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ORIGINAL

EFFICACY OF OPPOSING NEEDLING TECHNIQUE IN MANAGING KNEE OSTEOARTHRITIS AMONG ATHLETES: A META-ANALYSIS

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ABSTRACT

Objective: This meta-analysis aims to assess the clinical efficacy of opposing needling for treating knee osteoarthritis (KOA) in athletes, focusing on pain management, mobility improvement, and overall recovery, which are critical for maintaining athletic performance. Methods: A systematic search was conducted across several databases including China National Knowledge Infrastructure, China Biology Medicine disc, Wanfang Data Knowledge Service Platform, VIP Database for Chinese Technical Periodicals, PubMed, Web of Science, Cochrane Library, and EMBASE. Randomized controlled trials (RCTs) were selected based on strict inclusion and exclusion criteria. Data extraction and quality assessment were performed, followed by a meta-analysis using Revman 5.4 and Stata 14.0 software. Results: The meta-analysis revealed a higher clinical efficacy rate in the opposing needling group compared to the control group (RR=1.18, 95%CI [1.12,1.25], P<0.0001). Significant improvements were also observed in pain reduction, as indicated by lower VAS scores (MD=-1.31, 95%CI [-1.70, -0.93], P<0.0001), and in functional mobility, as reflected by improved WOMAC scores (MD=-10.17, 95%CI [-13.64, -6.69], P<0.0001). However, the differences in Lysholm scoring, which relates specifically to knee stability and function in sports, did not show statistical significance (MD=18.37, 95% CI [-1.02, 37.75], P=0.06), potentially due to limited studies focusing on this outcome. Conclusion: Opposing needling is an effective and reliable intervention for managing KOA in athletes. It shows significant advantages in enhancing clinical outcomes, reducing pain, and improving stiffness and daily activities compared to other treatments. Given its benefits in promoting quicker recovery and maintaining athletic performance, opposing needling therapy is recommended for broader clinical application in sports medicine.

KEYWORDS: Contralateral Point Selection; Acupuncture; Knee Osteoarthritis; Meta-analysis; Literature Research

1. INTRODUCTION

Knee osteoarthritis (KOA) is a significant barrier to athletic performance, particularly in sports that place high demands on joint stability and mobility such as football, basketball, and track and field. The repetitive stress and acute trauma associated with these activities not only accelerate the progression of KOA but also make its management critically important for maintaining an athlete's career longevity and performance. Traditional treatment modalities, while effective to a degree, often fail to fully address the unique needs of the athlete population, leading to prolonged recovery periods and not infrequently, a decrease in performance levels or premature retirement from sports. The biomechanical impact of KOA in athletes involves more than just the degradation of joint cartilage(Association, 2018). It includes alterations in joint kinematics and loading patterns, which can compromise the efficiency of movement and increase the susceptibility to further injury. For athletes, whose careers depend on optimal physical function, even minor impairments can lead to significant setbacks. Therefore, interventions that can effectively address the root causes and symptoms of KOA while accommodating the high-performance demands of athletes are of paramount importance. Opposing needling, derived from traditional Chinese acupuncture, offers a compelling approach by potentially modifying pain pathways and local inflammatory responses directly at the knee joint. This technique, which involves inserting needles at points opposite to the pain location, is theorized to stimulate a systemic healing response. For athletes, the advantages of such a treatment include not only symptom relief but also enhanced recovery processes, allowing for quicker return to training and competition with minimal disruption(Tian, Li, & Zhang, 2019). The integration of opposing needling into sports medicine represents a confluence of traditional and modern therapeutic practices. This meta-analysis aims to explore this integration by assessing the effectiveness of opposing needling in the treatment of KOA within an athletic context. By compiling and analyzing data from randomized controlled trials specifically focused on athletic or physically active populations, the study seeks to identify patterns and outcomes that could validate the use of opposing needling as a routine part of sports medical care. This research will systematically evaluate the impact of opposing needling on pain management, joint function, and overall athletic performance in individuals with KOA. The objectives include determining the method's efficacy in reducing pain intensity, enhancing joint mobility, and improving athletes' functional capabilities. The findings are expected to contribute significantly to the field of sports medicine by providing evidence-based recommendations for incorporating opposing needling into athletic rehabilitation programs(Hun, 2020). As sports organizations and health professionals continuously seek to optimize athlete care, the potential for opposing needling to serve as a viable, non-pharmacological treatment that aligns with athletes' health and performance goals is both timely and promising. This study aims not only to bridge the gap between traditional acupuncture techniques and modern sports rehabilitation but also to foster a more holistic approach to athlete health care, ultimately enhancing both the quality of care and the athletic longevity.

2. Information and Methodology

2.1 Search Policy

Computer search China Knowledge Infrastructure China(CNKI), China Biomedical Literature Database (China Biology Medicine disc (CBM), Wanfang Data Knowledge Service Platform (WF), Weipu Chinese Journal Service Platform (VIP). Database for Chinese Technical Periodicals, VIP), Pubmed, Web of Science, Cochrane library, EMbase, search strategy uses a combination of subject words and free words. Chinese search terms are: osteoarthritis, knee, knee arthritis, knee osteoarthritis, knee osteoarthritis, degenerative knee arthritis, proliferative knee arthritis, knee paralysis, cross point extraction, corresponding point extraction, giant thorn, Miu thorn, balance needle, etc., English search terms are: Osteoarthritis, Knee, Knee Osteoarthritides, Knee Osteoarthritis, Osteoarthritis of Knee, Osteoarthritis of the Knee、Contralateral Point Selection Method、Ju Ci、Miu Ci、Opposing Needling、Contralateral Needling、Contralateral Acupuncture、Balance Acupuncture， The search period is from the establishment of the library to July 2022.

2.2 Inclusion Criteria

(1) Research type: RCT literature, language is not limited; (2) Research subjects: KOA patients with clear diagnostic criteria, general baseline data including: gender, age, site of onset, underlying diseases, ethnicity and place of residence are not limited; (3) Interventions: The experimental group was a treatment method based on contralateral cross-acupuncture alone or contralateral cross-acupuncture, and the control group used other treatments (knee local acupuncture, oral drug treatment and intra-articular injection, etc., which were different from the observation group; (4) Outcome measures: clinical effectiveness, visual analogue scale (VAS), Western Ontario and Mc Master Universities Osteoarthritis Index (WOMAC), Lysholm score.

2.3 Exclusion Criteria

(1) Non-RCT literature such as review, expert experience summary,

animal research, case report, academic theory discussion, etc.; (2) literature with repeated publications; (3) no valid outcome data could be extracted from the text; (4) Literature whose full text is not available; (5) The experimental group used contralateral cross-acupuncture with other therapies, but the control group used other therapies other than the experimental group. 1.4 Data extraction and literature quality evaluation. Two researchers independently searched, downloaded and collated the documents that met the criteria, checked each other, and if there was a difference of opinion that was difficult to determine, a third investigator assisted in judging or directly accessed the first author of the literature to resolve it. The included studies were collated using Microsoft Word 2010 software to produce a statistical table of "basic characteristics of included studies", including first author name, year of publication, sample size, sex, age, intervention, outcome time and outcome measures. The quality of the included studies was assessed using the bias assessment tool provided by the Cochrane Collaboration Network, and all assessed items were classified as low risk, unclear risk and high risk.

2.4 Statistical Methods

Meta-analysis was performed using RevMan 5.4 and Stata 14.0 software from the Cochrane Collaboration Network. The risk ratio (RR) was used as the effect index for the counting data, and the standard mean difference (SMD) was used as the effect index for the measurement data, and each effect size gave 95% confidence intervals (CI). When there was statistical homogeneity between studies ($P>0.1$, $^{I2}\leq50\%$), a fixed-effect model was used to pool the analysis; When there was statistical heterogeneity between studies ($P\leq0.1$, $I^2>50\%$), sources of heterogeneity were analysed using subgroup or sensitivity analyses if clinical and methodological heterogeneity existed, random-effects models were used for pooled analyses if absent, and descriptive analyses were used if sources of heterogeneity could not be determined. Meta-analysis results were presented as forest plots, and the presence of publication bias was shown as funnel plots.

3. Results

3.1 Literature Search Results

According to the above search strategy, 317 articles were initially obtained, including 25 CNKI, 25 CBM, 218 WF, 26 VIPs, 12 WOS and 11 Cochrane Library. 73 duplicate articles were excluded from each database, leaving 244 articles. 67 articles in the review and animal research categories were excluded, and the remaining 177 articles were excluded. After reading the abstract, keywords and basic information, 130 studies were excluded from discrepancies, leaving 47. A review of the full texts excluded 30 studies in which interventions were not eligible and for which valid data could not be extracted, and 17 RCTs were included (Bai, 2020; Cai, 2011; K. CHEN & FANG, 2016; DING & XU, 2021; HE, 2016; Hong & Wu, 2021; JIANG, WANG, & ZHAO, 2020; Zhe LI, 2014; Zhihai LI, 2019; LIANG, 2015; MAK & HUANG, 2021; X. WANG, LIU, & LIU, 2017; XIAO, ZHAO, & CHANG, 2021; L. Zhang, 2017; S. ZHANG, ZHANG, & XING, 2018; F. ZHOU & GUO, 2018; M. ZHOU, 2018). See Figure 1 for details.

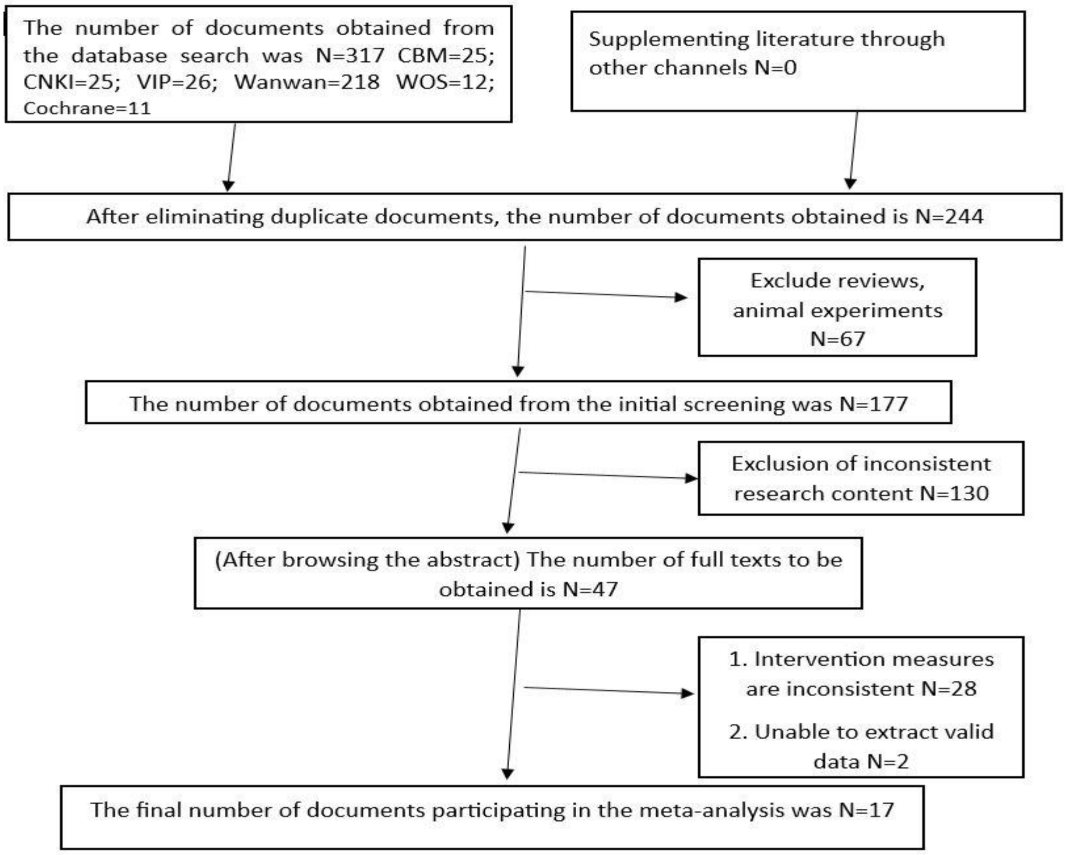

Figure 1: Literature search flow chart

3.2 Basic Characteristics and Quality Evaluation of Included Literature

A total of 17 articles were included in this study, published from 2011 to 2021, all of which were clinical randomized controlled trials, with a total of 1251 subjects, 682 cases in the experimental group, 569 cases in the control group, the largest sample size of 60 cases, and the minimum sample size of 22 cases. Three three-arm trials (X. WANG et al., 2017; XIAO et al., 2021; M. ZHOU, 2018), one four-arm trial (LIANG, 2015), and the remainder were biarmial. Among the 17 RCTs, eight were in the group of cross-acupuncture alone, and other therapies in the control group. Thirteen experimental groups were cross-explanatory acupuncture combined with other therapies, and the control group was the experimental group using this kind of therapy other than cross-acupuncture. There were four outcomes: clinical response, VAS score, WOMAC score, and Lysholm score. All studies met the quality requirements for inclusion. See Table 1, Figure 2 and Figure 3 for details.

Table 1: Includes basic characteristics of the literature

INCLUDED STUDIES	SAMPLE SIZE		AGE AND COURSE OF THE DISEASE	INTERVENTIONS		TREATMENT (D)	OUTCOME MEASURES
	EXPERIMENTAL GROUP	CONTROL GROUP		EXPERIMENTAL GROUP	CONTROL GROUP		
(CAI, 2011)	30	30	comparable	Acupuncture the middle shoulder point, elbow one point, and elbow two acupuncture points	Acupuncture of both knee eyes, Yangling spring	42	①
(JIANG ET AL., 2020)	20	20	comparable	Acupuncture of the contralateral spirit bone, big white, heart door, knee pain point	Oral glucosamine sulfate capsules	28	①②③
(K. CHEN & FANG, 2016)	30	30	comparable	Acupuncture contralateral curvature, shakuzawa + joint loosening	Electroacupuncture local + joint loosening	21	①③
(M. ZHOU, 2018)	45(22+23)	23	comparable	acupuncture contralateral curved pond, shakuzawa; Acupuncture contralateral curvature, shakuzawa + oral celecoxib	Oral celecoxib	5	①②③
(BAI, 2020)	52	52	comparable	Acupuncture contralateral curvature pool, shakuzawa + affected side inner and outer knee eyes, Yinling spring, Yangling spring, Zusanli + oral celecoxib capsules	Acupuncture ipsilateral curvature, shakuzawa + inner and outer knee eyes on the affected side, Yinling spring, Yangling spring, Zusanli + oral celecoxib capsules	28	②③④
(DING & XU, 2021)	35	35	comparable	Acupuncture of the opposite knee pain point + inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	Acupuncture of inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	84	①②③

(S. ZHANG ET AL., 2018)	35	35	comparable	Acupuncture of the contralateral knee pain point	Acupuncture Zusanli, Liangqiu, Blood Sea, Yangling Spring, Yinling Spring, Knee Eye, Heding, Ah Shi Point	1	②
(ZHE LI, 2014)	31	30	comparable	Acupuncture of the contralateral knee pain point	Acupuncture knee eye, Liangqiu, blood sea, Yangling spring, Yinling spring, knee Yangguan, Zusanli, Ah Shi acupoint	14	①②
(LIANG, 2015)	40(20+20)	40(20+20)	comparable	Acupuncture of the contralateral knee pain point; Acupuncture contralateral knee pain point + seedling medicine pain patch	Oral meloxicam group; Seedling medicine pain patch	14	①②③
(L. ZHANG, 2017)	30	30	comparable	Acupuncture contralateral knee pain point + warm acupuncture knee eye, Yangling spring, Taixi, Zusanli (bilateral)	Wen acupuncture knee eye, Yangling spring, Taixi, Zusanli (bilateral)	14	①②③
(XIAO ET AL., 2021)	120(60+60)	60	comparable	Acupuncture of the contralateral knee pain point; Acupuncture contralateral knee pain point + lidocaine local infiltration anesthesia	Lidocaine local infiltration anesthesia	28	①②
(HONG & WU, 2021)	34	34	comparable	Acupuncture contralateral knee pain point + warm acupuncture inside and outside knee eyes, Zusanli, Guan Yuan	Wen acupuncture inside and outside knee eyes, zusanli, Guan Yuan	21	①②③
(X. WANG ET AL.,	60(30+30)	30	comparable	Acupuncture of the contralateral knee pain point	Floating needles	14	①②

2017)				Acupuncture contralateral knee pain point + floating needle			
(HE, 2016)	30	30	comparable	Acupuncture of the opposite knee pain point + inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	Acupuncture of inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	28	①②③
(F. ZHOU & GUO, 2018)	30	30	comparable	Acupuncture of the opposite knee pain point + inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	Acupuncture of inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	28	①②③
(MAK & HUANG, 2021)	30	30	comparable	Acupuncture of the opposite knee pain point + inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	Acupuncture of inner and outer knee eyes, blood sea, Liangqiu, Yangling spring, Yinling spring	28	①②③
(ZHIHAI LI, 2019)	30	30	comparable	Acupuncture contralateral curvature + lumbosacral side wrench	Lumbosacral lateral wrench	28	①②④

Note: *(1) clinically effective; (2) VAS score; (3) WOMAC knee osteoarthritis score; (4) Knee Lysholm score*

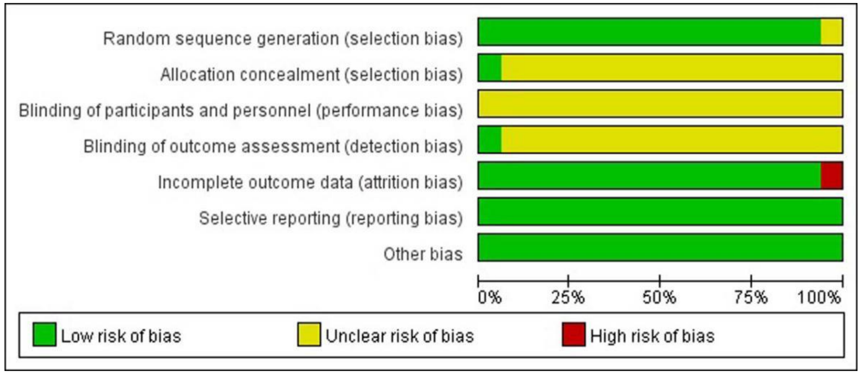

Figure 2: Risk of bias plot (proportion of bias)

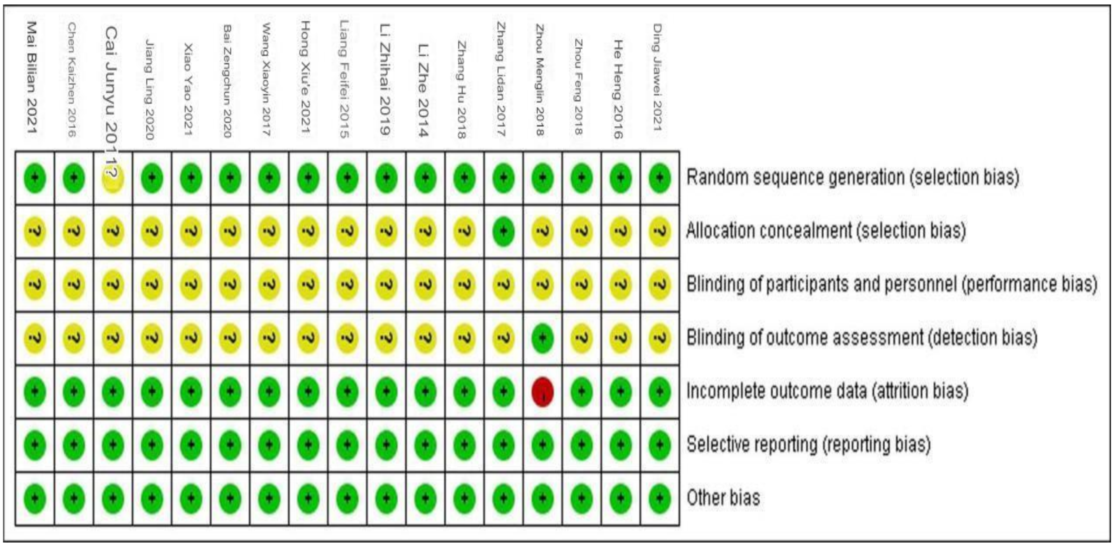

Figure 3: Risk of bias plot (bias in the included literature)

3.3 Results of Meta-Analysis of Outcome Measures

3.3.1 Clinical Effectiveness

A total of 15 articles (Bai, 2020; DING & XU, 2021; HE, 2016; Hong & Wu, 2021; Zhe LI, 2014; Zhihai LI, 2019; LIANG, 2015; MAK & HUANG, 2021; X. WANG et al., 2017; XIAO et al., 2021; L. Zhang, 2017; S. ZHANG et al., 2018; F. ZHOU & GUO, 2018) reported clinical response rates in a total of 1077 participants (595 in the experimental group and 482 in the control group), showing homogeneity between the studies (I2 =0%, P=0.47), using a fixed-effect model analysis, the pooled effect size (RR=1.18, 95% CI [1.12 to 1.25], P<0.0001), the difference between the two groups was statistically significant, suggesting that the efficacy of cross-acupuncture in the treatment of knee osteoarthritis was significantly better than that of other therapies, as shown in Figure 4.

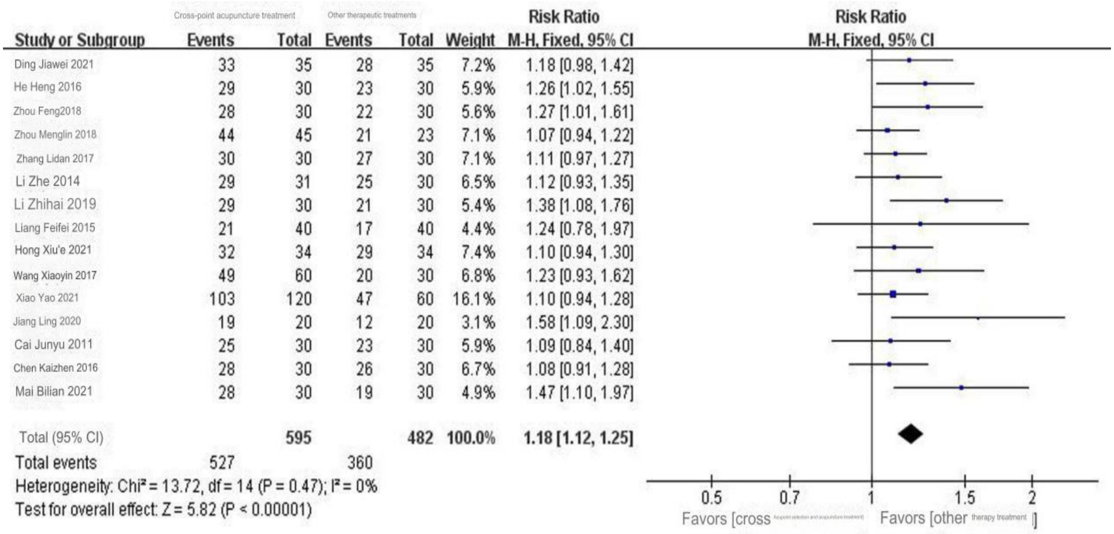

Figure 4: Clinical effective forest

3.3.2 VAS Score

VAS scores were reported in 15 articles (Bai, 2020; DING & XU, 2021; HE, 2016; Hong & Wu, 2021; JIANG et al., 2020; Zhe LI, 2014; Zhihai LI, 2019; LIANG, 2015; MAK & HUANG, 2021; X. WANG et al., 2017; XIAO et al., 2021; L. Zhang, 2017; S. ZHANG et al., 2018; F. ZHOU & GUO, 2018; M. ZHOU, 2018) with a total of 1131 participants (622 in the experimental group versus 509 in the control group), and the results showed heterogeneity between the studies (I2 =92%, P <0.0001), using random-effects model analysis, pooled effect size (MD = -1.31, 95% CI [-1.70 to -0.93], P<0.0001). The difference between the two groups was statistically significant, suggesting that the efficacy of cross-acupuncture in the treatment of knee osteoarthritis was significantly better than that of other therapies, as shown in Figure 5.

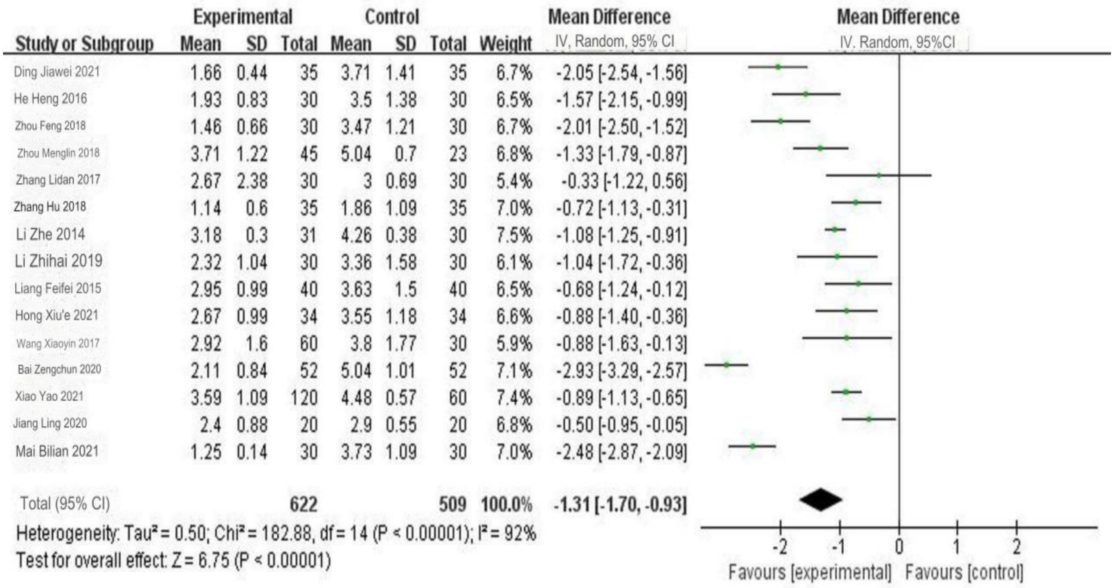

Figure 5: VAS scoring forest plot

3.3.3 WOMAC Score

A total of 10 studies (Cai, 2011; K. CHEN & FANG, 2016; Hong & Wu, 2021; Zhe LI, 2014; Zhihai LI, 2019; MAK & HUANG, 2021; X. WANG et al., 2017; XIAO et al., 2021; L. Zhang, 2017; F. ZHOU & GUO, 2018) reported WOMAC scores with a total of 670 participants (346 in the experimental group and 324 in the control group), showing heterogeneity between the studies (I2 =95%, P <0.0001), using random-effects model analysis, combined effect size (MD = -10.17, 95% CI [-13.64 to -6.69], P<0.0001). The difference between the two groups was statistically significant, indicating that the efficacy of cross-acupuncture in the treatment of knee osteoarthritis was significantly better than that of other therapies, as shown in Figure 6.

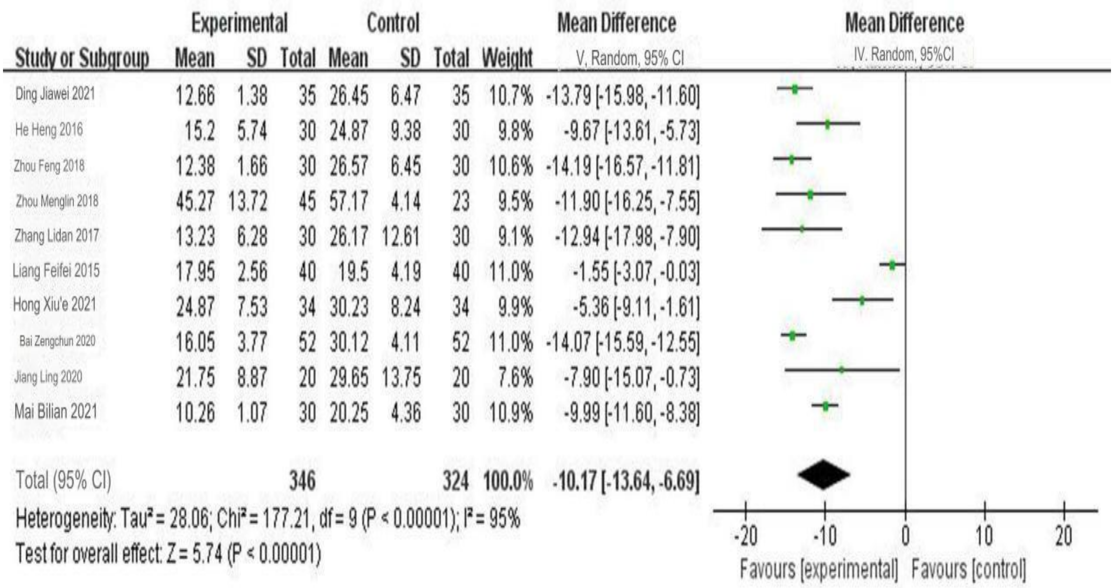

Figure 6: WOMAC scoring forest chart

3.3.4 Lysholm Score

Two studies (Bai, 2020; Zhihai LI, 2019) reported on the Lysholm score with a total of 164 participants (82 in the experimental group versus 82 in the control group), showing heterogeneity between the studies (I^2 =99%, P <0.0001), using random-effects model analysis, pooled effect size (MD=18.37, 95% CI [-1.02 to 37.75], P=0.06), the difference between groups was not statistically significant, suggesting that the efficacy of cross-acupuncture in the treatment of knee osteoarthritis was not significantly different from other therapies, which may be related to the small number of literature reporting Lysholm score, as shown in Figure 7.

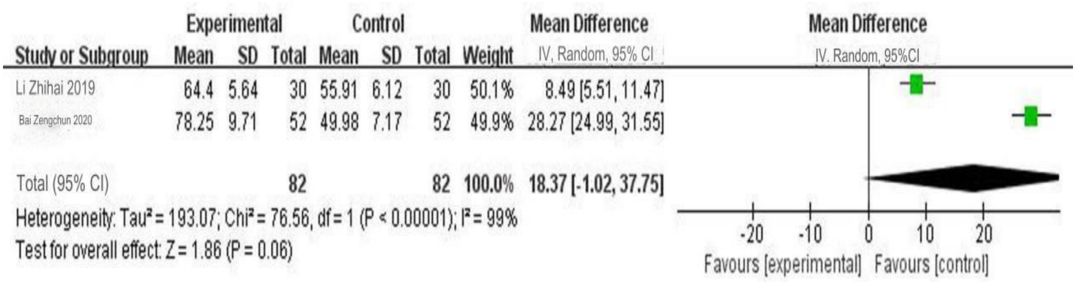

Figure 7: Lysholm scoring forest plot

3.4 Reporting of Adverse Events

Of the 17 included studies, four (Cai, 2011; L. Zhang, 2017; F. ZHOU & GUO, 2018; M. ZHOU, 2018) studies had no adverse events during the trial, one (XIAO et al., 2021) study reported two adverse events (dizziness, micro nausea, no treatment affected, self-remission at the end of treatment), and the remaining 12 studies (Bai, 2020; K. CHEN & FANG, 2016; DING & XU, 2021;

Hong & Wu, 2021; JIANG et al., 2020; Zhe LI, 2014; Zhihai LI, 2019; LIANG, 2015; MAK & HUANG, 2021; X. WANG et al., 2017; S. ZHANG et al., 2018; F. ZHOU & GUO, 2018) did not mention adverse events.

3.5 Sensitivity Analysis and Publication Bias

The sensitivity analysis of the data was carried out by excluding the included articles one by one, and the results showed that the clinical response rate, VAS score, and WOMAC score were not reversed and there was no significant change, indicating that the results of this meta-analysis were stable and the confidence was high. Taking the clinical efficacy rate as an example, see Figure 8 for details.

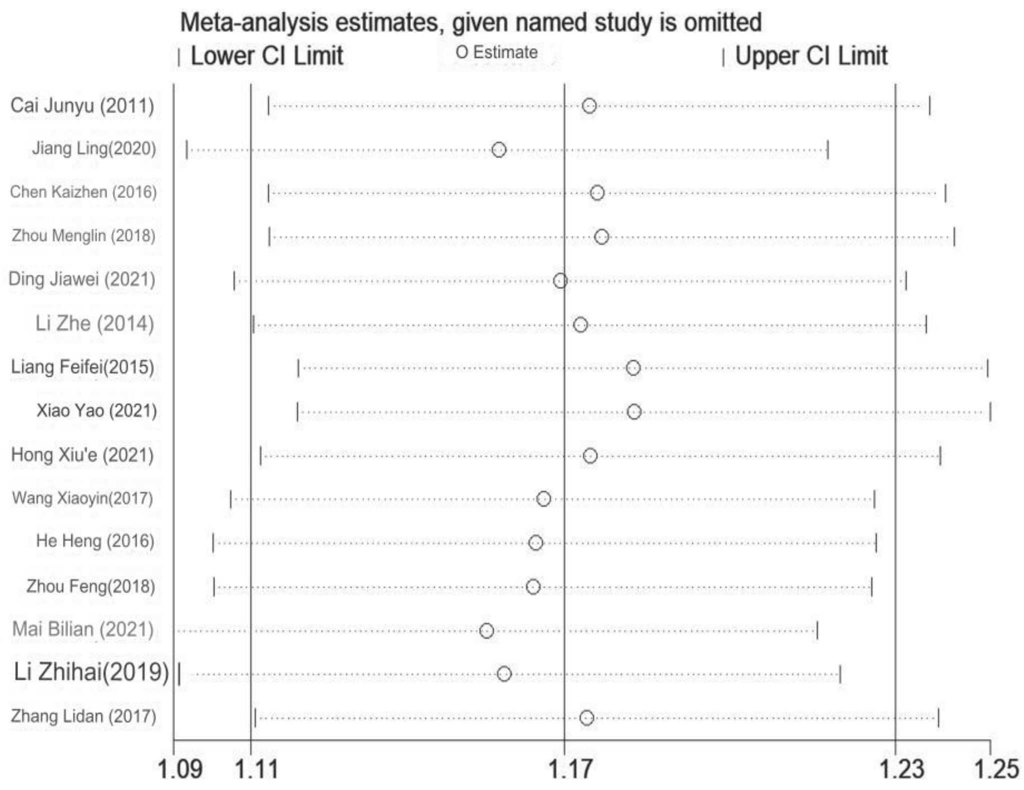

Figure 8: Sensitivity analysis of clinical efficiency

Based on the clinical efficacy rate, the qualitative analysis of publication bias by funnel plot showed that the scatter distribution of the graph was not completely symmetrical, indicating that the literature included in this study had certain publication bias, as shown in Figure 9. Correction bias by clipping method: for the asymmetric funnel plot, the results of 3 articles were selected for editing, and after 4 iterations, the results of 3 articles were dumbfounded, and the results of 18 articles after clipping were not subject to publication bias, and the combined effect size of 18 articles (RR = 1.14, 95% CI [1.02 to 1.03], P<0.0001), compared the results before clipping with the results after clipping, and the results were not reversed, then the results of the existing meta-analysis were considered to be relatively robust, as shown in Figure 10.

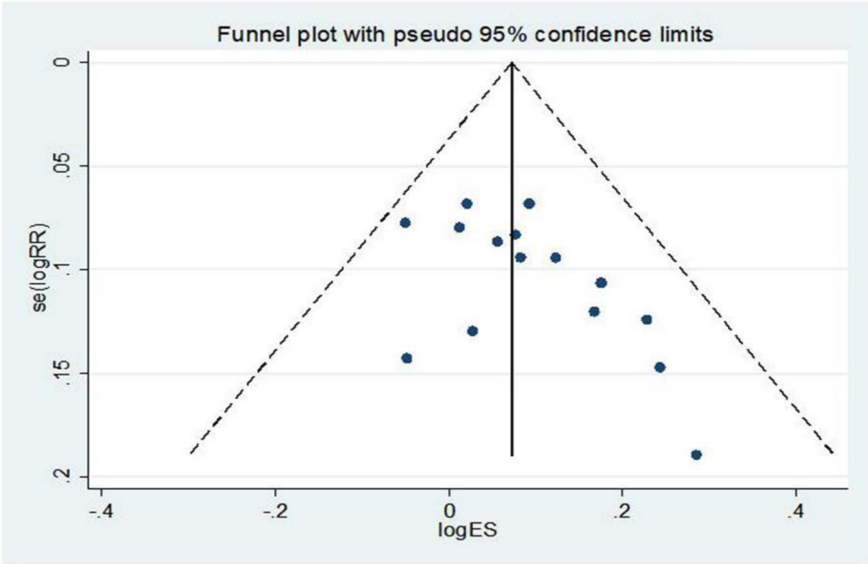

Figure 9: Clinical effective funnel diagram

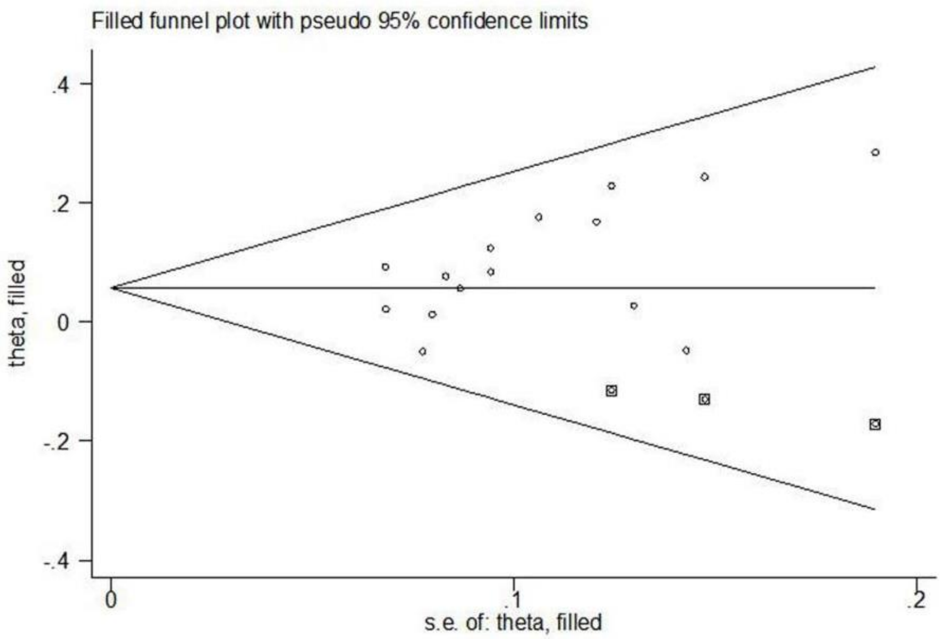

Figure 10: Clinical efficacy funnel after editing

Based on the above results, the following conclusions can be drawn for cross-extraction acupuncture for KOA: (1) the clinical efficacy of cross-acupuncture is better than that of other therapies; (2) Combined with VAS score, the pain relief effect of cross-acupuncture was better than that of other therapies; (3) Combined with the WOMAC score, cross-acupuncture was better than other therapies in improving knee stiffness and daily mobility; (4) According to the results of Lysholm score, the efficacy of cross-acupuncture in the treatment of KOA was not significantly different from that of other therapies, which may be related to the small number of literature reporting Lysholm score.

4. Discussion

Modern medicine believes that KOA is a chronic progressive aseptic inflammation of joint cartilage caused by a variety of causes and involving multiple joint structures of the joint. At present, non-drug and pharmacological treatment methods are mainly used, and surgery can be used if necessary (W. CHEN, 2020; B. Wang & Yu, 2019). Traditional Chinese medicine generally classifies KOA into the categories of "paralysis", "tendon paralysis" and "bone paralysis" (Pu & Yang, 2017), believing that the occurrence of this disease is closely related to the rise and fall of the constitution, as well as climatic conditions and living environment, and is caused by the combined action of internal and external factors, internal factors are mainly liver, spleen and kidney deficiency, insufficient qi and blood, and external factors are mainly responsible for wind evil, cold evil, wet evil and heat evil and other invasion of the human body or trauma, etc., resulting in poor flow of qi and blood in the body, tendon and pulse obstruction, qi stasis and blood stasis. If it is not passed, it will hurt (Medicine, 2018; SHI, HUANG, & GUI, 2021). For example, "Quasi-Evidence Cures Judgment and Paralysis" Yun: "Zhu Paralysis... The good is the first to be weak, the reason is not dense, the wind and cold take advantage of the deficiency and the internal attack, the righteous qi is blocked by evil, and it cannot be proclaimed, so that the qi and blood are stagnant and coagulated, and it becomes paralyzed for a long time"(Qing, 2005) "Zhang's Medical Tong" Yun: "The knee is the house of the tendons, the flexion and extension cannot be bent, the line is prostrate, the tendons will be exhausted, so the knee pain is not due to liver and kidney deficiency, and the deficiency is attacked by wind and cold". As stated in the "Introduction to Medicine": "Paralysis is caused by the invasion of wind, cold and humidity, but external evil is not a deficiency of qi and blood". Cross-acupuncture is developed from theories such as "giant thorn" and "miu thorn" in the Neijing. Traditional Chinese medicine believes that the meridians on the left and right sides of the human body affect and regulate each other physiologically and pathologically. When external evil invades the human body, it can cause an imbalance of qi and blood in the human body, left prosperity and right deficiency, or right prosperity and left deficiency, such as the "Suwen Yin and Yang Yin and Yang should be like the great treatise" cloud: "The evil guest is in the scriptures, the left Sheng is the right disease, and the right Sheng is the left disease"。 At this time, we can prick the opposite side to correct the imbalance between the left and right of qi and blood, which is the so-called "leveling". Miu thorn and giant thorn are acupuncture methods that regulate the balance of human qi and blood, the same is left to right, right to left, but there is a clear difference between the two, "Suwen Miu Thorn Theory": "Take left to take right and right to take left, how is it different from giant thorns?" Qi Boyu: The evil guest is in the meridian, the left Sheng is the right disease, the right Sheng is the left disease, there are also those who shift, the left pain is not over, and the right vein is the first disease, so that it will be a huge thorn, and it will hit its meridian, and it will not be in the vein. Therefore, the pain and meridians of the sick person are called Miu Thorn"· If the patient has pain but the pulse has not changed, a mu prick should be used; If there is a change in the pulse and the pain is on the opposite side, a giant thorn is used. At the same time, the stabbing method of myotic puncture, generally the needle is shallow, combined with the use of bloodletting therapy; The giant thorn method is used to treat deep diseases, and the needle is generally deep· The meridians follow like a ring perfusion, communicate with all parts of the body, and cross-take acupuncture needles can adjust the imbalanced distribution of qi and blood in the human body, so that qi and blood are balanced and diseases are eliminated. Modern medical research has found that acupuncture cross-reaction points can exert a protective inhibitory effect on the cerebral cortex, cut off local pain stimuli, and reduce pain (W. WANG, 2005). A number of animal experiments have shown that cross-taking can promote the activation proliferation, migration and differentiation of damaged skeletal muscle muscle satellite cells, accelerate the repair process of skeletal muscle injury, and repair neurovascular unit homeostasis (HU, SHI, & YANG, 2022). In addition, the cross point is not acupunctured in the affected area, which does not affect the joint movement of the affected area, so it is more cooperated with the affected area movement in the clinic to strengthen the curative effect, that is, "exercise acupuncture". Sports acupuncture originated from ancient guidance, which is a combination of exercise and acupuncture, which is an acupuncture method that actively or passively moves the affected area after the needle is pricked to mobilize its own qi and blood to treat the disease (Xue & Fan, 2022). Later generations such as Dong's Qiqi Acupuncture Method, "Resistance Acupuncture Method", "Tendon Needle Therapy" and "Reperfusion Activity" all belong to this category· By moving, the effect can not only be enhanced, but also tested in real time, which has led to the widespread use of this therapy in clinical practice (Q. ZHANG, SUN, & CHEN, 2020).

5. Conclusion

The findings from this meta-analysis confirm that opposing needling is a highly effective treatment for managing knee osteoarthritis (KOA) in athletes. The results indicate significant improvements in clinical effectiveness rates, reduction in pain as measured by the Visual Analog Scale (VAS), and enhancements in joint function and daily activities according to the WOMAC scores. These outcomes underscore the potential of opposing needling not only as a pain management strategy but also as a means to enhance overall joint functionality, which is crucial for athletes who depend heavily on optimal physical conditions for performance. While the meta-analysis showed substantial benefits in terms of pain relief and functional improvement, the results related to the Lysholm scores, which assess knee stability and function specifically relevant to sports activities, did not reach statistical significance. This highlights a potential area for further research, suggesting a need for more focused studies to fully understand the impact of opposing needling on sportsspecific functional outcomes. The limited data on Lysholm scores may reflect an underrepresentation in the literature, pointing to the necessity for targeted clinical trials that evaluate the efficacy of opposing needling in enhancing sports-related movements and abilities. Given the positive outcomes observed with opposing needling, it is recommended that sports medicine practitioners consider incorporating this therapy into the broader treatment and rehabilitation protocols for athletes with KOA. The ability of opposing needling to effectively reduce pain and improve joint function can play a critical role in the rehabilitation process, potentially shortening recovery times and improving the quality of life for athletes. Furthermore, its implementation in clinical sports medicine can provide athletes with a non-invasive, reliable alternative to more conventional treatments, which often come with higher risks and longer recovery periods. Future investigations should aim to expand on these findings by incorporating larger sample sizes, diverse athletic populations, and longer follow-up periods to validate and extend the observed benefits of opposing needling. Additionally, exploring the integration of opposing needling with other therapeutic modalities could offer insights into synergistic effects that might further enhance treatment outcomes for athletes with KOA.

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