# The Effectiveness of Kinesio Taping on Pain in Knee Osteoarthritis Patients: Meta-analysis

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**Abstract.** Osteoarthritis is a musculoskeletal rheumatic disease, affecting 303 million people globally in 2017. One of the physiotherapy modalities commonly utilized to overcome pain in osteoarthritis is Kinesio taping. This study aims to analyze the effectiveness of Kinesio taping in reducing pain in knee osteoarthritis patients. This research is a systematic review and meta-analysis. The articles employed were obtained from several databases, including PubMed, Science Direct, Scopus, and Google Scholar. The inclusion criteria comprised full paper articles with the Randomized Control Trial (RCT), knee osteoarthritis patients as the research subject, and decreased pain as the study result. Articles were collected using the PRISMA flow diagram and analyzed using the Review Manager 5.3 application. A meta-analysis of 12 articles regarding the effectiveness of Kinesio taping in reducing pain in knee osteoarthritis patients from Spain, the United States, Finland, Lithuania, Mexico, India, Korea, and Turkey revealed that Kinesio taping could reduce pain in knee osteoarthritis patients. Knee osteoarthritis patients who utilized Kinesio taping had a pain intensity of 0.56 units compared to those without Kinesio taping. These results were statistically significant (SMD $= -0.56$; 95% CI $= -1.04$ to $-0.08$; $p = 0.02$). This study demonstrated the effectiveness of Kinesio taping in reducing pain in knee osteoarthritis patients.

**Keywords:** Kinesio Taping · Pain · Osteoarthritis · Knee Osteoarthritis · Meta-analysis

## 1 Introduction

One of the most prevalent musculoskeletal conditions in adults is osteoarthritis [1, 2]. It has been revealed that 15%–40% of people over 40 have osteoarthritis—a degenerative joint condition [3]. Additionally, as people live longer on average, osteoarthritis is becoming more common [4, 5]. Osteoarthritis diagnoses reached 57% in 2020, while those with movement restrictions reached 66% [4]. According to reports, 23% of men and 31% of women in Asia over 24 have osteoarthritis. Osteoarthritis was reported to affect 61% of women and 53% of men aged 40 to 75 [6]. Meanwhile, the prevalence of osteoarthritis in Indonesia increases with age: 5% in individuals aged <40 years, 30% in


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individuals aged 40–60 years, and 65% in individuals >60 years. It is also comparable to the increased prevalence of knee osteoarthritis in Indonesia, 15.5% in men and 12.7% in women [7, 8]. International data estimate that the condition affects >250 million people worldwide [9]. However, progress in treatment approaches for osteoarthritis of the knee appears to be slow. Many treatments offer limited cures [10] and often focus on symptom relief [11].

Various non-pharmacological and pharmacological treatments have been applied to address osteoarthritis symptoms, particularly pain control [12]. Acetaminophen or nonsteroidal anti-inflammatory drugs are typically the only pharmacological options [13]. Many patients have persistent discomfort [10, 12, 13] regardless of medication use, which can have negative repercussions. Crutches and walkers [14] are frequently utilized as initial preventive or as an addition to pharmaceutical therapy [12], as are physical therapy [10, 14], exercise [15], weight loss [16], acupuncture [17], and physical therapy [14]. However, it should be considered because it might be costly or challenging to implement.

Kinesio taping is a woven elastic tape with an acrylic adhesive composition that reacts to heat [18]. Flexibility and muscle strength can both be improved with Kinesio taping [19]. Kinesio taping's impact on knee pain and range of motion in osteoarthritis patients has been examined in several studies [11, 18, 20–22]; however, the findings are conflicting and inconsistent, necessitating more research to determine the treatment's efficacy [11].

The United States College of Rheumatology recently advised Kinesio taping for people with knee osteoarthritis [23]. Kinesio taping is now more frequently employed by therapists. Kinesio taping is frequently applied to provide mechanical support, enhance gait patterns, decrease inflammation, increase range of motion (ROM), inhibit or facilitate muscle relaxation, decrease pain and improve patient functional outcomes [24, 25]. As Anandkumar et al. (2014) [26] discovered, Kinesio taping improved performance and decreased pain in patients with knee osteoarthritis.

Around the world, numerous research has been conducted with varied outcomes; however, additional investigation is required to acquire a more conclusive conclusion. The effectiveness of Kinesio taping in relieving pain in knee osteoarthritis patients is therefore examined by researchers using a systematic approach to relevant studies and a meta-analysis.

## 2 Method

### 2.1 Research Design

This research is a systematic review and meta-analysis.

### 2.2 Research Strategy

The articles included in this study were published between 2015 and 2022 on PubMed, Google Scholar, Science Direct, and Scopus. "Kinesio taping" and "pain" and "patient knee osteoarthritis" or "osteoarthritis" and "randomized controlled trial" and "effectiveness" were the search terms deployed. The articles were collected using the PRISMA diagram in Fig. 1 as a guide.

### 2.3 Criteria of Study

The inclusion criteria in this study included (1) a full paper article with a randomized control trial (RCT), (2) knee osteoarthritis patients as the study subject, and (3) a decrease in pain as the study outcome.

The exclusion criteria covered (1) articles published before 2015, (2) research results excluding the mean and standard deviation (SD), and (3) using a language other than English.

### 2.4 Operational Definition of Variables

Kinesio taping is an adhesive plaster that forms a band made of latex material for the body's natural automatic healing process, facilitating the nervous and circulatory systems. Kinesio taping is utilized under the standard operating procedures (SOP).

Pain in knee osteoarthritis patients who utilize Kinesio taping has a reduction in their level of pain. A 0–10 numeric rating scale (NRS) and visual analog scale (VAS) were employed to quantify pain.

### 2.5 Quality Assessment

The PRISMA diagram's instructions were applied to perform this study. The critical appraisal was evaluated using the Centre for Evidence-Based Medicine (CEBM) Critical Appraisal for RCT studies.

### 2.6 Data Analysis

The Review Manager tool was applied to assess the research findings (Revman 5.3). Effect size and data heterogeneity were assessed using forest plots and funnel plots. The fixed effect model was employed to analyze homogeneous data, whereas heterogeneous data were studied using the random effect model.

## 3 Results

There were 1,028 papers discussing Kinesio taping in treating knee osteoarthritis pain discovered in the database's initial search. Moreover, 12 articles meeting the criteria for a full-text review were discovered following the screening for published articles (Fig. 1).

The Critical Appraisal Skills Program, a publication of CEBM, contained 12 questions that three individuals utilized to conduct the critical criteria evaluation. Answers to question items include assigning a score. Score 0 for no response in the primary study, 1 for a dubious response, and 3 for a completed response. There were 12 publications in the primary study that underwent meta-analysis (Table 1).

There were 12 publications discussing how well Kinesio taping worked to ease knee osteoarthritis sufferers' pain. Each article's summary was employed in the meta-analysis (Table 2).

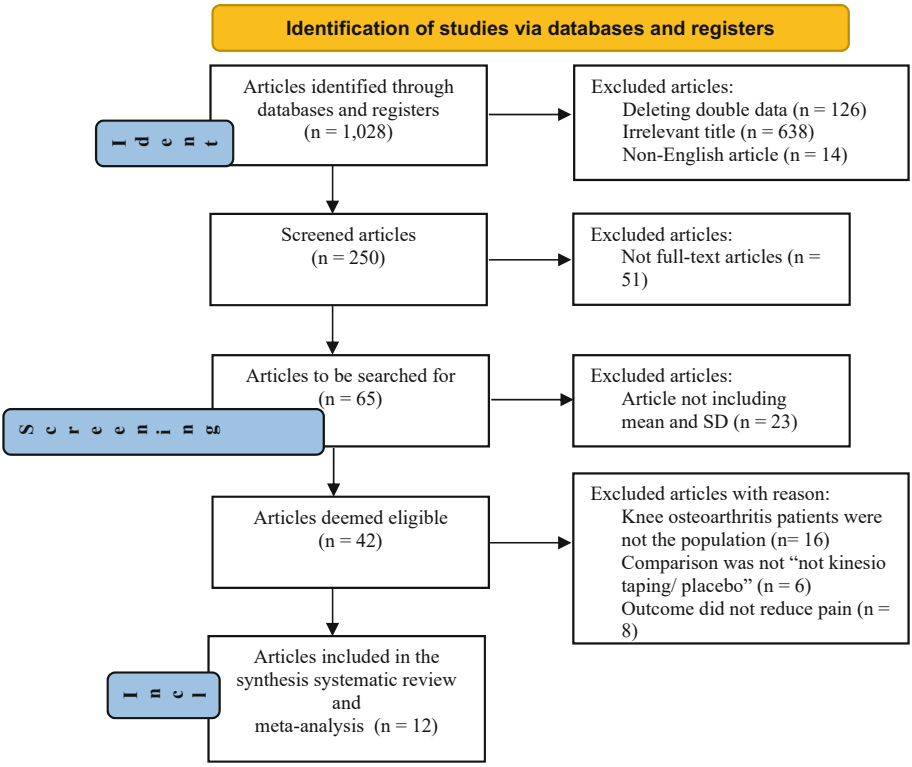


**Fig. 1.** PRISMA Flow Diagram

Figure 2's forest plot demonstrates how Kinesio taping could help lessen pain in individuals with knee osteoarthritis. The difference in pain intensity between knee osteoarthritis patients who utilized Kinesio taping and those who did not was 0.56 units, and this difference was statistically significant (SMD = −0.56; 95% CI = −1.04 to −0.08; p = 0.02). I2 = 86%, suggesting that the effect estimates between the primary studies in this meta-analysis differ, which is a sign of the heterogeneity of the study data. As a result, the random effect model approach was utilized to calculate the average effect estimate.

The funnel plot in Fig. 3 depicts publication bias due to the distribution of effect estimates from the primary study meta-analysis being more to the right than to the left of the projected mean vertical line. The publishing bias tended to amplify the effect of the actual concession taping on pain intensity since it was typically to the right of the average vertical line and in a different direction from where the diamond shape was located in the forest plot (overestimate).

**Table 1.** Assessment of research quality with Critical Appraisal Questions for RCT published by CEBM

| No | Question | Publications (Author and Year) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Donec et al. (2019) | Ogut et al. (2018) | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Han et al. (2018) | Dhanakotti et al. (2018) |
| 1 | Does the research address a clear research focus? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | Is the Randomized Controlled Trial research method suitable for answering research questions? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | Are there enough subjects in the study to establish that the findings are not accidental? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

(*continued*)

**Table 1.** (*continued*)

| No | Question | Publications (Author and Year) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Donec et al. (2019) | Ogut et al. (2018) | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Han et al. (2018) | Dhanakotti et al. (2018) |
| 4 | Are subjects randomly divided into experimental and control groups? If not, can it introduce bias? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 5 | Does the study use inclusion or exclusion criteria? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6 | Are the two groups comparable at the beginning of the study? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 7 | Are the outcome criteria objective and unbiased? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

(*continued*)

**Table 1.** (*continued*)

| No | Question | Publications (Author and Year) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Donec et al. (2019) | Ogut et al. (2018) | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Han et al. (2018) | Dhanakotti et al. (2018) |
| 8 | Is the measurement method used objective and valid to measure the results? If not, is there blinding in the study? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 9 | Is the effect size practically relevant? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 10 | Are the effect estimates correct? Is there a degree of the confidence interval? | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

(*continued*)

**Table 1.** (*continued*)

| No | Question | Publications (Author and Year) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Donec et al. (2019) | Ogut et al. (2018) | Aydogdu et al. (2021) | Mutlu et al. (2016) | Kocygit et al. (2016) | Cho et al. (2015) | Han et al. (2018) | Dhanakotti et al. (2018) |
| 11 | Are there any confounding factors that have not been taken into account? | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 12 | Can the results be applied to your research? | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Total score** | | **23** | **21** | **22** | **22** | **22** | **24** | **22** | **22** | **22** | **22** | **22** | **22** |

Description: 2 = Yes; 1 = Undecided; 0 = No.

**Table 2.** Summary of sources of primary studies included in the meta-analysis

| Author (Year) | Country | Study Design | Total sample | | Intervention | Comparison | Outcome | Mean ± SD | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Kinesio taping | Control | | | | Kinesio taping | Control |
| Aydogdu et al. (2021) [27] | Turkey | RCT | N = 28<br>Age = 52.53 (9.68) year<br>WEIGHT = 80.78 (13.11) kg<br>BMI = 31.18 (5.14) kg/m$^2$ | N = 26<br>Age = 51.19 (8.94) year<br>WEIGHT = 80.53 (14.16) kg<br>BMI = 31.52 (5.70) kg/m$^2$ | Kinesio taping | Placebo | Reduced pain | Pre = 3.85 ± 1.57<br>Post = 3.37 ± 1.59 | Pre = 4.87 ± 1.49<br>Post = 2.76 ± 1.76 |
| Mutlu et al. (2016) [19] | Turkey | RCT | N = 20<br>L/P = 4/16<br>Age = 54.25 (6.01) year<br>BMI = 30.72 (3.80) kg/m$^2$ | N = 19<br>L/P = 2/17<br>Age = 57.10 (6.26) year<br>BMI = 31.34 (6.16) kg/m$^2$ | Kinesio taping with 25% tension | Placebo | Reduced pain | Pre = 1.92 ± 2.66<br>Post = 0.62 ± 1.68 | Pre = 3.60 ± 2.33<br>Post = 2.67 ± 2.22 |
| Kocygit et al. (2016) [28] | The United States | RCT | N = 21<br>L/P = 2/19 | N = 20<br>L/P = 3/17 | Kinesio taping with 25% tension | Placebo | Reduced pain | Pre = 40 ± 27<br>Post = 26 ± 22 | Pre = 42 ± 27<br>Post = 26 ± 8 |

(*continued*)

**Table 2.** (*continued*)

| Author (Year) | Country | Study Design | Total sample | | Intervention | Comparison | Outcome | Mean ± SD | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Kinesio taping | Control | | | | Kinesio taping | Control |
| Cho et al. (2015) [20] | Korea | RCT | N = 23<br>L/P = 6/17<br>Age = 58.2 (4.5) year<br>WEIGHT = 65.7 (8.7) kg | N = 23<br>L/P = 7/16<br>Age = 57.5 (4.4) year<br>BMI = 68.6 (10.0) kg | Kinesio taping with 15–25% tension | Placebo | Reduced pain | Pre = 39.1 ± 36.8<br>Post = 36.8 ± 9.7 | Pre = 37.5 ± 8.9<br>Post = 37.0 ± 8.8 |
| Donec et al. (2019) [29] | Lithuania, Europe | RCT | N = 81<br>L/P = 17/64<br>Age = 68.7 (9.9) year<br>BMI = 30.5 (5.3) kg/m$^2$ | N = 76<br>L/P = 16/60<br>Age = 70.6 (8.3) year<br>BMI = 30.7 (5.2) kg/m$^2$ | Kinesio taping with 10–15% tension | Placebo | Reduced pain | Pre = 1.74 ± 2.1<br>Post = 1.4 ± 2.5 | Pre = 0.84 ± 2.2<br>Post = 0.8 ± 2.5 |
| Ogut et al. (2018) [30] | Turkey | RCT | N = 28<br>Age = 53.8 (3.5) year<br>WEIGHT = 84.0 (5.4) kg<br>BMI = 33.6 (2.3) kg/m$^2$ | N = 26<br>Age = 53.1 (3.6) year<br>WEIGHT = 83 (6.7) kg<br>BMI = 33.2 (2.8) kg/m$^2$ | Kinesio taping | Placebo | Reduced pain | Pre = 10.4 ± 1.5<br>Post = 4.0 ± 0.8 | Pre = 10.4 ± 1.4<br>Post = 4.1 ± 0.5 |

(*continued*)

**Table 2.** (*continued*)

| Author (Year) | Country | Study Design | Total sample | | Intervention | Comparison | Outcome | Mean ± SD | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Kinesio taping | Control | | | | Kinesio taping | Control |
| Leon-Ballesteros et al. (2018) [31] | Mexico | | N = 16<br>Age = 56.5 (5.0) year<br>BMI = 29.5 (4.1) kg/m$^2$ | N = 16<br>Age = 59.6 (5.2) year<br>BMI = 29.4 (3.2) kg/m$^2$ | Kinesio taping | Placebo | Reduced pain | Pre = 6.4 ± 1.7<br>Post = 4.6 ± 1.9 | Pre = 4.6 ± 1.9<br>Post = 5.2 ± 1.2 |
| Rahlf et al. (2019) [32] | Finland | RCT | N = 47<br>L/P = 23/24<br>Age = 64.7 (7.3) year<br>WEIGHT = 85.0 (18.4) kg | N = 47<br>Age = 65.4 (7.6) year<br>WEIGHT = 78.3 (13.4) kg | Kinesio taping | Placebo | Reduced pain | Pre = 3.33 ± 1.35<br>Post = -0.70 ± 1.2 | Pre = 3.58 ± 1.27<br>Post = -0.12 ± 0.87 |
| Lee et al. (2016) [33] | Korea | RCT | N = 15<br>Age = 72.0 (4.0) year<br>WEIGHT = 64.9 (8.8) kg | N = 15<br>Age = 73.1 (5.8) year<br>WEIGHT = 61.1 (10.7) kg | Kinesio taping | Placebo | Reduced pain | Pre = 7.5 ± 1.0<br>Post = 4.3 ± 1.2 | Pre = 7.1 ± 1.1<br>Post = 5.7 ± 0.9 |
| Park et al. (2017) [34] | Finland | RCT | N = 10 | N = 10 | Kinesio taping | Placebo | Reduced pain | Pre = 6.68 ± 1.57<br>Post = 3.94 ± 0.83 | Pre = 7.15 ± 1.98<br>Post = 5.53 ± 0.96 |

(*continued*)

**Table 2.** (*continued*)

| Author (Year) | Country | Study Design | Total sample | | Intervention | Comparison | Outcome | Mean ± SD | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Kinesio taping | Control | | | | Kinesio taping | Control |
| Han et al. (2018) [35] | Korea | RCT | N = 16<br>L/P = 8/8<br>Age = 63.5 (5.7) year<br>WEIGHT = 60.2 (7.2) kg | N = 16<br>L/P = 8/8<br>Age = 61.5 (3.4) year<br>WEIGHT = 58.7 (6.7) kg | Kinesio taping | Placebo | Reduced pain | Pre = 7.3 ± 0.9<br>Post = 2.5 ± 0.9 | Pre = 6.9 ± 0.9<br>Post = 0.9 ± 0.9 |
| Dhanakoti et al. (2018) [36] | India | RCT | N = 15<br>Age = 57.73 (5.10) year<br>WEIGHT = 62.00 (5.85) kg<br>BMI = 24.54 (3.38) kg/m$^2$ | N = 15<br>Age = 51.26 (4.86) year<br>WEIGHT = 67.86 (9.5) kg<br>BMI = 26.16 (3.14) kg/m2 | Kinesio taping with 40% tension | Placebo | Reduced pain | Pre = 6.40 ± 1.06<br>Post = 4.90 ± 5.40 | Pre = 6.40 ± 0.98<br>Post = 0.91 ± 1.59 |

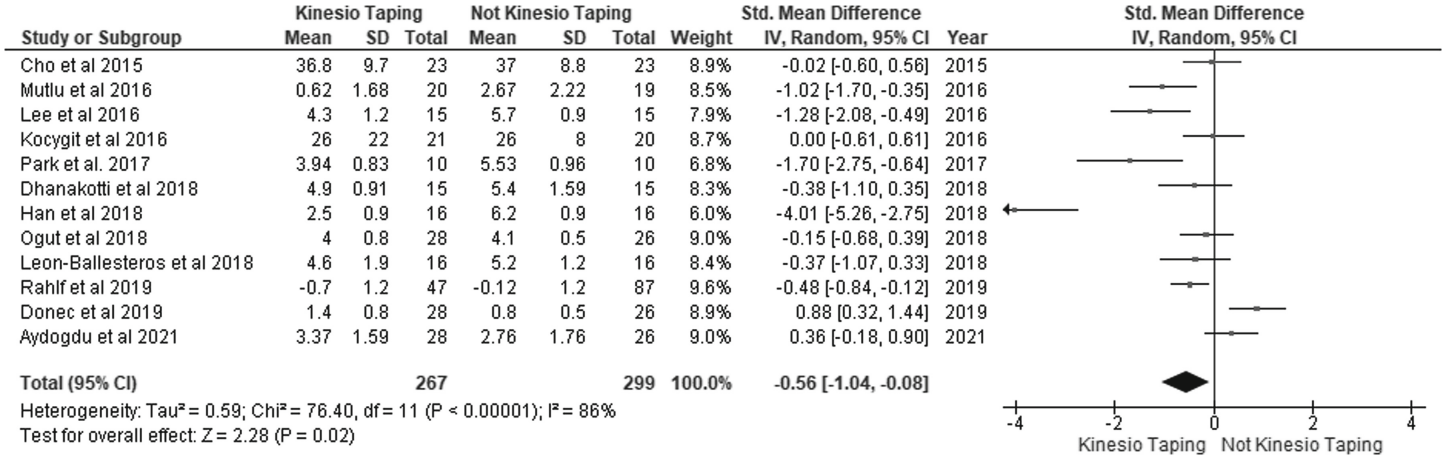


**Fig. 2.** Forest plot effectiveness of Kinesio taping to reduce pain in knee osteoarthritis patients

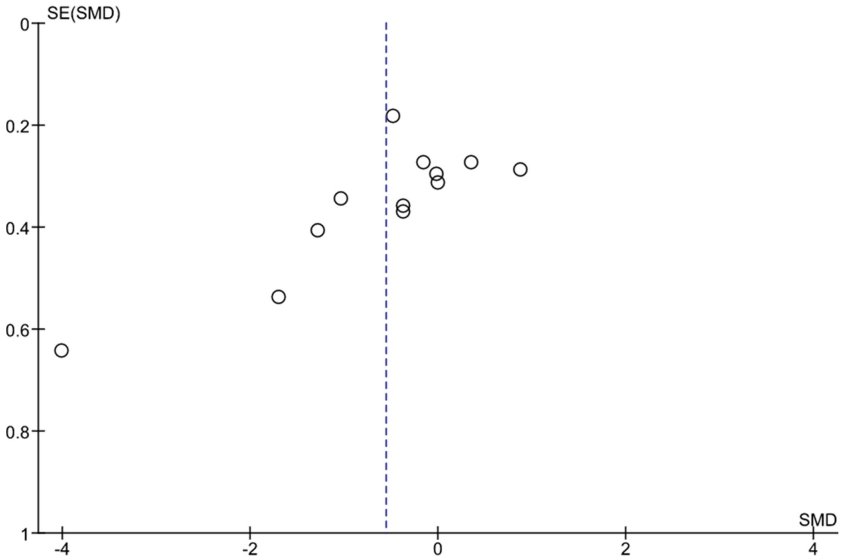


**Fig. 3.** Funnel plot Kinesio taping effectiveness on reducing pain in knee osteoarthritis patients

## 4 Discussion

In order to increase the generalizability of the data and draw firm conclusions from the findings of comparable studies about the efficacy of Kinesio taping in reducing pain in knee osteoarthritis patients, a systematic review and meta-analysis were conducted in this study. The 12 primary articles in this study originated from Spain, Lithuania, Mexico, Finland, India, Turkey, Korea, and the United States.

RCT was used as a source for the meta-analysis of how well Kinesio taping worked to relieve pain in people with knee osteoarthritis in 12 experimental studies. According to this study, Kinesio taping could help alleviate pain in people with knee osteoarthritis. The difference in pain intensity between knee osteoarthritis patients who utilized Kinesio taping and those who did not was 0.56 units. This difference was statistically significant (SMD = −0.56; 95% CI = −1.04 to −0.08; p = 0.02).

Following the gate control theory, pain inputs are first picked up by pain receptors (nociceptors) and then transmitted by C and delta fibers to the dorsal region of the spine before reaching the thalamus in the brain; the use of Kinesio taping can lessen pain. The stimulation of Kinesio taping will suppress pain stimuli, preventing them from being transferred to the thalamus and exciting mechanoreceptors, of which impulses are provided by faster and larger beta fibers [37].

The findings of this study are corroborated by research by Cho et al. (2015) [20], discovering that employing Kinesio taping significantly reduced pain in 46 patients with knee osteoarthritis on the Visual Analog Scale (VAS). Another study disclosed that using Kinesio reduced taping discomfort and persisted for three weeks [27]. Using Kinesio taping for an hour successfully lowered pain in individuals with knee osteoarthritis, according to research by Abolhasani et al. (2019) [38]. Similar investigations were

conducted in India (Dhanakoti et al., 2018) [36], Korea (Cho et al., 2015), and Finland (Rahlf et al., 2019) [32], revealing that the use of Kinesio taping for an hour was effective for reducing pain in patients with knee osteoarthritis. Similar research was performed in Finland (Rahlf et al., 2019) [32], Korea (Cho et al., 2015) [20], India (Dhanakoti et al., 2018), Mexico (Leon-Ballesteros et al., 2018) [31], and Turkey (Aydogdu et al., 2021) [27].

The study of Kuru et al. (2012) [39] comparing the use of Kinesio taping and electrical stimulation in patients with patellofemoral pain syndrome revealed no substantial changes between the two groups. This study is different from that study. Only two assessments were conducted, at baseline and in the sixth week. Therefore, it was unclear how much impact the therapeutic effect had. Similar investigations unveiled that Kinesio taping could temporarily alleviate pain for up to one month [30]. According to other studies, Kinesio taping extended the knee joint's range of motion [19, 20, 27, 40, 41].

This study uncovered that Kinesio taping helped lessen pain in people with knee osteoarthritis. Due to the use of English-language publications and the omission of other languages, this research possessed a language bias. Using solely four database sources and disregarding additional search sources raised the issue of search bias. Hence, it is suggested to undertake additional meta-analyses on the usefulness of Kinesio taping in lowering pain to avoid osteoarthritis, with a bigger sample size, more countries being examined, and without restricting the retrieval of English-language papers.

## 5 Conclusion

This study unveiled that Kinesio taping helped reduce pain in people with knee osteoarthritis, making it a beneficial intervention option.

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**Authors' Contributions.** LP is the main researcher who selected the research topic and explored and collected the data. SSP and ANA contributed to analyzing data and reviewing research articles.

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