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Effectiveness of Isokinetic Muscle Strength Training on Knee Osteoarthritis Patients: A Meta-Analysis and Grading Recommendations (GRADE) System

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ABSTRACT

Background: Isokinetic muscle strength training (IMST) is a method of assessing and training muscle strength through a fixed speed of movement to test and enhance muscle strength. The purpose of this systematic review was to systematically evaluate the effects of isokinetic exercises on knee osteoarthritis (KOA), and to provide a basis for further application and research of this training method.

Methods: We searched for randomized controlled trials (RCTs) comparing isokinetic exercises versus other medical care for KOA patients, six databases (CBM, PubMed, Cochrane Library, Web of Science, CNKI, and Wan Fang), two clinical trial registries and one gray literature database were searched from inception to January 1, 2024. Two investigators independently screened literature, extracted data, and assessed risk of bias according to the Cochrane Handbook Version 6.1.0. The RevMan 5.4 software was used to perform the meta-analysis. Overall quality of evidence was rated using GRADE (Grading of Recommendations, Assessment, Development and Evaluation).

Results: 19 RCTs involving 1386 patients were finally included. Three of which had high risk bias. Compared with other treatments, IMST can significantly increase Lysholm score (SMD = 1.21, 95% CI: [-0.62, 3.04], I2=95%, P < .05, very low certainty), extensor peak torque (SMD = 4.12, 95% CI: [-0.17, 8.41], I2=74%, P < .05, very low certainty) and flexor peak torque of KOA patients (SMD = 7.94, 95% CI: [4.23, 11.66], I2=71%, P < .05, low certainty). Besides, IMST can significantly decrease the VAS score (SMD = -0.64, 95% CI: [-1.19, -0.10], I2=95%, P < .05, Moderate certainty) and WOMAC total score (SMD = -6.96, 95% CI: [-15.85, 1.92], I2=98%, P < .05, Moderate certainty), as well as improved the function of knee, relief the pain and stiffness.

Conclusion: IMST can effectively improve motor function and reduce pain of KOA. In order to better improving the quality of life of relevant patients and give more reliable advice, more trials of direct comparisons are needed to inform clinical decision making with greater confidence.

INTRODUCTION

Osteoarthritis (OA) is a degenerative bone and joint disease. Its typical pathological features include articular cartilage destruction, subchondral osteosclerosis and osteophyte formation. Osteoarthritis tends to occur in knee joint, hip joint, spine and finger joint with heavy load, and is a common factor leading to disability in the elderly Cui et al. (2023). Knee osteoarthritis (KOA) is a kind of disease in the knee joint and its surrounding muscles and muscles. Studies have shown that KOA is related to age, nutrition, knee structural abnormalities, quadriceps muscle strength and hyaluronic acid concentration Hyoung-Won et al. (2019). Patients with KOA have atherogenic muscle weakness in the muscles around the knee joint. The pathogenesis of knee osteoarthritis is closely related to the abnormal biomechanics of muscles. Muscle function not only plays an important role in joint movement, but also participates in stress absorption, proprioception and joint stability, which plays a key role in joint protection Tang et al. (2018). The peripheral muscle function of knee joint affects the occurrence and development of KOA. At present, muscle strength training, as a non-invasive and efficient means of treatment, is increasingly used in the rehabilitation of muscle function Xiang et al. (2018). Isokinetic technique is widely used in various stages of rehabilitation treatment, mainly to improve the muscle strength of injured joints. KOA patients are mostly older, with chronic diseases such as hypertension and diabetes Kucuk et al. (2017), and isokinetic technology provides a safe and effective means of rehabilitation for such patients He et al. (2018) Previous systematic reviews of the effectiveness of isokinetic muscle strength training (IMST) on KOA

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were outdated, and mixed combined interventions that hinder certain synthesis of evidence Bartholdy et al. (2017), Zacharias et al. (2014). Our goal is to conduct a more focused and comprehensive synthesis of evidence on the solo effect of isokinetic muscle strength to more clearly define its contribution as an adjunct therapy to the KOA rehabilitation program. As one of the ways to generate high-quality evidence, especially the comprehensive analysis providing guidance and enlightenment for clinical practice, systematic reviews and meta-analysis was used in many fields. Therefore, this study systematically analyzed the clinical effect of isokinetic muscle strength training on improving the muscle function of knee osteoarthritis, in order to provide a more comprehensive evidence-based basis for clinical rehabilitation.

MATERIALS AND METHODS

Search Strategy

Six databases PubMed, Cochrane Library, Web of Science, CNKI, CBM and Wan Fang were used to identify relevant trials from inception through January 1, 2024, with no language restrictions. In addition, we conducted supplementary searches through the WHO International Clinical Trials Registry Platform (ICTRP) Search Portal and grey literature. The main search strategies were as follows: ("knee osteoarthritis" OR "osteoarthritis" OR "knee joint osteoarthritis" OR "osteoarthritis of knee" OR "osteoarthritis of knee joint" OR "OA") AND ("isokinetic exercise" OR "isokinetic training" OR "isokinetic muscle strengthen" OR "isokinetic muscle strength training") We did not register our study protocol in the PROSPERO database because a significant portion of the data acquisition and quality assessment had been conducted prior to the initiation of the present work, in the context of another project that was completed by two of the investigators. The full search strategy is available in the Supplemental Material 1.

Inclusion and exclusion criteria

According to the PICO framework, we examined each reference during the screening process for specific elements: participants with KOA, IMST interventions, comparisons of other treatments (or no treatment), and assessment of pain, function, and flexor/extensor peak torque value. We excluded studies that involved mixed interventions or populations (e.g., patients with both knee and hip OA without separate outcomes for knee OA alone). Although mixed interventions may be common in practice, including them in our analysis could introduce clinical heterogeneity and increase variability in the estimated effects from meta-analyses. Studies were excluded if they did not provide numerical outcome data or were abstracts from meetings or letters.

Study selection, data extraction and Risk of Bias Assessment

Eligible studies were screened in their entirety and developed a data extraction form, and the information including authors and year of publication, publication type, sample size, gender, type of treatment was recorded in an Excel spreadsheet. We pre-tested it on five studies and subsequently adapted the final version. Two reviewers (JY-L and JW-L) independently conducted trial screening and data extraction, when the disagreement existed, conflicts were resolved by the third reviewer. Study authors contacted to request additional information if a study was eligible based on the inclusion criteria, but not all required data could be retrieved from the full-text. Overall, we adopted a conservative procedure in that we excluded studies for which ambiguity about the primary data source could not be resolved or the information necessary for effect size calculation could not be acquired. Two study investigators (JY-L and JW-L) independently rated the quality of included trials using the Cochrane Risk of Bias Tool.

Heterogeneity, sensitivity, and publication bias

According to the Cochrane Handbook Version 6.1.0, we evaluated statistical heterogeneity using the I2 statistic, with values over 50% suggesting substantial heterogeneity WU et al. (2021). The "Leave-one-out" method is used in sensitivity analyses to check for outliers that potentially influence the results of the meta-analysis disproportionately. All analyses were performed repeatedly with each study removed once to detect whether overall results depend on a single study. Publication bias was assessed by funnel plot Parmley et al. (1994). If any bias could be assumed based on these analyses, we planned to apply the trim-and-fill procedure to estimate the unbiased overall effect.

Data synthesis and statistical analysis

In analyzing continuous data, we calculated SMDs and 95% CIs. To account for clinical and methodological heterogeneity. To aid in interpretation of SMDs, we used the approach from Bliddal and Christensen. The fixed-effects model and the random-effects model are based on different assumptions. The results of meta-analysis using fixed-effect models are limited to specific populations Li et al. (2021). As we cannot expect these studies included in the research to show the same widespread impact; the fact that the studies were conducted under different conditions (i.e., days of treatment, etc.) could indispensably cause differences among the results. Thus, in the identification of effect sizes during the present meta-analytical processes, analyses were conducted according to the random effects model. The whole process of data analysis was performed in Review

Manager 5.4 LI et al. (2021).

Certainty Assessment

We utilized the GRADE approach to assess the confidence in estimates derived from meta-analysis of efficacy outcomes Santesso et al. (2020). In this methodology, initial high confidence is assigned to direct evidence from RCTs, which may be subsequently downgraded based on factors such as bias risk, indirectness, imprecision, inconsistency (or heterogeneity), and/or publication bias, resulting in moderate, low, or very low levels of confidence. The rating for indirect estimates commences at the lowest rating among the two pairwise estimates that contribute as first-order loops to the indirect estimate but can be further downgraded due to imprecision or intransitivity (differences between studies regarding clinical or methodological characteristics). If direct and indirect estimates were similar (i.e., coherent), then the higher of their rating can be assigned to the meta-analysis estimates.

RESULTS

Selection and Characteristics of Studies

A flow diagram showed in Figure 1. From a total 786 unique studies identified using our search strategy, 201 trials were removed because of duplication. 502 trials were removed according to titles and abstracts. After excluded 64 unsuitable full-text RCTs, 19 full-text publications met the requirements for the final inclusion Rang Min et al. (2022), Chen Wei et al.(2022), Zhen Tiansai et al. (2019), Zhang Xiuku et al.(2019), Zhang Jie et al.(2019), Xu Yuanhong et al. (2015), Yu Xiaojie et al. (2007), Nambi et al. (2020), Rosa et al. (2012), Weng et al. (2009), Huang et al. (2005), Huang et al. (2005), Huang et al. (2003), GüR et al. (2002), Maurer et al. (1999), Bahşi et al. (2022), Salli et al. (2010), Li Xiang et al. (2016), Qin Youlai Zhen et al. (2019), Küçük et al. (2017).

Figure 1: Flow diagram of the literature screening

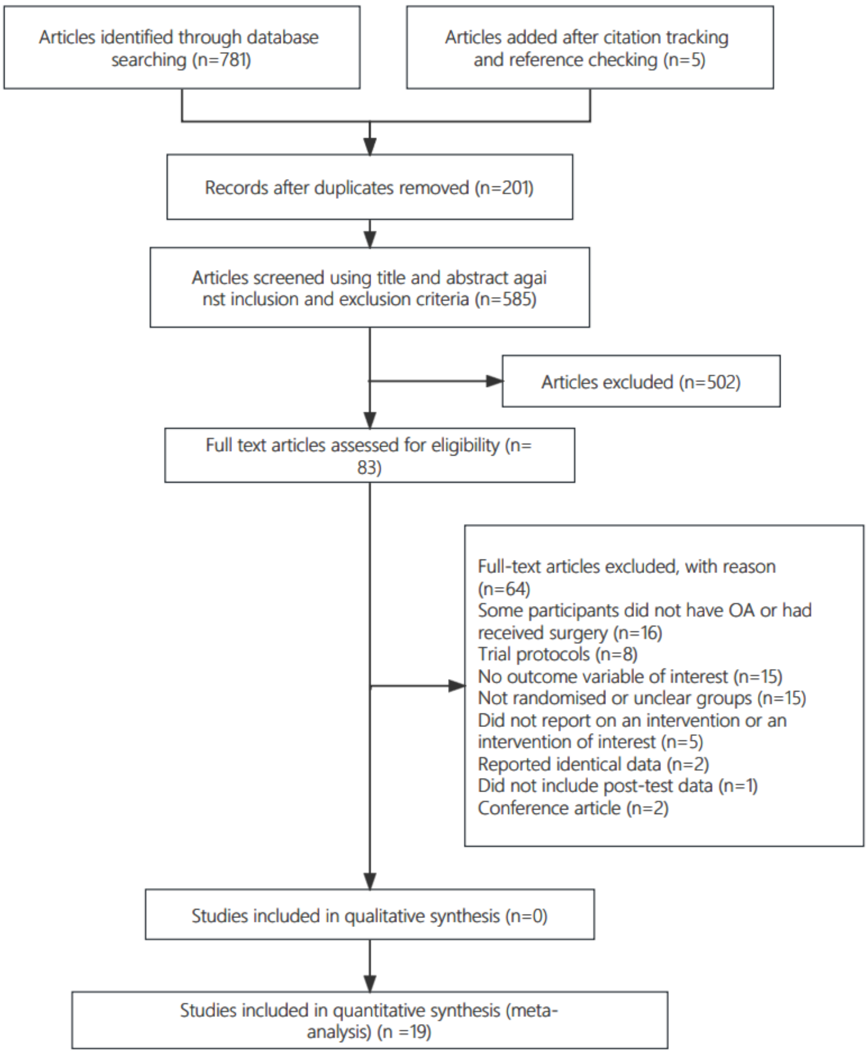


Table 1: Characteristic of the studies included in the meta-analysis

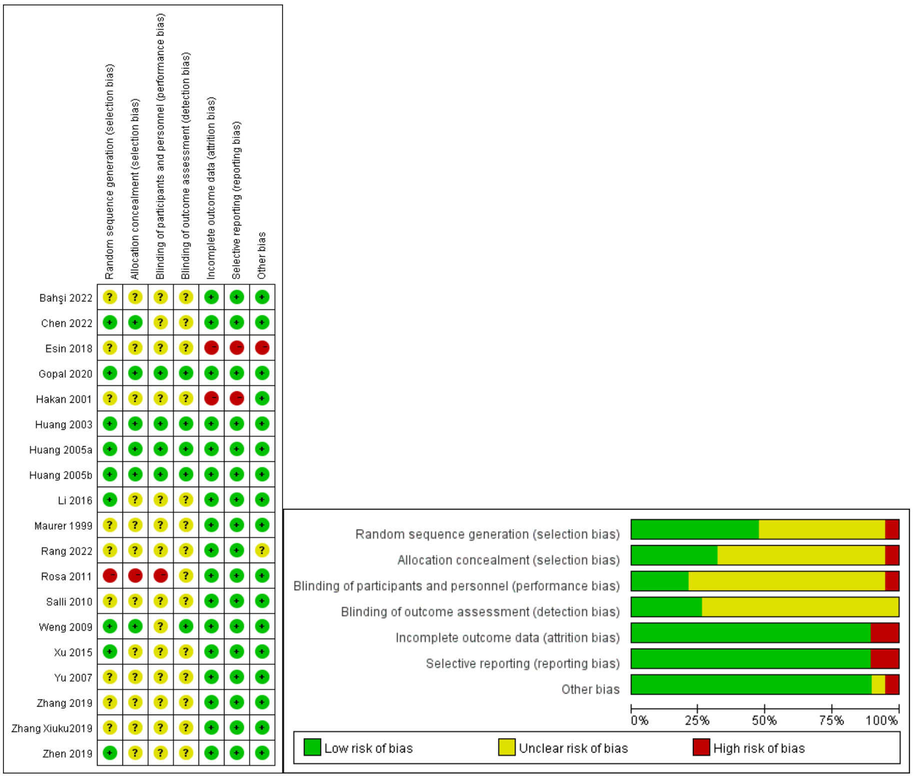
Study	Country	Participants	Intervention duration	Experimental Intervention	Control Intervention	Outcome indicators
Chen 2022[15]	China	Total number: 82(65F, 17M) Mean age: 60.8 ± 6.3	8-week	Isokinetic exercise	Warm moxibustion	WOMAC score; VAS score; Peak torque;
Ayşe Bahşi2022[29]	Turkey	Total number: 120(96F, 24M) Mean age: 63	8-week	Isokinetic exercise	Isotonic Exercise Isometric Exercise	WOMAC score; VAS score;
Rang 2022[14]	China	Total number: 81(38F, 43M) Mean age: 59.2±2.3	8-week	Isokinetic exercise	Conventional treatment + Tuina	VAS score; Lysholm score ; Quality of life
Gopal2020[21]	Saudi Arabia	Total number: 60 Mean age: 22.3±1.2	4-week	Isokinetic exercise	Sensory motor training	WOMAC score; VAS score;
Zhang 2019[18]	China	Total number: 68 Mean age: 61.0±6.2	4-week	Isokinetic exercise	Routine nursing care Laser therapy	WOMAC score; Peak torque;
Zhen 2019[32]	China	Total number: 120(68F, 52M) Mean age: 55.67±10.02	8-week	Isokinetic exercise	Routine nursing care	VAS score; Lysholm score
Zhang Xiuku 2019[17]	China	Total number: 120(96F, 24M) Mean age: 55.67±10.02	8-week	Isokinetic exercise	Isotonic combined Isometric Exercise	Peak torque;
Esin2018[33]	Turkey	Total number: 120(96F, 24M) Mean age: 69	7-week	Isokinetic exercise	Aerobic exercise Isometric Exercise	WOMAC score; VAS score;
Li 2016[31]	China	Total number: 60(37F, 23M) Mean age: 50.7± 11.5	10 days	Isokinetic exercise	Acupuncture	WOMAC score; Peak torque;
Xu 2015[19]	China	Total number: 60 Mean age: /	8-week	Isokinetic exercise	Warm moxibustion	VAS score; Lysholm score ; Peak torque;
Rosa 2011[22]	Mexico	Total number: 60(4F, 56M) Mean age: 56.25±6.59	8-week	Isokinetic exercise	Isometric Exercise	VAS score;
Salli 2010[30]	Turkey	Total number: 75(62F, 13M) Mean age: 55.73 ± 8.23	8/20-week	Isokinetic exercise	Isometric Exercise No treatment	WOMAC score; VAS score;
Weng2009[23]	China	Total number: 66 Mean age: 64.0±7.5	8-week	Isokinetic exercise	No treatment	WOMAC score;
Yu 2007[20]	China	Total number: 45 Mean age: 62±9.8	8-week	Isokinetic exercise	Isometric Exercise No treatment	VAS score;
Huang2005[25](a)	China	Total number: 70 Mean age: /	8-week	Isokinetic exercise	No treatment	VAS score; Peak torque;
Huang2005(b)[24]	China	Total number: 60 Mean age: 62.0±8.4	8-week	Isokinetic exercise	No treatment	VAS score; Peak torque;
Huang2003[26]	China	Total number: 132 Mean age: /	8-week	Isokinetic exercise	No treatment	Measurement of Pain Severity
Hakan Gur 2001[27]	Turkey	Total number: 23 Mean age: 62.0±8.4	8-week	Isokinetic exercise	Isometric Exercise No treatment	VAS score; Peak torque;
Maurer1999[28]	USA	Total number: 113(47F, 66M) Mean age: 66.3±8.8	8-week	Isokinetic exercise	OA education and self-management	WOMAC score;

As shown in Table 1, a total of 19 trials involving 1386 KOA were included, the duration of intervention was range from 10 days to 20 weeks. 12 RCTs (63.16%) were published in China, four of them was published in English language and others were in Chinese. Among the results of interventions, seven trials made a comparison between the IMST and non-intervention. Six trials made a comparison between the IMST and isometric exercise. Three trials made a comparison between the IMST with traditional Chinese medicine treatment (acupuncture, warm moxibustion and Tuina).

Risk of bias

As shown in Figure 2, 47.3% trials (n=9) were judged as "low risk of bias" in the random sequence generation analysis. 73.68% (n=14) were judged were judged as "unclear risk of bias" in the blinding of outcome assessment and blinding of participants because of unclear reports. 89.47% (n=17) were judged as "low risk bias" in the analysis of incomplete outcome data and selective reports.

Figure 2: Risk of bias assessment for the included studies



Synthesis analysis

Lysholm score

Six trials involving 411 patients evaluated the effectiveness of IMST for KOA patients. The random effect meta-analysis showed that, compared with other treatments, IMST can significantly increase the Lysholm score of KOA patients (SMD = 1.21, 95% CI: [-0.62, 3.04], I2=95%, $P < .05$). The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 3)

Extensor peak torque

Eight trials involving 546 patients evaluated the effectiveness of IMST for KOA patients. The random effect meta-analysis showed that, compared with other treatments, IMST can significantly increase the extensor peak torque of KOA patients (SMD = 4.12, 95% CI: [-0.17, 8.41], I2=74%, $P < .05$).

The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 4)

Flexor peak torque

Six trials involving 425 patients evaluated the effectiveness of IMST for KOA patients.

The random effect meta-analysis showed that, compared with other treatments, IMST can significantly increase the flexor peak torque of KOA patients (SMD = 7.94, 95% CI: [4.23, 11.66], I2=71%, $P < .05$).

The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 5)

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Figure 3: Meta-analysis for Lysholm score of KOA patients

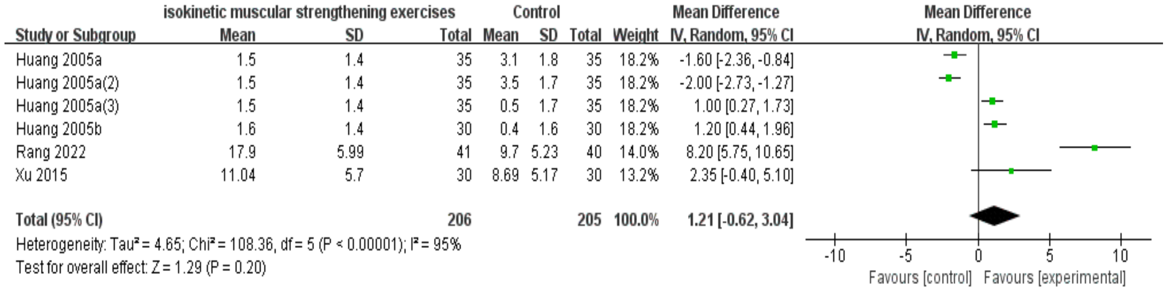


Figure 4: Meta-analysis for extensor peak torque of KOA patients

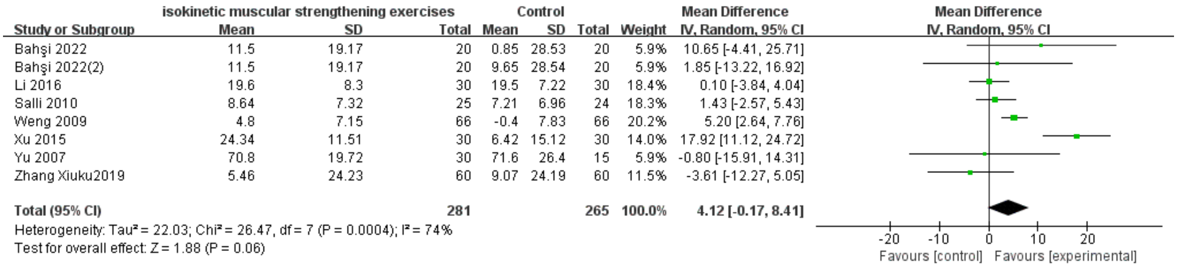
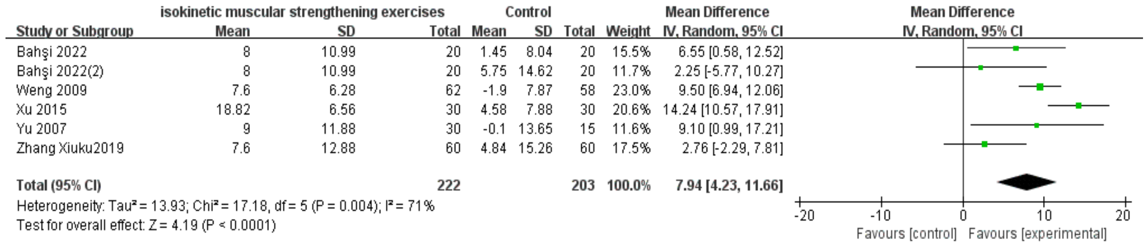


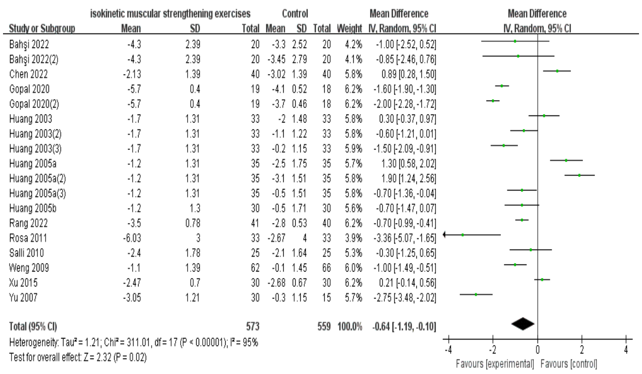
Figure 5: Meta-analysis for the flexor peak torque of KOA patients



VAS score

18 trials involving 1132 patients evaluated the effectiveness of IMST for KOA patients. The random effect meta-analysis showed that, compared with other treatments, IMST can decrease the VAS score of KOA patients (SMD = -0.64, 95% CI: [-1.19, -0.10], I2=95%, P < .05). The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 6)

Figure 6: Meta-analysis for VAS score of KOA patients



WOMAC total score

Nine trials involving 441 patients evaluated the effectiveness of IMST for KOA patients.

The random effect meta-analysis showed that, compared with other treatments, IMST can significantly decrease the WOMAC total score of KOA patients (SMD = -6.96, 95% CI: [-15.85, 1.92], I2=98%, P < .05). The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 7)

WOMAC sub-score

Four trials involving 169 patients showed that IMST can significantly decrease the WOMAC pain score (SMD = -1.66, 95% CI: [-2.45, -0.88], I2=0%, P > .91); WOMAC stiffness score (SMD = -1.78, 95% CI: [-3.63, 0.07],

I2=34%, P > .21); WOMAC function score (SMD = -4.64, 95% CI: [-9.41, 0.13], I2=0%, P > .40). The sensitivity analysis showed that no single study significantly affected overall heterogeneity. (Figure 8)

Figure 7: Meta-analysis for WOMAC total score of KOA patients

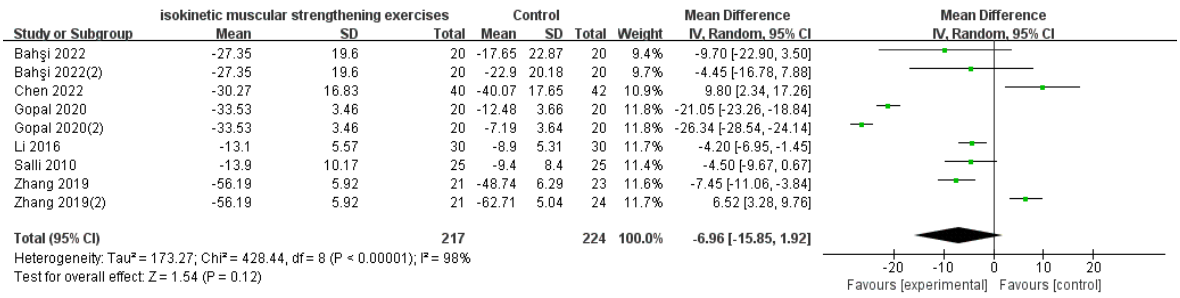
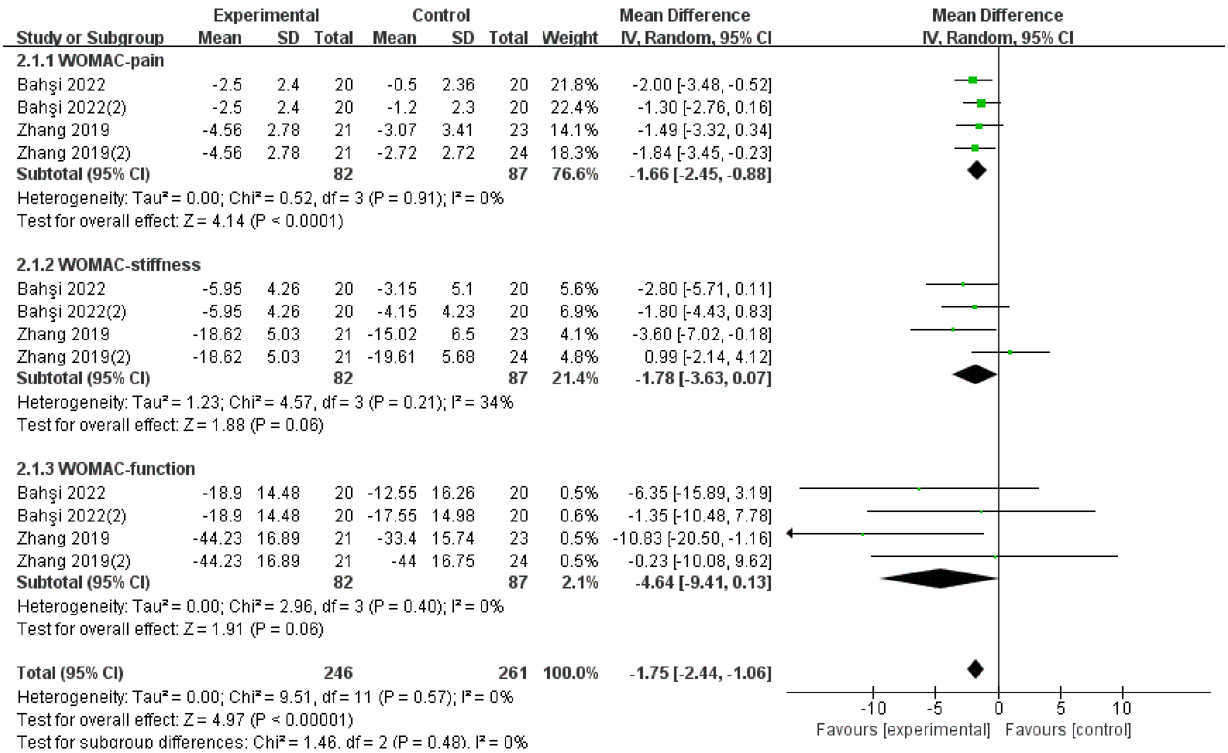


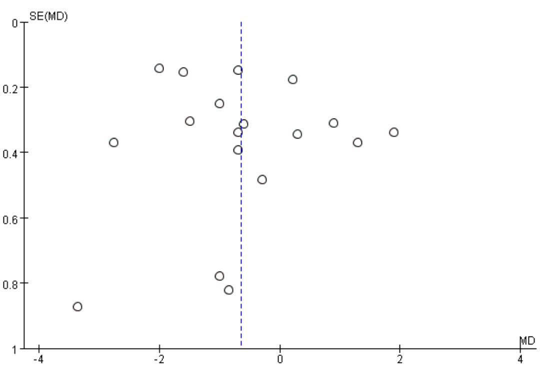
Figure 8: Meta-analysis for WOMAC sub-score of KOA patients



Sensitivity and Publication Bias

According to the "leave-one-out" strategy, 18 effect sizes of VAS score estimated values from -.39 to -.31 were got, indicated that there were no particularly prominent sensitivity issues in the included literature. Funnel plot shown a certain publication bias, and there was no obvious change in the results after the trim and -fill estimate.

Figure 8: Publication bias of included studies



Evidence Certainty

As shown in Table 3, the certainty of the evidence from very low to moderate according to the assessments of inconsistency (high heterogeneity between studies), study design (methodology, such as trial design), and other considerations (such as risk of bias or small effect sizes). Among all the outcomes, outcomes of Lysholm score and extensor peak torque were rated as very low- quality evidence. Flexor peak torque was rated as low evidence. VAS score, WOMAC relevant scores were rated as moderate level

DISCUSSION

This study focused on the clinical effect of IMST on improving muscle function in knee osteoarthritis. A total of 19 RCTs were included, involving 1386 patients. Through a meta-analysis of the main clinical indicators reflecting muscle function, the results showed that IMST could improve Lysholm's knee

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Table 3: Summary of finding

Certainty assessment							№ of patients		Effect	Certainty
№ of trials	**Study design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Isokinetic muscle strength training**	**Control**	**Absolute** (95% CI)	
Lysholm score										
6	Serious	Serious	Very serious	Not serious	Not serious	Not serious	206	205	SMD = 1.21, 95% CI: [-0.62, 3.04]	⊕◯◯◯ Very Low
Extensor peak torque										
8	Serious	Not serious	Very serious	Not serious	Not serious	Not serious	281	265	SMD = 4.12, 95% CI: [-0.17, 8.41]	⊕◯◯◯ Very Low
Flexor peak torque										
6	Serious	Not serious	Serious	Not serious	Not serious	Not serious	222	203	SMD = 7.94, 95% CI: [4.23, 11.66]	⊕⊕◯◯ Low
VAS score										
18	Serious	Not serious	Not serious	Not serious	Not serious	Not serious	573	559	SMD = -0.64, 95% CI: [-1.19, -0.10]	⊕⊕⊕◯ Moderate
WOMAC total score										
9	Serious	Not serious	Not serious	Not serious	Not serious	Not serious	217	224	SMD = -6.96, 95% CI: [-15.85, 1.92]	⊕⊕⊕◯ Moderate
WOMAC pain score										
4	Serious	Not serious	Not serious	Not serious	Not serious	Not serious	82	87	SMD = -1.66, 95% CI: [-2.45, -0.88]	⊕⊕⊕◯ Moderate
WOMAC stiffness score										
4	Serious	Not serious	Not serious	Not serious	Not serious	Not serious	82	87	SMD = -1.78, 95% CI: [-3.63, 0.07]	⊕⊕⊕◯ Moderate
WOMAC function score										
4	Serious	Not serious	Not serious	Not serious	Not serious	Not serious	82	87	SMD = -4.64, 95% CI: [-9.41, 0.13]	⊕⊕⊕◯ Moderate

Abbreviations: CI, confidence interval; RCT, randomized controlled trial; SMD, standardized mean difference.
Note:

High quality: Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality: We are very uncertain about the estimate.

Downgraded for imprecision (inadequate sample size).

Downgraded for inconsistency (results were inconsistent across studies: I2=98%, statistical test for heterogeneity $P < 0.05$)

function score, increase the both flexor and extensor peak torque value, and reduce VAS and WOMAC scores. It showed that muscle strength training is effective in improving muscle function, relieving pain and improving peak torque. At present, the management of KOA primarily involves surgical intervention, medication therapy, and rehabilitation. Rehabilitation treatment, particularly muscle strength training, offers a safe, efficient, and adaptable approach to breaking the cycle of muscle atrophy, mechanical instability, and pain

Nambi et al. (2020). Muscle strength training encompasses isometric exercises for muscle strengthening without joint movement; isotonic exercises involving joint movement against resistance; and isokinetic exercises that control resistance throughout the range of motion. The goal of KOA rehabilitation is to alleviate pain, prevent muscle weakness, and preserve joint function along with peripheral muscles. Pain stands out as a prominent symptom experienced by individuals with KOA. Its origin may be linked to mechanical injury or inflammation-induced stimulation of peripheral nerves leading to increased pain intensity. IMST enhances nerve activity while improving movement coordination for more balanced mobility. The major symptom experienced by patients with KOA is pain, which can be attributed to mechanical injury and inflammation. IMST has been shown to enhance nerve activity, improve movement coordination, and increase exercise efficiency compared to traditional training methods. Previous studies have demonstrated that KOA patients reported significant reductions in pain as measured by the VAS after 5 weeks of isokinetic muscle strength training Bahşi et al. (2022). In this study, both the study group and control group exhibited lower VAS post-treatment compared to pre-treatment; however, the study group displayed significantly lower VAS scores than the control group. These findings suggest that isokinetic muscle strength training may be more effective in alleviating pain among KOA patients when compared to simple the decline in muscle function of the knee joint leads to instability, resulting in both localized pain and impaired knee joint function, which is a contributing factor to KOA Wu et al. (2021). KOA can cause disuse atrophy due to reduced muscle function and abnormal stress distribution on the articular surface, exacerbating joint imbalance and accelerating disease progression. Previous studies have shown that IMST can alleviate cartilage wear caused by excessive concentration of local stress by enhancing knee joint muscle function, thereby reducing pain Lee et al. (2018). Furthermore, it can improve knee joint stability by alleviating abnormal muscle tension and decreasing pain associated with tissue dissociation. IMST helps maintain knee joint stability by increasing the strength and coordination of the muscles surrounding it. Additionally, it ensures stable angular velocity during movement without acceleration, thus reducing impact load on the joints and facilitating better recovery of muscle function and knee joint stability Cui et al. (2023). The comprehensive findings of this study indicated that compared to isometric exercise, isotonic exercise, warm acupuncture intervention, aerobic exercise, and conventional rehabilitation treatment, there were significant improvements in the Lysholm score and extensor and flexor PT. The study suggested that enhancing the muscle strength of knee joint extensors and flexors can effectively maintain knee joint stability Cui et al. (2023). Furthermore, IMST helps maintain joint flexibility, enhances neuromuscular control of the joint, improves patellar-femoral contact area, and increases joint mobility Bahşi et al. (2022). The primary objective of KOA treatment is to optimize overall well-being. Due to the limited availability of data on quality of life as an outcome measure in this study, conducting a meta-analysis is not feasible. Research has demonstrated that compared to traditional muscle strength rehabilitation training combined with massage therapy, 8 weeks of isokinetic muscle strength training significantly improves the quality of life for KOA patients. Survey findings indicate that over 80% of individuals aged 60 and above suffer from KOA Gezginaslan et al. (2018). Considering the increasing prevalence of knee arthritis among younger populations, this study's results also suggest that 4-week of IMST effectively alleviates pain in young individuals with KOA when compared to sensory motor training Rang Min et al. (2022). These findings imply that IMST offers greater advantages in improving quality of life, thereby facilitating normal daily activities and work for patients.

Although this Meta-analysis concluded the positive effect of isokinetic muscle strength training in the treatment of KOA, there were still some limitations. Firstly, variations in sample size and experimental design across different studies may impact the stability and generalizability of the results. Secondly, factors such as disease severity, patient age, and gender in different studies may influence the assessment of treatment efficacy. Future research could consider expanding sample sizes and controlling for potential confounding variables to enhance result accuracy and reliability.

CONCLUSION

This meta-analysis showed that isokinetic strength training can play a positive role in the treatment of KOA. However, the limitations of the trial and low-quality evidence reminded us we need to puts forward higher requirements for the application of methodology and quality assurance in the future study.

DECLARATIONS

Conflict of Interests

The authors declare that there is no conflict of interests.

Acknowledgments

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Highlights

•Isokinetic exercise is commonly used as an adjunctive treatment in rehabilitation of osteoarthritis.

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•Isokinetic muscle strength training may provide benefits for knee osteoarthritis, but its isolated effects have not been systematically assessed.

•High-quality randomized controlled trials are needed to confirm the efficacy of isokinetic muscle strength training for knee osteoarthritis.

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