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Title: Effects of Kinesio Taping Added to Rehabilitation in Knee Osteoarthritis: A Systematic Review and Meta-analysis of Randomized Controlled Trials

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Abstract

Background: Knee osteoarthritis (KOA) is a prevalent musculoskeletal disorder and a major cause of pain and disability. Although rehabilitation is central to conservative management, Kinesio Taping (KT) has emerged as a potential adjunct. This study synthesized evidence on the effectiveness of KT combined with rehabilitation for pain, functional status, ROM, mobility, and knee-related function in individuals with KOA.

Methods: This systematic review and meta-analysis included randomized controlled trials (RCTs) and was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations. The review protocol was prospectively registered with PROSPERO (CRD420261397071). A comprehensive literature search was conducted in PubMed, Scopus, and Web of Science, covering all records available from database inception through June 2026. Statistical heterogeneity among the included studies was quantified using the I^2 statistic. Potential publication bias was examined through funnel plot inspection and Egger's regression test. The methodological rigor of the included trials was appraised using the Physiotherapy Evidence Database (PEDro) scale. The overall certainty of the available evidence was subsequently rated according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework.

Results: Out of 2876 papers, 33 RCTs involving 1,402 participants were included. KT combined with rehabilitation programs demonstrated significant improvements in pain (Hedges' g = -1.023, 95% CI: −1.281 to −0.765), functional status (Hedges' g = -0.864, 95% CI: −1.124 to −0.604), ROM (Hedges' g = -0.857, 95% CI: −1.120 to −0.593), mobility (Hedges' g = -0.804, 95% CI: −1.212 to −0.396), and knee-related function (Hedges' g = -0.924, 95% CI: −1.653 to −0.196) compared with control interventions. Substantial heterogeneity was observed for pain (I^2 = 83%), functional status (I^2 = 79%), mobility (I^2 = 71%), and knee-related function (I^2 = 82%), whereas ROM demonstrated lower heterogeneity (I^2 = 40%). Subgroup analyses suggested that improvements in pain and functional status were statistically significant in studies including male or mixed-sex populations, whereas the female-only subgroup did not reach statistical significance for either pain (p = 0.109) or functional status (p = 0.780). According to GRADE criteria, evidence certainty ranged from low to moderate across outcomes.

Conclusion: Adding KT to rehabilitation programs appears to provide greater improvements in pain, functional status, ROM, mobility, and knee-related function than exercise-based interventions alone in individuals with KOA. However, substantial heterogeneity and methodological limitations across studies warrant cautious interpretation, and further high-quality RCTs with standardized protocols and long-term follow-up are needed.

Keywords: Kinesio taping, Knee osteoarthritis, Meta-analysis, Rehabilitation

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Highlighting

- Kinesio Taping (KT) combined with rehabilitation significantly improved pain, function, mobility, and knee-related function in individuals with knee osteoarthritis.
- Meta-analysis of 33 randomized controlled trials involving 1,402 participants demonstrated moderate-to-large pooled effects favoring KT-augmented rehabilitation.
- Despite consistent benefits, substantial heterogeneity and low-to-moderate certainty of evidence highlight the need for standardized KT protocols and high-quality long-term trials.

Plain language summary

Knee osteoarthritis is a common condition that can cause persistent knee pain, stiffness, reduced movement, and difficulty with daily activities. Rehabilitation, particularly exercise, is an important part of treatment, but additional approaches may help improve outcomes. This systematic review and meta-analysis examined whether adding Kinesio Taping (KT), an elastic adhesive tape applied to the skin around the knee, to rehabilitation programs provides greater benefits than rehabilitation alone. We reviewed 33 randomized controlled trials involving 1,402 people with knee osteoarthritis. The results showed that adding KT to rehabilitation was associated with greater improvements in pain, physical function, knee range of motion, mobility, and knee-related function compared with control interventions. However, the findings varied considerably across studies, and the certainty of evidence ranged from low to moderate. Therefore, KT may be a useful complementary treatment alongside rehabilitation for people with knee osteoarthritis, but further well-designed studies using standardized treatment protocols and longer follow-up are needed to determine its long-term benefits.

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Introduction

Osteoarthritis is one of the most prevalent musculoskeletal disorders worldwide and a leading cause of pain, disability, and reduced quality of life among older adults (1). It is estimated that nearly one-third of individuals aged over 65 years are affected by osteoarthritis (2), with the knee joint being the most commonly involved site because of its weight-bearing function and continuous mechanical stress (3). The global burden of knee osteoarthritis (KOA) has increased substantially over recent decades due to aging populations, obesity, sedentary lifestyles, and increased life expectancy (4). KOA is characterized by progressive degeneration of the articular cartilage, subchondral bone remodeling, synovial inflammation, osteophyte formation, muscular weakness, and impaired neuromuscular control, all of which contribute to pain and functional limitation (5-7).

Pain reduction and improvement of physical function remain the principal goals of conservative management, since no definitive intervention currently exists to reverse cartilage degeneration or halt disease progression (8). Non-surgical management commonly includes therapeutic exercise, patient education, weight reduction, electrotherapy modalities, and taping techniques (9). Among these interventions, rehabilitation programs are considered the cornerstone of conservative KOA rehabilitation because of their well-established role in improving muscle strength, joint stability, physical performance, and functional independence (10, 11). In particular, it has been demonstrated that rehabilitation programs have beneficial effects on pain reduction, enhancement of neuromuscular control, and improvement of overall functional capacity in individuals with KOA (12). Rehabilitation programs may also improve proprioception, movement efficiency, and joint loading patterns, thereby contributing to long-term functional preservation (13, 14).

Among adjunctive rehabilitation interventions, kinesio taping (KT) has gained increasing attention because of its non-invasive nature, ease of application, and potential therapeutic effects (13). Proposed mechanisms of KT include pain modulation through cutaneous mechanoreceptor stimulation, enhancement of proprioceptive feedback, facilitation of muscle activation, and potential modification of patellar alignment and local tissue loading (15-17). Importantly, these effects may complement the physiological adaptations induced by active rehabilitation. The elastic tape applied to the skin can provide continuous cutaneous stimulation, which may recruit cutaneous mechanoreceptors and modify afferent sensory input to the central nervous system. This enhanced sensory feedback may facilitate proprioceptive processing and neuromuscular control during therapeutic exercise, potentially supporting more efficient movement and muscle activation (18). Several randomized controlled trials (RCTs) have demonstrated that KT may improve pain intensity, joint range of motion, quadriceps strength, proprioception, and functional performance in patients with KOA (19, 20).

Despite the well-established role of rehabilitation programs as the cornerstone of conservative management for KOA (21), increasing evidence suggests that adjunctive interventions such as KT may further enhance treatment outcomes. However, the incremental value of KT when added to rehabilitation programs remains insufficiently defined. A previous systematic review and meta-analysis by Lin et al. (22) compared physical therapy combined with KT with physical therapy alone in patients with KOA. That review included 15 RCTs and 546 participants and reported

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short-term improvements in pain and WOMAC-based function. Nevertheless, the evidence base has substantially evolved since that review, and additional RCTs now allow a more comprehensive synthesis of KT as an adjunct to exercise-based rehabilitation. Moreover, outcomes such as knee ROM, mobility, knee-related function, publication bias-adjusted estimates, and certainty of evidence were not comprehensively addressed. Therefore, this updated systematic review and meta-analysis aimed to synthesize newly available RCT evidence on the effectiveness of KT as an adjunct to rehabilitation programs for pain, functional status, ROM, mobility, and knee-related function in individuals with KOA.

Methods

This review and meta-analysis study was registered prospectively in PROSPERO under the number CRD420261397071.

Search strategy and keywords

The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (23). A comprehensive electronic search of PubMed, Scopus, and Web of Science was performed from the inception of each database through 30 June 2026 to retrieve potentially relevant studies. In addition to the database search, two reviewers (E.E. and SA.N.) independently examined the reference lists of relevant articles to identify additional eligible publications, with consultation from a subject-matter expert (H.M.) when necessary. The bibliographies of previously published systematic reviews were also manually checked to locate studies that might have been missed by the electronic search (24). For potentially eligible articles for which the full text could not be accessed, the corresponding authors were contacted by email to obtain the complete manuscript.

The following keyword combinations were used with the help of AND and OR operators as follows: (“kinesio taping” OR “kinesiology taping” OR “kinesio tape” OR “kinesiology tape” OR “elastic therapeutic tape” OR “therapeutic taping” OR “KT tape”) AND (“exercise” OR “training” OR “protocol” OR “rehabilitation” OR “physical therapy” OR “therapeutic exercise” OR “exercise therapy” OR “Exercise Movement Techniques” OR “physiotherapy” OR “rehabilitation programs”) AND (“knee osteoarthritis” OR “knee OA” OR gonarthrosis OR “osteoarthritis of knee”).

Inclusion and exclusion criteria

The eligibility criteria for this systematic review and meta-analysis were established according to the PICOS (Population, Intervention, Comparison, Outcomes, and Study) framework (25). The population (P) included adults who had been diagnosed with KOA by clinicians according to the American College of Rheumatology, based on clinical and/or radiographic criteria (26). The intervention (I) consisted of Kinesio taping applied as an adjunct to rehabilitation programs (e.g., therapeutic exercise, conventional physiotherapy, multimodal rehabilitation, and other conservative non-surgical interventions). The comparison (C) included exercise therapy alone, sham taping, placebo interventions, conventional physiotherapy, or other active treatment approaches without Kinesio taping. The outcomes (O) of interest included primary outcomes such

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as pain intensity (e.g., Visual Analog Scale [VAS], Numeric Pain Rating Scale [NPRS]), functional status (e.g., WOMAC), and knee-related function (e.g., KOOS). Secondary outcomes included knee range of motion (e.g., Goniometer) and mobility (e.g., Timed Up and Go test). The study design (S) was limited to randomized controlled trials (RCTs).

Moreover, only studies published in English in peer-reviewed journals were included from database inception until the end of the search period (June 2026). The following exclusion criteria were applied: (1) studies involving participants with knee pain caused by conditions other than knee osteoarthritis, such as fractures, inflammatory arthritis, neurological disorders, or post-surgical conditions; (2) studies that did not include Kinesio taping combined with therapeutic exercise or rehabilitation programs; (3) studies evaluating Kinesio taping as an isolated intervention without an exercise or rehabilitation component; (4) studies that did not provide sufficient quantitative data for effect size calculation; and (5) publications such as conference abstracts, review articles, protocols, letters, case reports, dissertations, or scientific posters. We also excluded studies that did not clearly describe the diagnostic criteria for knee osteoarthritis.

Study selection

Two reviewers (E.E. and SA.N.) independently screened the retrieved records by examining their titles and abstracts against the predefined eligibility criteria, following the PRISMA framework. A standardized Excel-based form was used to facilitate the screening and data extraction process. Any disagreements between the reviewers were evaluated and resolved by the supervising author (H.M.). All retrieved references were imported into EndNote 20 for reference management, and the software was used to identify and remove duplicate records before the screening process.

Data extraction and quality assessment

Data extraction was performed independently by the reviewers using a predefined Excel-based form. The extracted information was subsequently cross-checked between the reviewers to ensure consistency, with any disagreements or discrepancies adjudicated by the supervising author (H.M.). For each eligible study, the following characteristics were recorded: first author and publication year, study design, sample size, participant characteristics (including age, sex, and relevant index measures), principal data-collection methods and instruments, and the key findings reported by the investigators. Two researchers (H.T., M.R.) employed the Physiotherapy Evidence Database (PEDro) scale (27) to evaluate the potential for bias, selecting the specific tool according to the research design included in each study. The PEDro scale assesses the methodological quality of RCTs based on 11 criteria. Although the first item relates to external validity and is not included in the final score, the remaining 10 items contribute to a total score ranging from 0 to 10, with higher scores indicating better methodological quality. Studies scoring 9–10 were considered excellent, 6–8 good, 4–5 fair, and below 4 poor. The level of agreement between evaluators was perfect, with a Kappa coefficient of 1. If a study did not provide sufficient information regarding any PEDro scale elements, a zero score was assigned for that criterion. This approach ensured consistent, objective evaluation across all included studies.

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Data analysis

All statistical analyses were performed using Comprehensive Meta-Analysis (CMA), version 4.0 (Biostat Inc., Englewood, NJ, USA). For each eligible study, the required quantitative data, including pre- and post-intervention means and standard deviations, mean changes where reported, sample sizes, and corresponding P-values, were extracted. Pooled effects were expressed as standardized mean differences (SMDs) with 95% confidence intervals (CIs) and estimated using a random-effects model. The use of SMDs allowed outcomes measured with different instruments or scales to be synthesized within a common metric. To reduce potential bias associated with small sample sizes, Hedges' g adjustment was applied. Effect magnitudes were interpreted according to conventional thresholds, with SMD values below 0.20 considered trivial, 0.20–0.49 small, 0.50–0.79 moderate, and ≥0.80 large (28). Data heterogeneity was assessed using the Q-test and the I^2 statistic, with I^2 values representing the percentage of total variation due to heterogeneity. I^2 values of 25%, 50%, and 75% were considered to represent low, moderate, and high heterogeneity, respectively (29). Potential publication bias was assessed using funnel plots only for meta-analyses including at least 10 studies, given the limited reliability of funnel plot asymmetry assessments when fewer studies are available (30). To ensure consistent interpretation across outcomes measured using different instruments, the direction of effect was standardized according to the clinical meaning of each outcome (31). Thus, after standardization, negative Hedges' g values consistently represented a favorable KT effect.

Results

An initial search across the chosen databases yielded 2876 records (Figure 1). These references were imported into EndNote, where duplicate entries were identified and removed, leaving 631 unique articles. After reviewing the abstracts and titles, we selected 53 articles for further analysis, while excluding the rest. We then assessed 46 articles in full text, and 33 met the predefined inclusion criteria.

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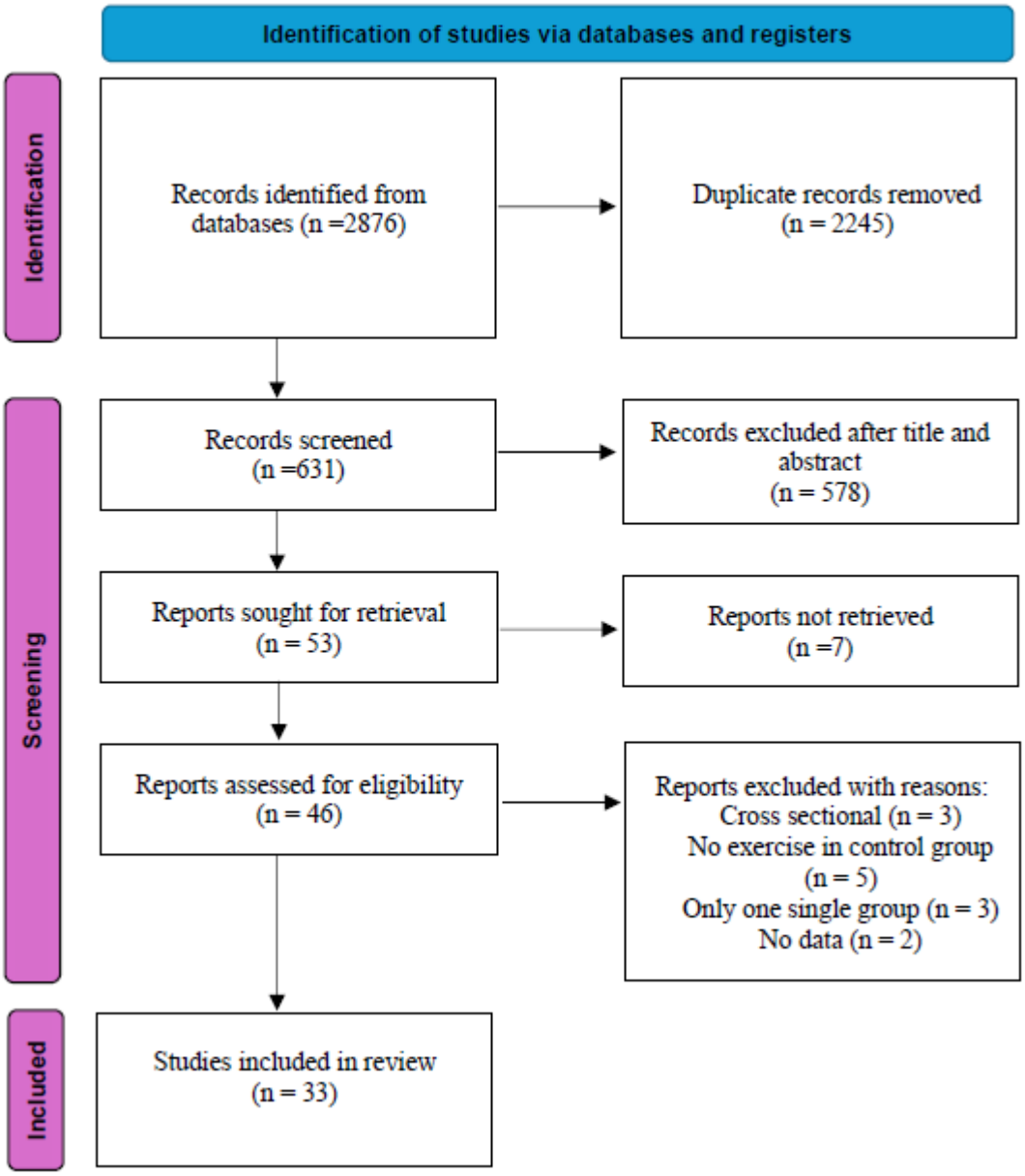


Figure 1. PRISMA flow diagram of the study selection process

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Study Characteristics

A total of 33 RCTs were included in this study, collectively enrolling 1,402 participants diagnosed with KOA (Table 1). The studies were published between 2012 and 2025, with the majority concentrated in the period from 2016 to 2024, reflecting a growing research interest in KT as an adjunct intervention in KOA rehabilitation. The mean or reported age of participants spanned from approximately 40 to 72 years. The gender distribution was notably skewed toward females across most studies; several trials enrolled exclusively female participants (32-41), while a small number enrolled exclusively male participants (34, 42, 43). All included studies employed exercise-based interventions as the foundation of treatment. The exercise protocols varied considerably across

trials and included quadriceps strengthening and stretching exercises (36, 39, 44), neuromuscular control exercises (35, 45), combined open and closed kinetic chain exercises (46, 47), home-based exercise programs (38, 43, 48), hip extension and abduction exercises (32), muscle energy techniques (49), conventional physiotherapy programs (40, 41, 50-52), and multimodal physical therapy protocols combining thermotherapy, electrotherapy, or transcutaneous electrical nerve stimulation (TENS) with exercise (37, 42, 53, 54). In all experimental groups, KT was applied as an adjunct to the prescribed exercise program. The most frequently utilized application technique was the Y-strip method, applied over the quadriceps or periarticular knee structures, either as a standalone strip or in combination with I-strips, U-strips, or additional Y-strips. Specifically, a single Y-strip was used in several studies (38, 40, 45, 48-51, 55), while combinations of two or more strips were employed in others (39, 44, 46, 47, 56-60). Yu et al. (2012) applied a claw-shaped configuration over painful and swollen areas (61). The primary outcomes assessed across the included studies encompassed pain intensity, functional status, ROM, mobility, and knee-related function. Pain was the most consistently measured outcome, predominantly quantified using the VAS or the NPRS. Functional status was most commonly evaluated using the Western Ontario and McMaster Universities Arthritis Index (WOMAC), while knee-specific function was assessed in several studies using the Knee Injury and Osteoarthritis Outcome Score (KOOS). Mobility was measured using the Timed Up and Go (TUG) test, and ROM was quantified via universal or digital goniometry.

Table 1 near here

Data synthesis

Pain

Thirty studies (33-50, 52-63) encompassing 1,150 participants were included for pain. The pooled analysis demonstrated a significant difference in pain intensity favoring the KT group over the control group (Hedges' g = -1.023, $p < 0.001$; 95% CI: −1.281 to −0.765), indicating that the adjunction of Kinesio Taping to rehabilitation programs yielded greater reductions in pain compared with control interventions. The Q test and I^2 statistic indicated substantial heterogeneity among the included studies ($p < 0.001$, $I^2 = 83\%$). According to the high heterogeneity of pain, subgroup analyses were done for genders, and the findings revealed a differential pattern of response. In the subgroup of studies including only female participants (8 studies, 283 participants), the pooled effect was not statistically significant (95% CI: −0.978 to 0.098; $p = 0.109$). In studies including both female and male participants, the pooled effect was statistically significant (95% CI: −1.567 to −0.762; $p < 0.001$), and a statistically significant pooled effect was also observed in studies including only male participants (3 studies, 126 participants, 95% CI: −1.666 to −0.804; $p < 0.001$). Interpret these findings with caution, as the subgroup analyses were based on study-level characteristics and do not provide evidence of a differential treatment effect by individual participant sex (Figure 2). Egger's test showed significant publication bias in pain ($P < 0.001$). We used the trim-and-fill method to assess the possible effect of future studies on the results. The results showed that imputing eight studies to the right side of the graph could not change the meta-analysis results (Figure 3).

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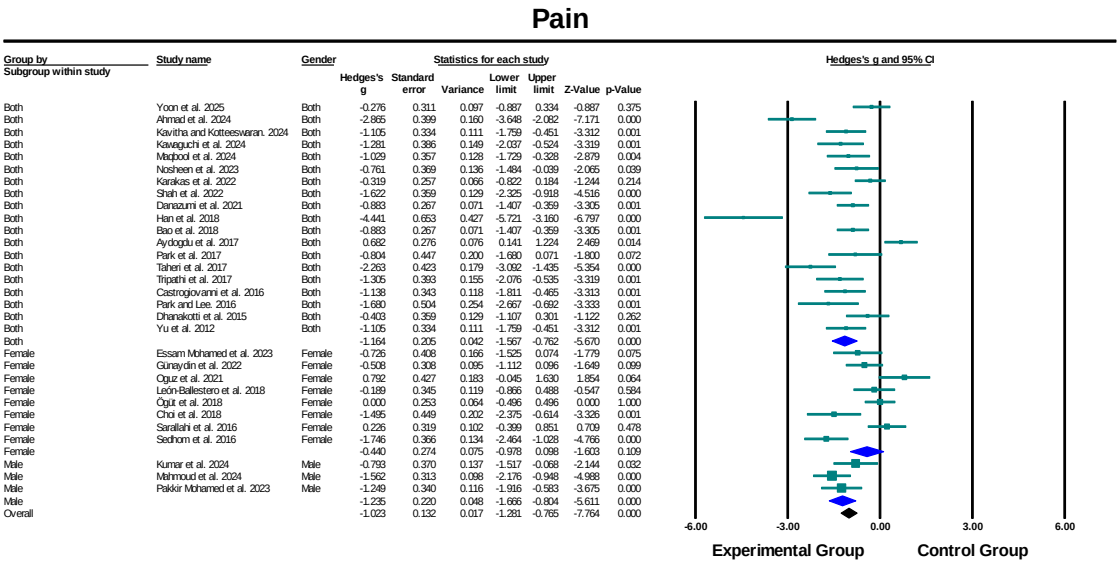


Figure 2: Forest plot of Pain

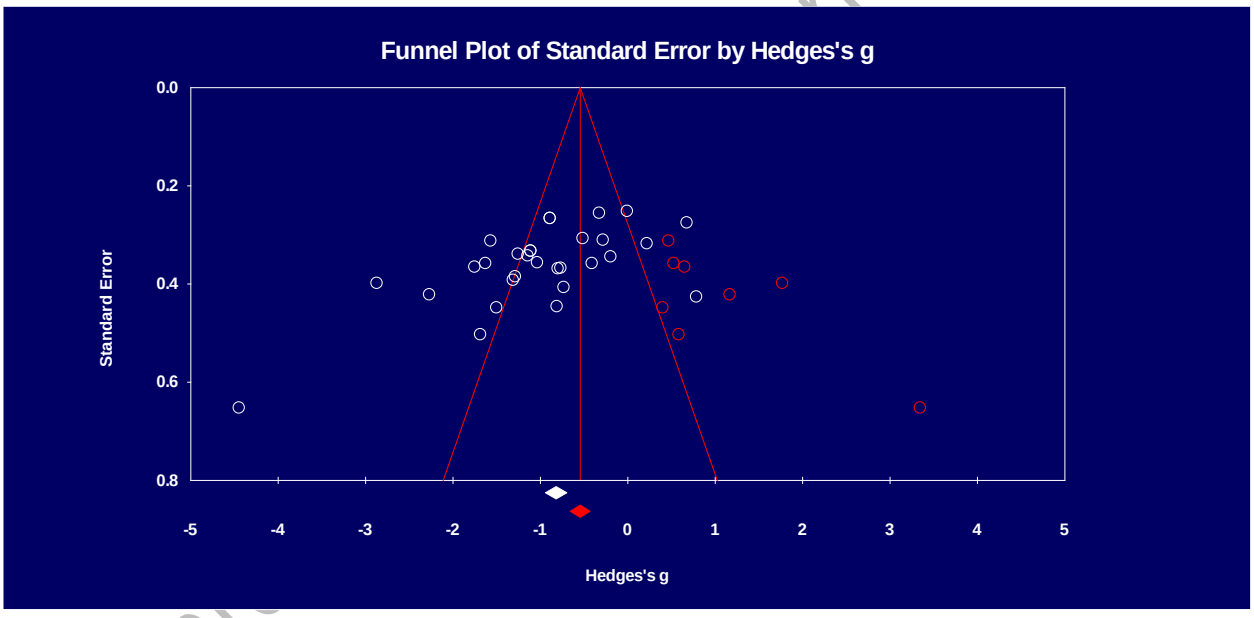


Figure 3: Funnel plot of Pain

Functional Status

Twenty studies (32, 36, 37, 39, 40, 42-45, 48, 51, 52, 55-57, 59, 61-64) encompassing 800 participants were included for functional status. The pooled analysis demonstrated a significant difference in functional status favoring the KT group over the control group (Hedges' g = -0.864, $p < 0.001$; 95% CI: −1.124 to −0.604), indicating that the addition of KT to rehabilitation programs yielded greater enhancements in functional status compared with control interventions. The Q test and I^2 statistic indicated substantial heterogeneity among the included studies ($p < 0.001$, I^2 = 79%). Due to the high heterogeneity of functional status. In studies recruiting female participants (6 studies, 199 participants), no significant differences were seen (p = 0.780; 95% CI: −0.572 to

0.429). In contrast, studies enrolling both sexes demonstrated a significant effect ($p < 0.001$; 95% CI: −1.355 to −0.606), as did studies restricted to male participants (2 studies, 70 participants, $p < 0.001$; 95% CI: −2.019 to −0.976) (Figure 4). Egger's test showed that publication bias was not statistically significant for functional status ($p = 0.055$).

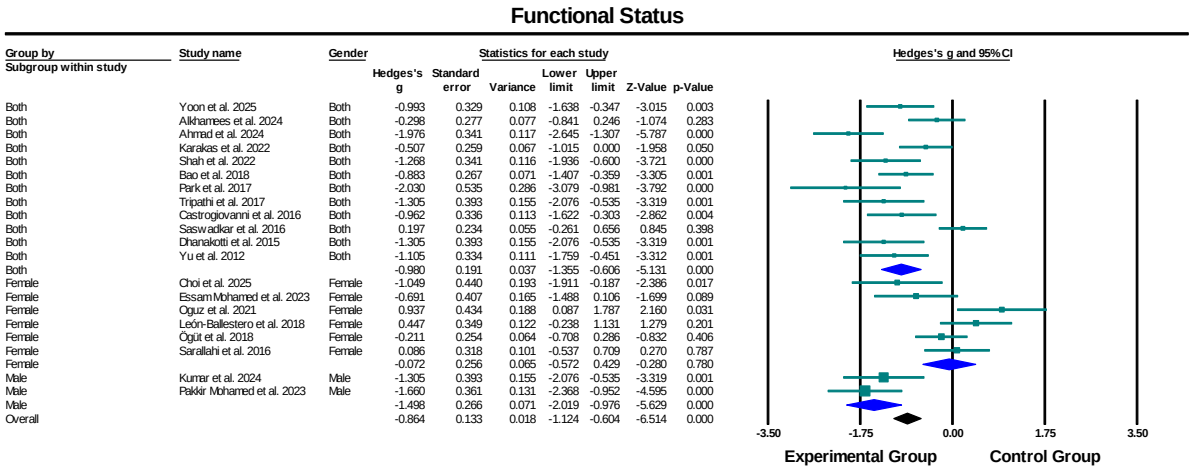


Figure 4: Forest plot of Functional Status

Range of Motion (ROM)

Ten studies (33, 34, 36, 37, 41, 42, 46, 47, 50, 58) encompassing 416 participants were included for ROM. The pooled analysis demonstrated a significant difference in ROM favoring the KT group over the control group (Hedges' g = -0.857, $p < 0.001$; 95% CI: −1.120 to −0.593), indicating that the addition of KT to rehabilitation programs yielded better improvements in ROM compared with control interventions (Figure 5). The Q-test and I^2 test showed no significant heterogeneity across ROM ($p = 0.085$, $I^2 = 40\%$). Egger's test showed significant publication bias in ROM ($p = 0.017$). The trim and fill method was used to assess the possible effect of future studies on the results. The results showed that adding two randomly generated hypothetical studies to the right side of the graph could not change the meta-analysis results (Figure 6).

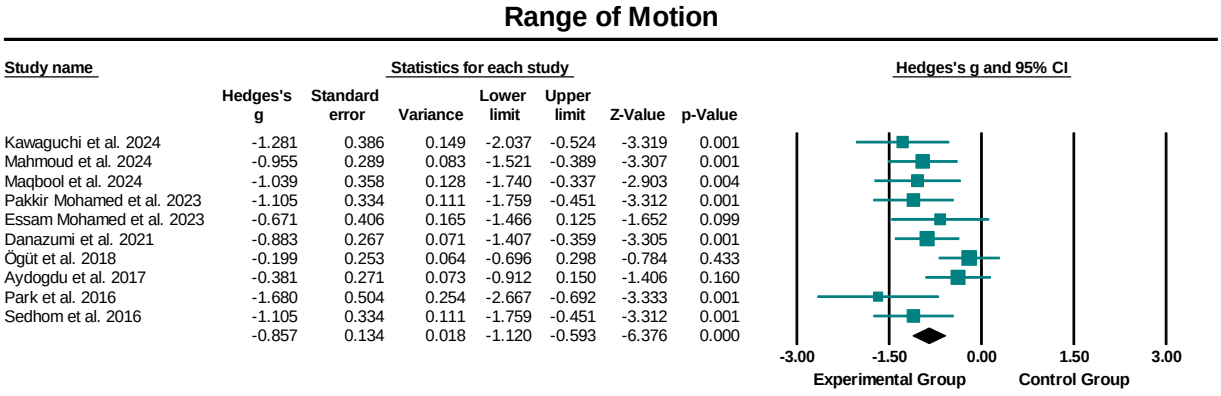


Figure 5: Forest plot of Range of Motion

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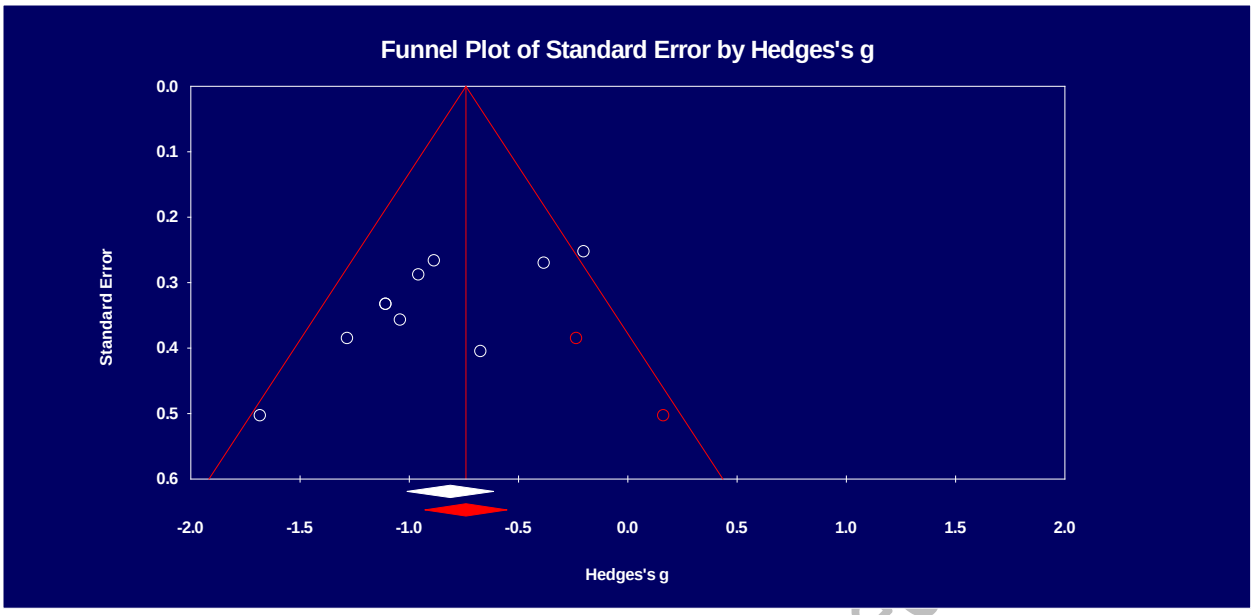


Figure 6: Funnel plot of Range of Motion

Mobility

Eight studies (35, 42, 47, 48, 52, 59, 60, 64) encompassing 357 participants were included for mobility. The pooled analysis demonstrated a significant difference in mobility favoring the KT group over the control group (Hedges' g = -0.804, $p < 0.001$; 95% CI: −1.212 to −0.396) (Figure 7). The Q test and I^2 statistic indicated substantial heterogeneity among the included studies ($p < 0.001$, $I^2 = 71\%$).

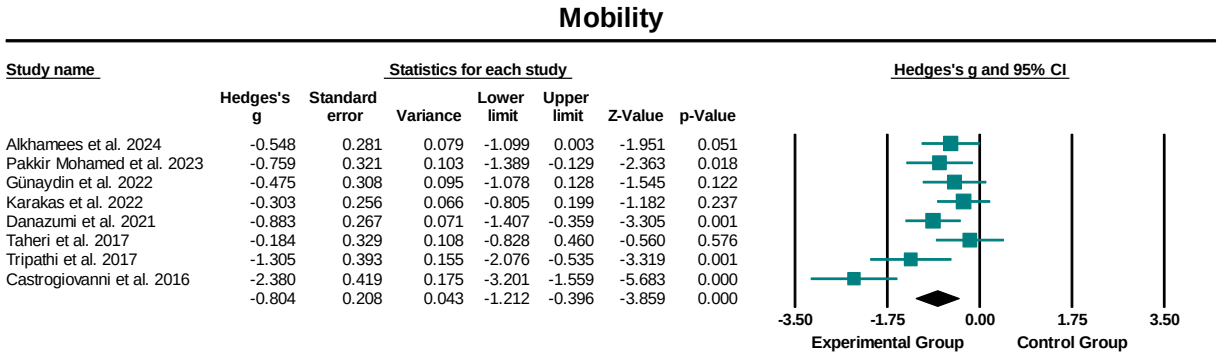


Figure 7: Forest plot of Mobility

Knee-related function

Five studies (33, 35, 49, 50, 58) encompassing 187 participants were included for knee-related function. The pooled analysis demonstrated a significant difference in knee-related function favoring the KT group over the control group (Hedges' g = -0.924, $p = 0.013$; 95% CI: −1.653 to

−0.196), indicating that the addition of KT to rehabilitation programs yielded greater improvements in knee-related function (Figure 9). The Q test and I^2 statistic indicated substantial heterogeneity among the included studies ($p < 0.001$, $I^2 = 82\%$).

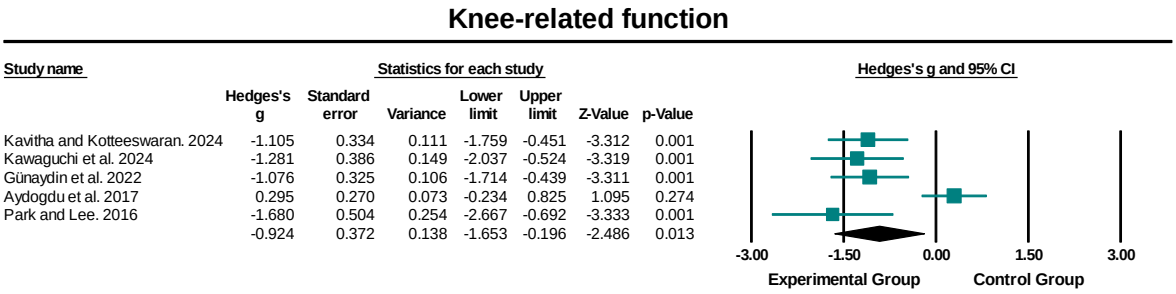


Figure 8: Forest plot of Knee-related function

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Methodological Quality Assessment

The methodological quality of the 33 included RCTs ranged from poor to good, with PEDro scores ranging from 3 to 8 out of 10 (Table 2). No study achieved an excellent methodological rating. Twenty-one studies were classified as good quality, scoring between 6 and 8 points (33, 35-39, 42, 44, 45, 47, 48, 50, 51, 53, 55, 57, 59-62, 64), ten studies were considered fair quality, scoring between 4 and 5 points (32, 34, 40, 41, 43, 46, 49, 52, 54, 58), and two studies were rated as poor quality, scoring 3 points (56, 63). All included studies satisfied the eligibility criteria item and reported random allocation, and all provided between-group statistical comparisons as well as point estimates and measures of variability, indicating acceptable reporting transparency. Most studies (n = 27) adequately addressed baseline comparability between groups. However, only 11 studies reported concealed allocation, which may introduce selection bias in the remaining trials. Blinding procedures represented the most prominent methodological limitation across the included literature. Therapist blinding was absent in all 33 studies, an expected finding given the inherently observable nature of KT and exercise interventions. Participant blinding was achieved in only four studies (33, 37, 45, 59), typically through the use of sham taping as the control condition. Assessor blinding was implemented in 16 studies, representing approximately half of the included trials. Adequate follow-up was reported in 29 studies, while intention-to-treat analysis, a key safeguard against attrition bias, was conducted in only five studies (35, 39, 47, 48, 62). Moreover, we independently assessed the methodological quality and risk of bias of included studies using the RoB-2 scale for randomized trials (Table 3).

Table 2 near here

Table 3 near here

Discussion

This systematic review and meta-analysis synthesized evidence from 33 RCTs encompassing 1,402 participants to evaluate the efficacy of KT as an adjunct to rehabilitation programs in individuals with KOA. The pooled findings showed that combining KT with rehabilitation programs produced significant benefits across all outcomes examined compared with rehabilitation programs alone. The pooled effect sizes were generally larger than those reported in previous meta-analyses (22), which may be attributable to differences in the evidence base and methodological characteristics of the reviews. Therefore, interpret the larger effects observed in the present analysis in the context of the expanded and broader evidence base, rather than as evidence that KT inherently produces greater effects than previously reported.

Pain

Given that pain is the principal symptom driving disability, reduced physical activity, and diminished quality of life in KOA, these findings are of substantial clinical importance. The observed superiority of KT combined with exercise supports the growing perspective that multimodal conservative management strategies may be more effective than isolated interventions. KT is hypothesized to stimulate cutaneous mechanoreceptors, thereby modulating nociceptive input through the gate control theory of pain. In addition, KT may improve proprioceptive feedback, reduce abnormal joint loading, facilitate quadriceps activation, and enhance patellofemoral alignment (65), all of which may contribute to reduced mechanical stress on degenerative knee structures. When combined with rehabilitation programs, which themselves improve muscular strength, neuromuscular control, and joint stability (10), the synergistic interaction between these interventions may explain the larger reductions in pain observed in the pooled analysis. Importantly, despite the significant pooled effect, considerable heterogeneity was identified ($I^2 = 83\%$), indicating substantial variability in treatment responses across trials. This heterogeneity likely reflects the marked methodological and clinical diversity among the included studies. The exercise protocols differed considerably with respect to intensity, frequency, duration, and therapeutic focus, ranging from quadriceps strengthening and neuromuscular training (38) to multimodal physiotherapy programs incorporating electrotherapy or thermotherapy (44). Similarly, KT application methods varied across studies, including differences in strip configuration, tape tension, anatomical placement, and duration of application. To further explore potential sources of heterogeneity, we conducted subgroup analyses by sex. Subgroup analyses based on study-level sex composition showed some variation in the pooled effects. Studies including male participants or mixed-sex populations demonstrated statistically significant effects, whereas the female-only subgroup did not reach statistical significance for pain. However, this finding should not be interpreted as evidence that KT is less effective or ineffective in women. The analysis was conducted at the study level rather than the individual participant level, and the number of female-only studies was limited. Moreover, the confidence interval for the female-only subgroup included zero and was relatively close to the significance threshold, indicating substantial uncertainty around the estimate. Therefore, these subgroup findings should be considered exploratory and hypothesis-generating rather than evidence of a true sex-specific difference in treatment response. Publication bias analyses revealed significant asymmetry by

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Egger's regression test, suggesting that smaller studies with negative or null findings may be underrepresented in the literature. Nevertheless, the trim-and-fill analysis showed that adding hypothetical missing studies did not alter the overall pooled effect, indicating that the observed analgesic benefit of KT remained statistically robust even after adjustment for potential publication bias. This finding strengthens confidence in the stability of the pooled estimate, although the possibility of overestimation cannot be entirely excluded.

Functional Status

The observed improvements in functional status are likely multifactorial and may be closely linked to the pain reductions demonstrated in the current analysis. Pain is one of the principal determinants of impaired mobility, muscle inhibition, altered gait mechanics, and reduced participation in daily activities among individuals with KOA (66). By reducing pain intensity, KT may indirectly facilitate greater movement confidence, increased participation in exercise therapy, and improved performance during functional activities. In addition, KT may improve proprioceptive input and neuromuscular control around the knee joint (67), thereby enhancing joint stability and movement efficiency during weight-bearing tasks (42). These mechanisms may contribute to improvements in self-reported functional outcomes such as walking, stair negotiation, sit-to-stand performance, and activities of daily living, which are commonly reflected in WOMAC-based assessments. Despite the significant pooled effect favoring KT, substantial heterogeneity was identified across studies ($I^2 = 79\%$), indicating considerable variability in the magnitude of functional improvement. Subgroup analyses based on sex revealed an interesting pattern. Subgroup analyses showed variation in pooled functional effects by study-level sex composition; however, these findings should be interpreted cautiously because the analysis was based on study-level characteristics and the number of female-only studies was limited. These results therefore do not establish a sex-specific difference in KT effectiveness. Publication bias analysis did not reveal statistically significant asymmetry according to Egger's regression test, suggesting that the pooled findings for functional status are relatively stable and less likely to be substantially influenced by selective publication of positive studies. Another important consideration relates to the potential interaction between pain reduction and functional improvement. Improvements in function following KT application may not solely reflect direct biomechanical or neuromuscular effects, but may instead be partially mediated by reduced pain and increased confidence during movement. This relationship highlights the complex and multidimensional nature of functional recovery in KOA rehabilitation.

ROM

Regarding ROM, the pooled analysis of ten studies showed a significant improvement favoring the KT group over the control group. These findings are clinically plausible and consistent with the proposed effects of KT on periarticular soft tissue dynamics (68). The elastic recoil properties of KT tape are thought to exert a gentle lifting effect on the skin and superficial fascia (69), thereby reducing mechanical compression on underlying joint structures, decompressing periarticular receptors, and facilitating afferent proprioceptive signaling (42, 46). Furthermore, KT may attenuate the reflex muscular inhibition that commonly restricts ROM in individuals with KOA, particularly during weight-bearing and functional movement tasks. Furthermore, in KOA,

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restricted ROM is not solely attributable to structural joint degeneration but is also mediated by pain-driven protective guarding (70), periarticular muscle tightness, and altered movement patterns, all of which are potentially addressable through the combined neurophysiological and biomechanical effects of KT. The integration of structured therapeutic exercise, which promotes cartilage nutrition, periarticular muscle flexibility, and neuromuscular coordination, with the sensorimotor facilitation afforded by KT may therefore represent a synergistic approach to ROM restoration in this population (71). Interestingly, the effect of KT on ROM appears to be more stable across studies than outcomes such as pain and functional status. One possible explanation is that ROM measurements are generally less susceptible to subjective interpretation and placebo-related influences, particularly when assessed using standardized goniometric methods. In contrast, pain and self-reported function are influenced by psychological, behavioral, and contextual factors that may vary substantially across populations and study settings. The comparatively lower heterogeneity observed for ROM therefore strengthens confidence in the reproducibility of this finding. Additionally, trim-and-fill analysis showed that adding hypothetical missing studies did not alter the pooled effect estimate, suggesting that the beneficial effect of KT on ROM remains relatively robust despite potential publication bias. Another noteworthy consideration is that improvements in ROM may not translate directly into clinically meaningful improvements in higher-level functional performance. Although increased ROM can facilitate mobility and task execution (58), functional recovery in KOA is also influenced by muscle strength, pain modulation, psychological factors, and movement efficiency. Therefore, ROM improvements should be interpreted as one component of a multidimensional rehabilitation response rather than an isolated indicator of overall recovery.

Mobility

Contemporary models of KOA increasingly recognize the role of altered neuromuscular control and movement variability in the progression of functional impairment (72). Individuals with KOA commonly exhibit reduced dynamic knee stability, slower gait velocity, and compensatory movement strategies to minimize joint loading and pain (10). KT may address these deficits by enhancing afferent sensory feedback and improving joint position awareness during transitional and ambulatory activities (73). Enhanced sensory input from the skin and surrounding tissues may facilitate more efficient motor control strategies (74), particularly during dynamic tasks requiring rapid postural adjustments. Another important consideration is KT's potential influence on fear-related movement behavior. Mobility limitations in KOA are not solely attributable to structural joint degeneration (66), but are also strongly influenced by pain anticipation, movement avoidance, and reduced confidence during weight-bearing activities (1). Emerging evidence in musculoskeletal rehabilitation suggests that external sensory cues and supportive interventions may positively influence motor behavior by reducing the perceived threat associated with movement (64). In this context, KT may function as a form of sensorimotor reassurance, allowing patients to perform mobility-related tasks with greater confidence and reduced compensatory stiffness (42). This interpretation may partly explain why improvements in mobility can occur even in the absence of substantial structural changes within the joint itself. In addition, performance-based outcomes such as TUG are less frequently reported in KT literature despite their growing importance in contemporary rehabilitation research. Recent clinical frameworks

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increasingly emphasize objective physical performance measures over solely patient-reported outcomes because they may better reflect real-world functional capacity. Consequently, the current findings contribute meaningful evidence supporting the potential role of KT in enhancing objective mobility performance in KOA rehabilitation.

Knee-related function

Outcomes assessing knee-specific function, primarily through KOOS-related measures, reflect a broader evaluation of symptoms, daily activities, sport and recreational function, and knee-related quality of life. Therefore, the observed benefits suggest that KT may positively influence not only isolated physical impairments, but also the overall perception of knee performance during functional activities. The improvements in knee-related function may be explained by the combined effects of pain reduction, enhanced proprioceptive feedback, and improved movement coordination associated with KT application. KT may facilitate more efficient lower-limb movement patterns and improve patient confidence during weight-bearing activities (11), thereby contributing to better knee-related functional performance. In addition, only five studies were included for this outcome, limiting the precision and generalizability of the pooled estimate. Nevertheless, despite the relatively small evidence base, the overall findings consistently favored KT-enhanced rehabilitation. Moreover, the limited number of included studies reduces the sensitivity of publication bias detection methods and warrants cautious interpretation.

Clinical implications

The findings of this systematic review and meta-analysis carry several important clinical implications for practitioners involved in the conservative management of KOA. The consistent robust gains observed across pain, functional status, ROM, mobility, and knee-related function support the integration of KT as a viable adjunctive modality within structured rehabilitation programs for individuals with KOA. Given that current clinical guidelines emphasize multimodal, exercise-centered conservative management as the cornerstone of KOA rehabilitation, the present evidence suggests that KT may serve as a clinically useful augmentation strategy rather than a standalone treatment, capable of enhancing the magnitude of rehabilitation outcomes without imposing substantial additional burden on patients or healthcare resources. From a practical standpoint, KT is non-invasive, relatively inexpensive, easy to apply in outpatient and community-based settings, and generally well tolerated, making it an attractive adjunct particularly for patients who are unable or unwilling to pursue pharmacological or surgical interventions. The analgesic and sensorimotor benefits of KT may also be particularly valuable during the early phases of a rehabilitation program, when pain and movement apprehension are most likely to limit exercise adherence and therapeutic dosage. By attenuating pain and facilitating neuromuscular control from the outset, KT may help patients engage more fully and confidently in prescribed exercise protocols, potentially accelerating functional recovery and improving long-term adherence. Clinicians are therefore encouraged to adopt an individualized approach, monitoring patient-specific responses to KT application and adjusting treatment protocols accordingly rather than assuming uniform efficacy across all individuals. Furthermore, selecting a taping protocol tailored to the specific biomechanical and symptomatic profile of the individual patient, in conjunction with a well-structured and progressively loaded exercise program, is likely to yield the most

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favorable outcomes. Taken together, the present findings support the routine consideration of KT as an adjunct to rehabilitation programs in KOA rehabilitation.

Limitations

Several limitations of the present meta-analysis should be acknowledged when interpreting the findings. First, we observed substantial heterogeneity across several outcomes, particularly pain, functional status, mobility, and knee-related function. This variability likely resulted from differences in exercise protocols, KT application techniques, treatment duration, disease severity, and participant characteristics across studies. Second, although most included studies demonstrated fair-to-good methodological quality, important methodological limitations were consistently present, including inadequate allocation concealment, limited assessor and participant blinding, and infrequent use of intention-to-treat analysis, all of which may increase the risk of performance and detection bias. Only 4 of the 33 included studies reported participant blinding, and 11 reported adequate allocation concealment. Furthermore, we did not perform sensitivity analyses restricted to low-risk-of-bias studies. Therefore, the extent to which these methodological limitations may have influenced the pooled estimates cannot be excluded, and the findings should be interpreted with appropriate caution. Third, most included studies evaluated only short-term outcomes, limiting conclusions about the long-term sustainability of KT-related benefits in individuals with KOA. Moreover, interpret subgroup analyses by sex cautiously because of the relatively small number of sex-specific studies and unequal sample distributions. Another limitation is that meta-regression could not formally explore the substantial heterogeneity observed for several outcomes. Although differences in KT application techniques, exercise protocols, treatment duration, baseline symptom severity, and participant characteristics may have contributed to between-study variability, these factors were not consistently reported or sufficiently standardized across the included studies. Another limitation is that we included only studies published in English, which may have introduced language bias and potentially omitted relevant evidence published in other languages. Therefore, interpret the findings in light of this potential limitation. Future large-scale, multicenter RCTs employing standardized KT protocols, rigorous methodological designs, and longer follow-up durations are needed to strengthen the current evidence base.

Conclusion

In conclusion, adding KT to rehabilitation programs provides greater improvements in pain, functional status, ROM, mobility, and knee-related function than exercise-based interventions alone in individuals with KOA. However, substantial heterogeneity across outcomes and methodological limitations in the included studies warrant cautious interpretation of the pooled estimates. Further well-designed RCTs employing standardized intervention protocols and extended follow-up periods are needed to establish the clinical effectiveness of KT and determine whether its benefits are sustained over time in individuals undergoing rehabilitation for KOA.

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List of Abbreviations

CG: Control Group
EG: Experimental Group
EQ-5D: EuroQol 5-Dimension
KOA: Knee Osteoarthritis
KOOS: Knee Injury and Osteoarthritis Outcome Score
KT: Kinesio Taping
NPRS: Numeric Pain Rating Scale
RCT: Randomized Controlled Trial
ROM: Range of Motion
TENS: Transcutaneous Electrical Nerve Stimulation
TUG: Timed Up and Go
VAS: Visual Analog Scale
WOMAC: Western Ontario and McMaster Universities Arthritis Index

Declarations

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Consent for publication: Not applicable.

Availability of data and materials: The experimental data that support the findings of this study are available in Zenodo with the identifier: 10.5281/zenodo.20567249.

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Table 1: Demographic information from included studies

Authors	Study Design	Participants	Gender (M/F)	Age	Experimental Intervention	Control Intervention	Application of Kinesio tape	Outcome	Tools	Results
Choi et al. 2025	RCT	22 patients with KOA (EG: 11, CG: 11)	0/22	EG: 57.18 ± 1.83 CG: 57.27 ± 1.27	Hip extension and abduction combined exercises + KT (3 times a week, for a total of 4 weeks)	Hip extension and abduction combined exercises	Suggested kinesio taping society method	Strength, Functional status	1RM, WOMAC index	Significant difference in muscle strength
Yoon et al. 2025	RCT	40 patients with KOA (EG: 20, CG: 20)	7/33	EG: 71.15 ± 3.59 CG: 71.70 ± 3.81	Neuromuscular control exercise program + KT (3 times a week, for a total of 4 weeks)	Neuromuscular control exercise program	Kinesio tape with Y-strip technique	Pain, Functional status, QOL	VAS, WOMAC, EQ-5D	Significant difference in all outcomes
Alkhamees et al. 2024	RCT	51 patients with KOA (EG: 26, CG: 25)	16/35	EG: 67.46 ± 8.55 CG: 66.31 ± 7.67	Strengthening and stretching exercises + KT (2 times a week, for a total of 6 weeks)	Conventional physical therapy	Combination of rigid tape and inverted Y-strip kinesio tape	Functional status, mobility	WOMAC, TUG test	Significant difference in all outcomes
Ahmad et al. 2024	RCT	50 patients with KOA (EG: 25, CG: 25)	20/30	EG: 45.40 ± 7.46, CG: 44.90 ± 7.26	Standard physiotherapy + KT (3 times a week, for a total of 2 weeks)	Standard physiotherapy	Two kinesio tapes (one Y-strip and one I-strip)	Pain, Functional status	VAS, WOMAC	Significant difference in pain and functional status
Kavitha and Kotteeswaran. 2024	RCT	40 patients with KOA (EG: 20, CG: 20)	Both genders included	45–65 years	Muscle energy technique + KT (4 times a week, for a total of 6 weeks)	Knee strengthening exercises for quadriceps and hamstrings	Kinesio tape with Y-strip technique	Pain, Knee-related function	NPRS, KOOS	Significant difference in pain and functional outcomes
Kawaguchi et al. 2024	RCT	31 patients with KOA (EG: 16, CG: 15)	1/30	EG: 70.7 ± 8.9 CG: 66.9 ± 8.5	Physical therapy + KT (2 times a week, for a total of 4 weeks)	Physical therapy + Sham taping	NA	Pain, Quadriceps strength, ROM, Quality of life,	VAS, Handheld dynamometer, Goniometer,	No significant differences

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								Knee-related function	JKOM, KOOS	
Kumar et al. 2024	RCT	30 patients with KOA (EG: 15, CG: 15)	30/0	40–65 years	Home-based exercises + KT (tape reapplied every 3–4 days for 21 days)	Home-based exercises	NA	Pain, Functional status	VAS, WOMAC	Significant differences in all outcomes
Mahmoud et al. 2024	RCT	56 patients with KOA (EG: 26, CG: 26)	56/0	EG: 66.1 ± 4.5 CG: 68.2 ± 4.5	Traditional physical therapy + KT (2 times a week, for a total of 6 weeks)	Conventional physical therapy	Three kinesio tapes (two Y-strips and one U-strip)	Pain, quadriceps strength, ROM	VAS, isokinetic dynamometer, universal goniometer	No significant differences
Maqbool et al. 2024	RCT	34 patients with KOA (EG: 17, CG: 17)	19/15	EG: 51.29 ± 6.48 CG: 48.00 ± 6.54	Combined chain exercises + KT (2 times a week, for a total of 4 weeks)	Sham taping	Two kinesio tapes (one Y-strip and one I-strip)	Pain, ROM, QOL	NPRS, goniometer, SF-36	Significant differences in all outcomes
Pakkir Mohamed et al. 2023	RCT	40 patients with KOA (EG: 20, CG: 20)	40/0	EG: 60.60 ± 9.43 CG: 63.40 ± 7.98	TENS and exercise therapy + KT (2 times a week, for a total of 6 weeks)	Conventional physical therapy	Four kinesio tapes (two Y-strips and two I-strips)	Pain, knee ROM, Functional status, mobility	NPRS, goniometer, WOMAC, TUG test	No significant differences
Nosheen et al. 2023	RCT	60 patients with KOA (EG: 15, CG: 15)	35/25	EG: 54.30 ± 5.61 CG: 53.45 ± 7.73	Interferential therapy and isometric exercises + KT (2 times a week, for a total of 4 weeks)	Endurance training with therapeutic band	Elastic therapeutic kinesio tape	Pain, QOL	NPRS, SF-36	No significant differences
Essam Mohamed et al. 2023	RCT	24 patients with KOA (EG: 12, CG: 12)	0/24	EG: 59.84 ± 5.52 CG: 58.54 ± 6.17	Hamstring/calf stretching and quadriceps strengthening exercises + KT (3 times a week, for a total of 4 weeks)	Conventional physical therapy	Three kinesio tapes (two Y-strips and one U-strip)	Pain, ROM, Functional status	VAS, Universal goniometer, WOMAC	No significant differences
Günaydin et al. 2022	RCT	42 patients with KOA	0/42	Mean age:	Home exercise program including	Home-based exercises	Four kinesio tapes (two Y-	Pain,	VAS, isokinetic	Significant differences

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		(EG: 22, CG: 20)		58.8 ± 6.2	neuromuscular and strengthening exercises + KT (2 times a week, for a total of 12 weeks)		strips and two I-strips)	Strength, Mobility, Knee-related function	dynamometer, TUG test, KOOS	were seen in pain.
Karakaş et al. 2022	RCT	60 patients with KOA (EG: 30, CG: 30)	13/47	EG: 60.3 ± 8.1 CG: 59.5 ± 7.2	Home exercise program + KT (2 sessions/day for 30 days; KT applied every 3 days for 3 applications)	Home-based exercises	Three kinesio tapes with Y-strip technique	Pain, Functional status, Mobility	VAS, WOMAC, TUG	No significant differences
Shah et al. 2022	RCT	40 patients with KOA (EG: 20, CG: 20)	27/13	EG: 55.55 ± 3.80 CG: 55.3 ± 3.88	Supervised exercise protocol including + KT (5 times a week, for a total of 4 weeks)	Supervised exercise protocol	McConnell patellar	Pain, Functional status	VAS, WOMAC	Significant difference in all outcomes.
Danazumi et al. 2021	RCT	60 patients with KOA (EG: 30, CG: 30)	27/33	EG: 52.3 ± 5.19 CG: 52.0 ± 6.25	Combined chain exercises + KT (3 times a week, for a total of 8 weeks)	Combined chain exercises	Three kinesio tapes (two Y-strips and one I-strip)	Pain, ROM, Mobility, QOL	VAS, Goniometer, TUG test, SF-36	Significant difference in all outcomes
Oğuz et al. 2021	RCT	22 patients with KOA (EG: 11, CG: 11)	0/22	EG: 48.18 ± 7.56 CG: 51.00 ± 3.69	Exercise training + KT (3 times a week, for a total of 6 weeks)	Exercise training	Two kinesio tapes (one Y-strip and one I-strip)	Pain, Functional status	VAS, WOMAC	No significant differences
Han et al. 2018	RCT	32 patients with KOA (EG: 16, CG: 16)	16/16	EG: 63.5 ± 5.7 CG: 61.5 ± 3.4	Thermotherapy and electrotherapy + KT (5 times a week, for a total of 4 weeks)	Thermotherapy and electrotherapy	Elastic therapeutic kinesiology tape	Pain	VAS	Significant difference in all outcomes
Bao et al. 2018	RCT	60 patients with KOA (EG: 30, CG: 30)	22/38	EG: 60.62 CG: 60.32	Therapeutic exercise + KT (for two weeks)	Therapeutic exercise	Kinesio tape with Y-strip technique	Pain, Functional status	VAS WOMAC	Significant difference in all outcomes

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León-Ballestero et al. 2018	RCT	32 patients with KOA (EG: 16, CG: 16)	0/32	EG: 56.5 ± 5.0 CG: 59.6 ± 5.2	Quadriceps strengthening and stretching exercises with elastic band + KT (3 times a week, for a total of 6 weeks)	Quadriceps strengthening and stretching exercises	Two kinesio tapes (one Y-strip and one I-strip)	Pain, Functional status	VAS, WOMAC	No significant differences
Öğüt et al. 2018	RCT	61 patients with KOA (EG: 31, CG: 30)	0/61	EG: 53.8 ± 3.5 CG: 53.1 ± 3.6	Hot pack, TENS, ultrasound, and home exercise program + KT (5 times a week, for a total of 3 weeks)	Home-based exercises	Kinesio tape with Y-strip technique	Pain, Functional status ROM, Strength	VAS, WOMAC, goniometer, isokinetic dynamometer	No significant differences
Choi et al. 2018	RCT	24 patients with KOA (EG: 12, CG: 12)	0/24	EG: 67.91 ± 0.83 CG: 67.54 ± 0.87	Home hip abductor exercise program using Thera-band + KT (3 times a week, for a total of 6 weeks)	Home-based exercises	Kinesio tape with Y-strip technique	Pain, Quadriceps muscle strength	VAS, 1RM	Significant difference in all outcomes
Aydoğdu et al. 2017	RCT	54 patients with KOA (EG: 28, CG: 26)	8/46	EG: 52.53 ± 9.68 CG: 51.19 ± 8.94	Conventional treatment including hot pack, ultrasound, TENS, stretching, and strengthening exercises + KT (5 times a week, for a total of 3 weeks)	Conventional physical therapy	Kinesio tape with Y-strip technique	Pain, ROM, Strength, Knee-related function	VAS, universal goniometer, digital muscle strength dynamometer, KOOS	No significant differences
Park et al. 2017	RCT	20 patients with KOA (EG: 10, CG: 10)	Both genders included	NA	EG: elastic Kinesio taping + magnetic field therapy after general physiotherapy (3 times a week, for a total of 6 weeks)	General physiotherapy	Elastic kinesiology tape	Pain, Functional status	VAS, WOMAC	Significant differences in all outcomes
Taheri et al. 2017	RCT	36 patients with KOA	4/32	EG: 56.4 ±	Exercise therapy + KT (3 times a	Exercise therapy + medical therapy	Three kinesiology	Pain, Mobility	VAS, TUG	Significant difference

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		(EG: 20, CG: 16)		6.4 CG: 56.1 ± 6.3	week, for a total of 6 weeks)		tapes (two Y-strips and one I-strip)			in all outcomes
Tripathi et al. 2017	RCT	30 patients with KOA (EG: 15, CG: 15)	Both genders included	>60 years	Conventional physiotherapy + KT (3 times a week, for a total of 3 weeks)	Conventional physical therapy	Kinesio tape with Y-strip technique	Pain, Functional status, Mobility	NPRS, WOMAC, TUG	Significant difference in all outcomes
Castrogiovanni et al. 2016	RCT	38 patients with KOA (EG: 19, CG: 19)	20/18	EG: 64.20 ± 14.5 CG: 63.90 ± 15.4	EG: exercise therapy + KT (for a total of 3 months)	Exercise therapy only	Three kinesio tapes (two Y-strips and one I-strip)	Pain, functional status, mobility	VAS WOMAC, TUG	Significant difference in all outcomes
Park and Lee. 2016	RCT	20 patients with KOA (EG: 10, CG: 10)	3/17	EG: 65.70 ± 7.17 CG: 66.80 ± 6.30	Joint mobilization + KT (3 times a week, for a total of 4 weeks)	Joint mobilization only	Three kinesio tapes (two Y-strips and one I-strip)	Pain, ROM, knee-related function	VAS, smartphone goniometer application, KOOS	Significant difference in all outcomes
Sarallahi et al. 2016	RCT	38 patients with KOA (EG: 19, CG: 19)	0/38	EG: 55.63 ± 8.45 CG: 55.63 ± 8.95	Conventional physiotherapy including ultrasound, hot pack, TENS, and strengthening exercises + KT (3 times a week, for a total of 10 sessions)	Conventional physical therapy	Kinesio tape with Y-strip technique	Pain, functional status	VAS, WOMAC	No significant differences
Saswadkar et al. 2016	RCT	72 patients with KOA (EG: 36, CG: 36)	26/46	EG: 52.9 ± 5.6 CG: 51.8 ± 5.8	Conventional physiotherapy + KT (1 time a day for a total of 3 days)	Conventional physiotherapy	Kinesio tape with Y-strip technique	Strength, Functional status	Dynamometer, WOMAC	No significant difference in all outcomes
Sedhom et al. 2016	RCT	40 patients with KOA (EG: 20, CG: 20)	0/40	EG: 49.25 ± 5.82 CG:	Hot packs + stretching and strengthening exercises + KT (3	Conventional physical therapy	Kinesio tape with Y-strip technique	Pain, ROM	VAS, Electronic digital goniometer	Significant difference in pain

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				48.7 ± 5.82	times a week, for a total of 4 weeks)					
Dhanakotti et al. 2015	RCT	30 patients with KOA (EG: 15, CG: 15)	7/23	EG: 51.73 ± 5.10 CG: 51.26 ± 4.86	Conventional physiotherapy including quadriceps isometrics, strengthening + KT (3 times a week, for a total of 3 weeks)	Conventional physiotherapy exercises	Two kinesio tapes (one Y-strip and one I-strip)	Pain, Strength, Functional status	NPRS, Hand-held dynamometer, WOMAC	Significant difference in all outcomes
Yu et al. 2012	RCT	40 patients with KOA (EG: 20, CG: 20)	16/24	EG: 51.12 CG: 50.97	Thermotherapy + KT (one session/day, for seven sessions)	Thermotherapy	Claw-shaped tape over painful and swelling are	Pain Functional status	VAS WOMAC	Significant difference in all outcomes

EG Experimental Group, CG Control Group, KT Kinesio Taping, KOA Knee Osteoarthritis, QOL Quality of Life, WOMAC Western Ontario and McMaster Universities Arthritis Index, KOOS Knee Injury and Osteoarthritis Outcome Score, TUG Timed Up and Go, NPRS Numeric Pain Rating Scale, ROM Range of Motion, VAS Visual Analogue Scale, 6MWT 6-Minute Walk Test, SF-36 36-Item Short Form Survey, EQ-5D EuroQol- 5 Dimension, JKOM Japan knee osteoarthritis measure

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Table 2: Critical appraisal results of eligible systematic reviews

Study	1	2	3	4	5	6	7	8	9	10	11	Total	Quality
Choi et al. 2025	1	1	0	1	0	0	0	0	0	1	1	4/10	Fair
Yoon et al. 2025	1	1	0	1	1	0	0	1	0	1	1	6/10	Good
Alkhamees et al. 2024	1	1	1	1	0	0	1	1	0	1	1	7/10	Good
Ahmad et al. 2024	1	0	0	0	0	0	0	1	0	1	1	3/10	Poor
Kavitha and Kotteeswaran. 2024	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Kawaguchi et al. 2024	1	1	0	1	1	0	0	1	0	1	1	6/10	Good
Kumar et al. 2024	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Mahmoud et al. 2024	1	1	0	0	0	0	1	1	0	1	1	5/10	Fair
Maqbool et al. 2024	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Pakkir Mohamed et al. 2023	1	1	0	1	1	0	1	1	0	1	1	7/10	Good
Nosheen et al. 2023	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Essam Mohamed et al. 2023	1	1	0	1	0	0	1	1	0	1	1	6/10	Good
Günaydin et al. 2022	1	1	1	1	0	0	1	1	1	1	1	8/10	Good
Karakaş et al. 2022	1	1	1	1	0	0	1	1	1	1	1	8/10	Good
Shah et al. 2022	1	1	1	1	0	0	1	1	1	1	1	8/10	Good
Danazumi et al. 2021	1	1	1	1	0	0	1	0	1	1	1	7/10	Good
Oğuz et al. 2021	1	1	0	1	0	0	1	1	0	1	1	610	Good
Han et al. 2018	1	1	1	1	0	0	0	1	0	1	1	6/10	Good
Bao et al. 2018	1	1	0	1	0	0	1	1	0	1	1	6/10	Good
León-Ballestero et al. 2018	1	1	1	1	0	0	1	1	1	1	1	8/10	Good
Öğüt et al. 2018	1	1	1	1	1	0	0	1	0	1	1	7/10	Good
Choi et al. 2018	1	1	1	1	0	0	0	1	0	1	1	6/10	Good
Aydoğdu et al. 2017	1	1	1	1	0	0	0	1	0	1	1	6/10	Good
Park et al. 2017	1	1	0	0	0	0	0	0	0	1	1	3/10	Poor
Taheri et al. 2017	1	1	0	1	0	0	1	1	0	1	1	6/10	Good
Tripathi et al. 2017	1	1	0	1	0	0	0	0	0	1	1	4/10	Fair
Castrogiovanni et al. 2016	1	1	0	0	1	0	1	1	0	1	1	6/10	Good
Park and Lee. 2016	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Sarallahi et al. 2016	1	1	0	0	0	0	0	1	0	1	1	4/10	Fair
Saswadkar et al. 2016	1	1	1	0	0	0	1	1	0	1	1	6/10	Good
Sedhom et al. 2016	1	1	0	1	0	0	0	1	0	1	1	5/10	Fair
Dhanakotti et al. 2015	1	1	0	1	0	0	1	1	0	1	1	6/10	Good
Yu et al. 2012	1	1	0	1	0	0	1	1	0	1	1	6/10	Good

Abbreviation: PEDro, Physiotherapy Evidence Database. Descriptions of PEDro scale items: (1) eligibility criteria, (2) random allocation, (3) concealed allocation, (4) baseline comparability, (5) anonymization of participants, (6) anonymization of therapists, (7) anonymization of assessors, (8) adequate follow-up;

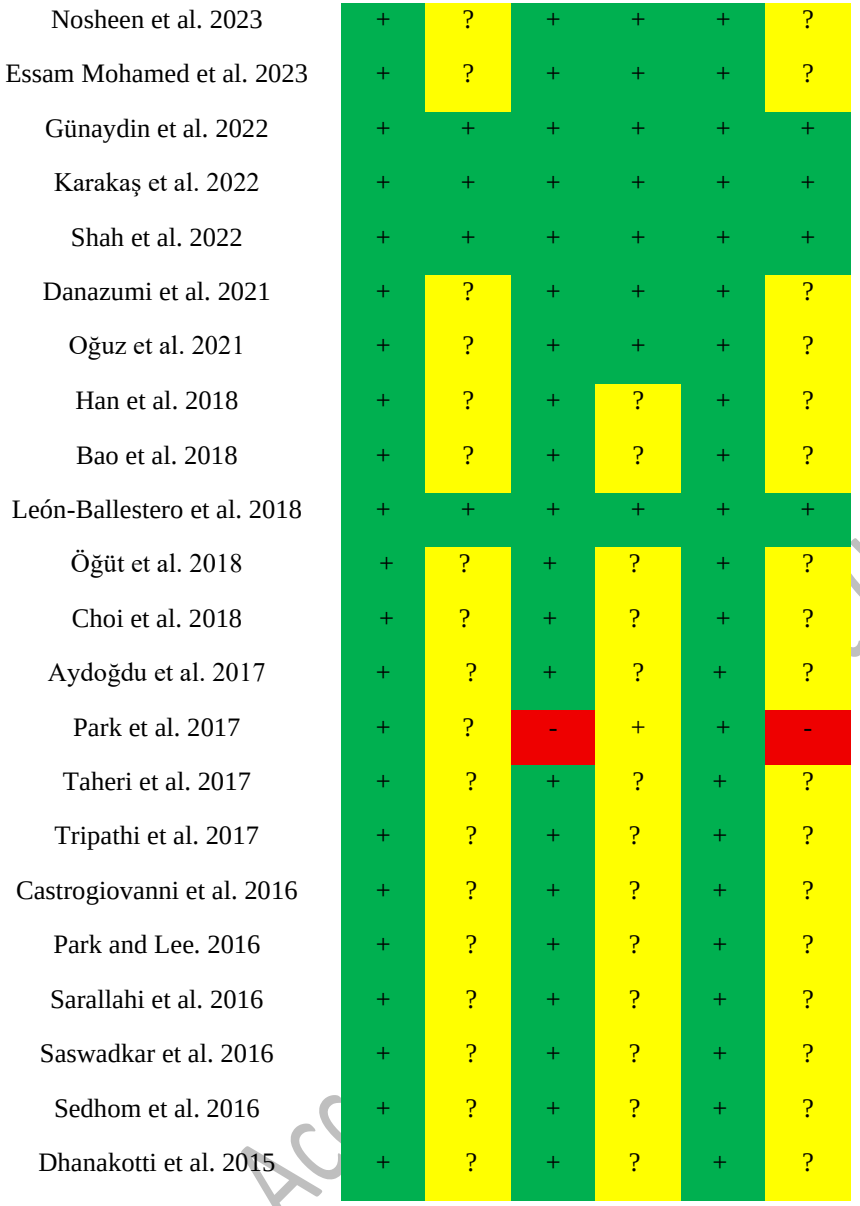
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(9) intention-to-treat analysis, (10) between-group comparisons, and (11) point estimates and variability. Rating Scale: ≤3 = Poor, 4–5 = Fair, 6–8 = Good, 9–10 = Excellent

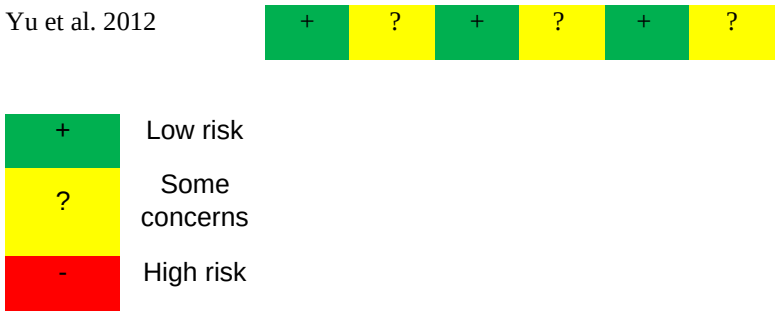
Table 3. Risk of bias in RCTs

Study	Randomization process	Deviations from intended intervention	Missing outcome data	Measurement of the outcome	Selection of the reported result	Overall
Choi et al. 2025	?	+	+	?	+	?
Yoon et al. 2025	+	?	+	+	+	?
Alkhamees et al. 2024	+	?	+	+	+	?
Ahmad et al. 2024	+	?	-	+	+	-
Kavitha and Kotteeswaran. 2024	+	?	+	+	+	?
Kawaguchi et al. 2024	+	?	+	?	+	?
Kumar et al. 2024	+	?	+	+	+	?
Mahmoud et al. 2024	+	?	+	+	+	?
Maqbool et al. 2024	+	?	+	+	+	?
Pakkir Mohamed et al. 2023	+	?	+	?	+	?

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