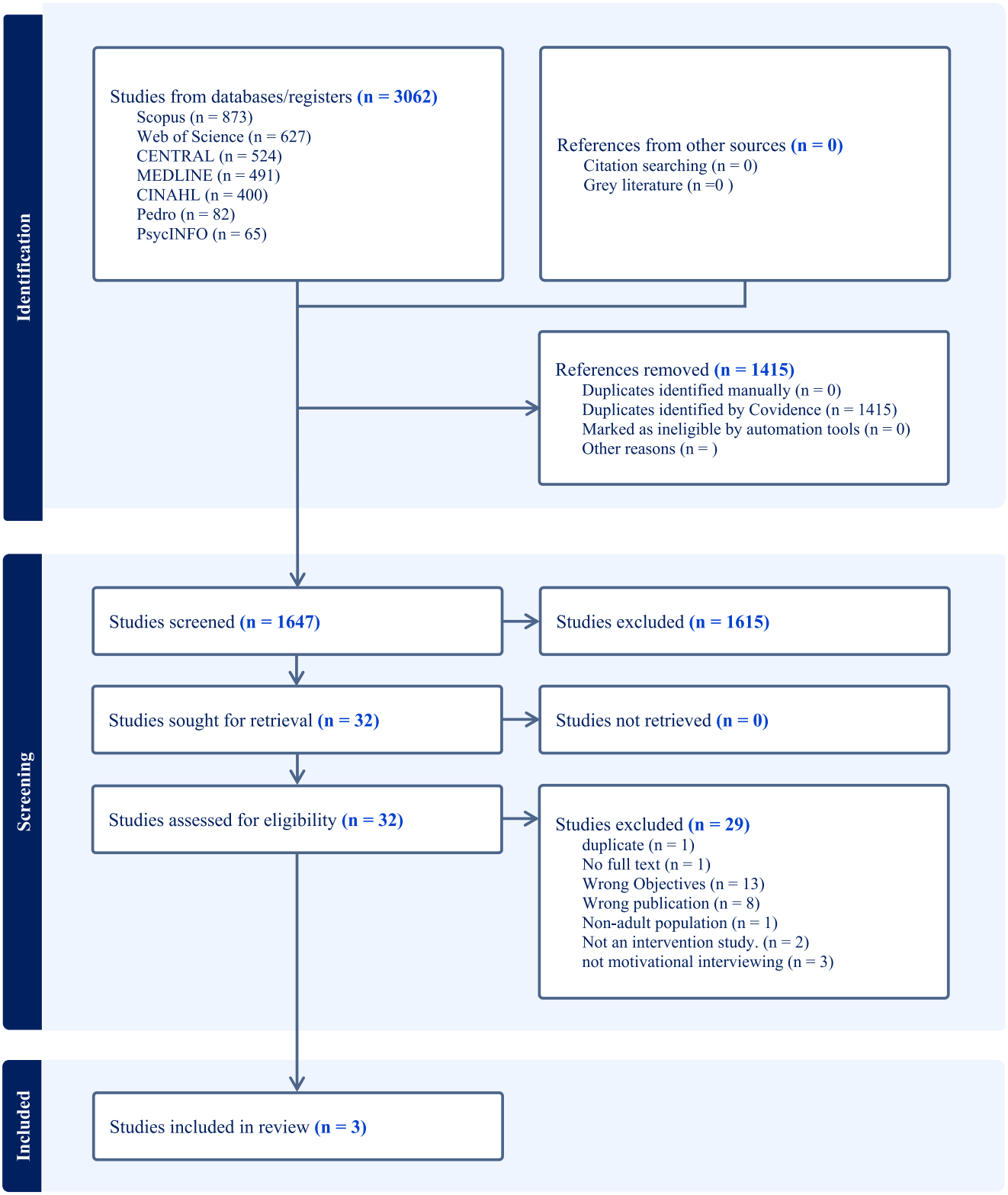

FIGURE 1 | PRISMA flow.

et al. 2021). It is assumed that MI will be used as an additive intervention to general exercise therapy. The primary finding was that MI in addition to exercise showed no significant reduction in pain intensity. Similarly, for the secondary outcomes, the effect of the intervention on disability did not lead to a significant improvement in disability. While for physical function, compared to the control group, the effect of MI and exercise was not different from the intervention group.

There is strong evidence to support the benefit of exercise therapy for both acute low back pain and CLBP (Hayden et al. 2021; Searle et al. 2015). While there is also evidence to support that MI was

TABLE 1 | Characteristics of included studies.

Authors (Year)	Study design	Country/ Setting	Sample size	Age mean (SD)	Intervention description	Control description
Kasimis et al. (2024)	Randomized clinical trial study	Greece/Physiotherapy outpatient setting	$N = 60$ IG1 = 20 IG2 = 20 CG2 = 20	IG1 = 46.60 (8.89) IG2 = 45.50 (9.58) CG = 45.90 (9.38)	Combined therapy group (IG1): Participants received manual therapy with enhanced pain neuroscience education (PNE) with integrated MI sessions. The PNE with integrated MI sessions consisted of four personalised 30 min sessions, conducted over 4 weeks after the manual therapy sessions. Manual therapy group (IG2): Participants received manual therapy involving spinal mobilisation, soft tissue mobilisation, supervised exercises and neural mobilisation for 30 min, 10 times over 4 weeks.	Participants were given written instructions for carrying out general exercises at home which include stretching exercises, positioning and simple breathing exercises.
Shimo et al. (2021)	Pilot randomized control trial	Japan/Workplace setting	$N = 39$ Dropout = 2 IG = 20 CG = 19	IG = 47.8 (12.8) CG = 41.4 (11.9)	Participants received a workplace counselling programme which incorporated MI techniques. The counselling programme was led by a physical therapist and two occupational health nurses who provided a 15-min face-to-face individual counselling session during working hours once a week for 12 weeks. Home-exercise programs to be performed in a single 60 min session. These include 7 floor stretches, 4 standing stretches to be held for 20 s, 3 core stability exercises of 10 reps each and 10 min of walking at moderate speed to be performed for least 5 days/week.	Home-exercise programs to be performed in a single 60 min session. These include 7 floor stretches, 4 standing stretches to be held for 20 s, 3 core stability exercises of 10 reps each and 10 min of walking at moderate speed to be performed for least 5 days/week

(Continues)

TABLE 1 | (Continued)

Authors (Year)	Study design	Country/ Setting	Sample size	Age mean (SD)	Intervention description	Control description
Vong et al. (2011)	Randomized control trial	China/Physiotherapy outpatient department	$N = 76$; IG = 38, CG = 38;	IG = 44.6 (11.2) CG = 45.1 (10.7)	Motivational enhancement therapy (MET): Subject received MET from their physical therapists who were trained by a clinical psychologist. The physical therapists integrated MI skills and several psychosocial components designed to ensure the motivations of subjects to engage in treatment and make appropriate behavioural changes. Conventional physiotherapy (PT): All subject received 10 30-min PT sessions in 8 weeks which included 15 min of interferential therapy and a tailored-made back exercise programme.	Conventional physiotherapy (PT): All subject received 10 30-min PT sessions in 8 weeks which included 15 min of interferential therapy and a tailored-made back exercise programme.

Abbreviations: CG, control group; IG, intervention group.

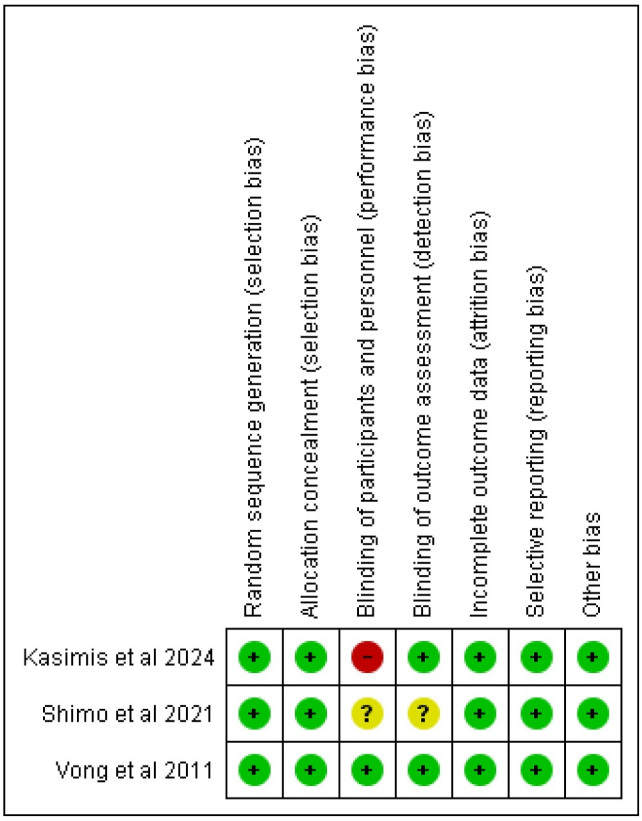

FIGURE 2 | Risk of bias.

effective among individuals with chronic pain (Alperstein and Sharpe 2016), it is reasonable to assume that a combination of MI and exercise will result in significant benefit among individuals with CLBP. Surprisingly, this systematic review found a contrary result with regard to the effect of MI and exercise on pain intensity, disability and physical function. Although the intervention led to a reduction in pain intensity, it did not reach a statistically significant level. One possible reason for this finding could be the small number of studies included in this review. Interestingly, other behavioural interventions such as cognitive behavioural therapy (CBT), mindfulness and operant therapy have been shown to be effective in improving pain among individuals with CLBP (Cherkin et al. 2016; Richmond et al. 2015). For example, a systematic review by Richmond et al. (2015) including 23 studies showed that compared to the control group, CBT leads to a reduction of pain and disability in individuals with non-specific CLBP. Although comparing the effect of MI and other behavioural interventions on CLBP may be difficult because of the different guiding principles, underlying theories, and mechanisms of action.

It is not surprising that MI and exercise did not lead to a significant reduction in disability among individuals with CLBP. Studies have shown that CLBP may lead to significant disability and interfere with the activities of daily living (Shafshak and Elnemr 2021; Sirbu et al. 2023). Although disability has been reported to be a predictor of pain in individuals with CLBP (Sirbu et al. 2023), nonetheless, the relationship has been shown to be non-linear (Shafshak and Elnemr 2021). For example,

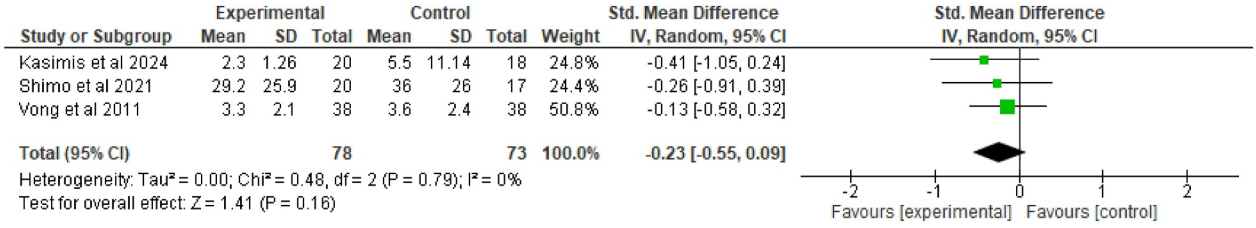

FIGURE 3 | Effect on pain.

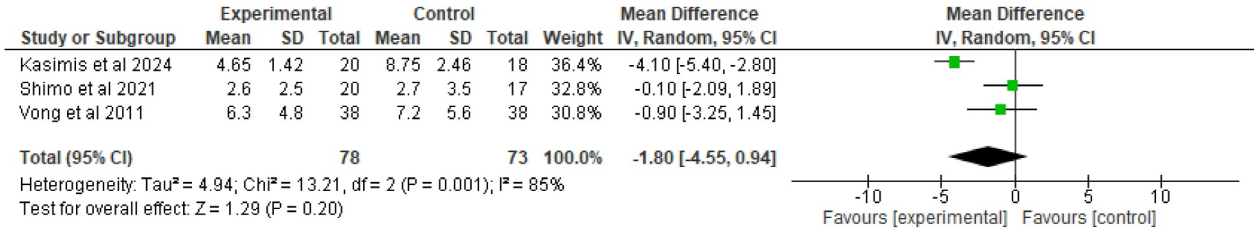

FIGURE 4 | Effect on disability.

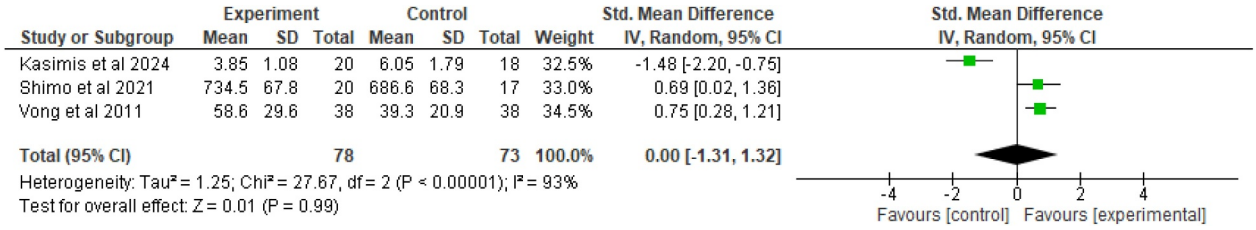

FIGURE 5 | Effect on physical function.

studies have shown that individuals with a pain rating of ≥ 5 usually present with more disability than those that report lower pain (Jensen et al. 2001; Shafshak and Elnemr 2021). Therefore, interventions that modulate pain may have an indirect or direct influence on disability, especially in musculoskeletal conditions. Similarly, compared with the control group, the effect of MI and exercise on physical function was not different from that of the intervention group. Physical function has been shown to be a strong predictor of future disability (Chatterji et al. 2015). Since these two variables—physical function and disability—are closely linked, this may also explain the lack of effect of MI and exercise on physical function.

Despite the results showing no significant improvement in pain, level of disability, and physical function, it is important to interpret the robustness of the findings within the context of the limitations of the meta-analysis. The major limitation of this review was the small number of studies included in the meta-analysis and the consequent lack of statistical power. Hence, the results of the effect of MI and exercise on pain in individuals with CLBP should not be concluded as 'evidence of no effect' but rather 'no evidence of effect' because the three clinical trials included in the analysis do not have sufficient power to detect treatment effects. Therefore, additional studies investigating the effect of MI and exercise on CLBP outcomes (pain, disability, and physical function) are needed for a conclusive estimate of the effects.

In conclusion, the effect of MI and exercise on individuals with CLBP demonstrated no significant improvement in pain intensity, disability, or physical function. There is low evidence to support the effect of MI and exercise on pain in individuals with CLBP. The findings of this review may be counter-intuitive because both interventions—MI and exercise—have been shown to be beneficial in individuals with chronic pain and CLBP respectively (Alperstein and Sharpe 2016; Hayden et al. 2021). One would expect that MI will complement exercise to provide maximum benefits in individuals with CLBP. However, caution must be taken before conclusive evidence can be drawn. This systematic review reveals a huge gap in the utilization of both MI and exercise in individuals with CLBP. Finally, we recommend that more high-quality trials be conducted and the need for counsellors delivering MI to have an adequate level of competence.

Author Contributions

O.A. conceptualised, designed the review, and conducted a meta-analysis. H.F. and U.A. were involved in refining the research questions, drafting the protocol, screening, and data extraction. F.K., S.I., O. G.A., and B.E. were involved in screening. N.S. conducted the literature search. Q.A., U.A., H.F., E.A., F.K., and O.I. were involved in drafting and reviewing the manuscript. All review authors approved the final version.

Ethics Statement

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The authors have nothing to report.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.