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The Effect of Kinesiotaping on Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis

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A B S T R A C T

Objective: Anterior cruciate ligament reconstruction (ACLR) is one of the most common orthopedic surgeries, and optimal functional recovery requires a precise and multifaceted rehabilitation program. Kinesio taping (KT) has emerged as a non-invasive adjunctive therapy for managing postoperative complications. This study aimed to systematically review and meta-analyze the effects of KT on balance, muscle strength, pain, and edema in patients following ACLR.

Methods and Materials: A systematic search was conducted across six databases PubMed, Medline, Scopus, EMBASE, Google Scholar, and the Cochrane Central Register of Controlled Trials (CENTRAL) from 2014 until the final search date in February 2025. Eligible studies were randomized controlled trials (RCTs) evaluating the effects of KT in post-ACLR patients. Study quality was assessed using the Cochrane Risk of Bias tool (RoB 2). Data were pooled using a random-effects model, and the standardized mean difference (SMD) was calculated as the effect size.

Findings: Thirteen studies with 631 participants were included in the final analysis. Meta-analysis revealed that KT was significantly associated with improved dynamic balance (SMD = 0.75, 95% CI: 0.33 to 1.17), increased quadriceps strength (SMD = 0.53, 95% CI: 0.19 to 0.87), reduced pain (SMD = 0.53, 95% CI: 0.22 to 0.85), and decreased edema (SMD = 1.01, 95% CI: 0.68 to 1.35). Heterogeneity across studies was low to moderate ($I^2 = 45$–68%).

Conclusion: Current evidence supports KT as a safe and effective adjunctive intervention in ACLR rehabilitation, providing significant improvements in balance, muscle strength, pain, and swelling.

Keywords: *ACL reconstruction, Kinesio taping, Rehabilition, Pain, Balance, Muscle strength, Edema.*

1. Introduction

The anterior cruciate ligament (ACL) is crucial for both static and dynamic knee joint stability (1). ACL rupture, a common injury among athletes, particularly in high-intensity sports (2), leads to joint instability, reduced function, and an increased risk of secondary meniscal and cartilage damage, profoundly altering lower limb

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biomechanics. In the United States, approximately 200,000 ACL injuries occur annually, with a rising trend, predominantly affecting high school and college-aged individuals (3, 4). Notably, female athletes exhibit a higher overall injury rate (0.081 per 1000 exposures) compared to males (0.05 per 1000 exposures), with soccer and basketball posing the highest risk for women, and football and lacrosse for men (4-6).

The ACL is vital for preserving knee stability and function, and its rupture often results in serious impairments, such as instability, especially in anteromedial stability, limited mobility, and an increased risk of secondary injuries to the meniscus and cartilage. Additionally, it significantly reduces a patient's ability to maintain a standing position and control their center of gravity. Anterior Cruciate Ligament Reconstruction (ACLR), is commonly considered the gold standard for treating complete ACL tears, aiming to restore knee stability and function. However, despite improvements in surgical methods, a significant number of patients do not regain their preinjury activity levels, and many young athletes are at a high risk of re-injury when returning to sports (7). Furthermore, almost 25% of young athletes encounter a secondary ACLI upon their return to sports that may be due to post-traumatic neuromuscular depression, which reduces muscle strength and motor function. Postoperative rehabilitation is a critical component of the recovery process following ACLR, as it aims to restore muscle strength, joint stability, and neuromuscular control. Various rehabilitation strategies, including muscle-strength training, reduction of pain and swelling, neuromuscular stimulation, and cryotherapy, have been employed to improve functional outcomes (8). In the initial stage of ACLR patients' rehabilitation, various methods include cryotherapy, knee braces, elevating the leg, wearing compression socks, continuous passive motion therapy, performing ankle pumping exercises, conducting isometric exercises, and applying electrical stimulation (9).

Among these, Kinesio taping (KT) has gained increasing attention as a noninvasive and cost-effective intervention. Today, it is relevant to nearly all types of muscle and joint dysfunction. KT is a therapeutic elastic tape designed to support injured muscles and joints while promoting pain relief, blood circulation, and lymphatic drainage (10). It is ability to enhance proprioception and neuromuscular control has made it a popular choice in sports medicine (11). One suggested mechanism of kinesiology taping is to boost proprioceptive sensitivity, which helps support weak muscles, ultimately enhancing muscle function and reducing pain. Also KT may enhance the proprioceptive awareness of joints, and the observed enhancement in force control from taping is probably a result of neural desynchronization in the motor cortex (12). The KT application stimulates mechanoreceptors, improving proprioception, joint position awareness, and the ability to prevent excessive movement (13). KT can be stretched by 130%–150%, and the elastic recoil in KT lifts the skin and increases the space between skin and muscle. This systematic review and meta-analysis aim to synthesize existing evidence on the effects of KT in patients undergoing rehabilitation after ACLR. During the initial stage of rehabilitation for ACLR patients, various methods are utilized, including cryotherapy, knee braces, leg elevation, compression garments, continuous passive motion therapy, ankle pumping exercises, isometric exercises, and electrical stimulation (9). Therefore, this systematic review and meta-analysis aimed to assess the role of KT in ACLR.

1. Methods and Materials

This systematic review and meta-analysis followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (14). The protocol for this systematic review with meta-analysis was registered in the PROSPERO database (CRD420251055272).

1.1 Information sources, search strategy

A comprehensive search was conducted across six electronic databases (PubMed, Medline, Scopus, EMBASE, the Cochrane Central Register of Controlled Trials, and Google Scholar) for English-language, peer-reviewed articles published from 2014 until the final search date in February 2025. The search strategy was developed using the PICOS[1] framework (Table 1), incorporating relevant MeSH terms and keywords combined with Boolean operators (AND/OR), as detailed in Table 2. For Google Scholar, the first 100 results sorted by relevance were screened using the search string: ("kinesio taping" OR "Kinesiotape") AND ("anterior cruciate ligament reconstruction" OR "ACLR"). The study selection followed a two-phase screening process: initially, authors independently screened titles and abstracts, resolving disagreements through consensus; subsequently, the full texts of potentially eligible studies were reviewed for

[1] Population, Intervention, Comparison, Outcome, Study design

final inclusion. The same rigorous eligibility criteria applied to all databases, ensuring consistency and minimizing bias.

Table 1. Component of PICOS

1. Population: Patients aged 13 to 57 years who underwent ACLR. Female / Male
2. Intervention: Application of KT as part of the rehabilitation protocol.
3. Comparison: Placebo Taping, And Physiotherapy as Control Methods.
4. Outcomes: Change in Pain, Quadriceps Strength, Hamstring Strength, Knee Joint, Joint Swelling, And Knee Range of Motion.
5. Study Design: Only RCTs were included to minimize bias.

KT: Kinesio taping; **RCTs**: Randomized Controlled Trials

Table 2. Keywords used for the search (all databases).

	Search terms with Boolean operators AND, OR
Pub Med	Boolean operators combined MeSH terms and keywords for ACLR, kinesio tape, clinical outcomes, and publication types, filtered by date and language.
EMBASE	EMBASE subject headings and keywords were used to query ACL surgery, elastic therapeutic tape, recovery metrics, and trial designs, with limits applied for publication year and language.
Scopus	The search was conducted within article titles, abstracts, and keywords for terms related to ACL reconstruction, kinesio taping, functional outcomes, and clinical trials, with specific year-by-year and language filters.
Cochrane	The Central Register of Controlled Trials was searched using title, abstract, and keyword fields for the core concepts, with filters for the publication date range and English language.
Google Scholar	A broad-based search was performed using Boolean operators to combine key terms for ACL surgery, kinesio tape, rehabilitation outcomes, and clinical trials.
Medline	The strategy utilized a combination of MeSH terms and free-text keywords to locate studies on ACLR, therapeutic taping, relevant outcomes, and specific clinical trial types within the set timeframe.

1.2 Inclusion criteria

This meta-analysis exclusively synthesized evidence from RCTs examining the impact of KT on clinical outcomes after ACLR. We included English-language articles published. Participants were post-ACLR patients aged 13 to 57, with no gender-based restrictions. While the initial search strategy focused on adults, no studies were excluded based on age alone to ensure a comprehensive review of all available RCTs. The definitive inclusion criteria were a confirmed ACL rupture treated with ACLR and the implementation of a KT intervention.

1.3 Exclusion criteria

The exclusion criteria were defined as follows: non-English publications, animal or in vitro studies, and a lack of quantitative outcome data. Furthermore, studies concentrating on PCL, meniscal, or other knee-related injuries, as well as those involving participants with pre-existing joint conditions, were also excluded. Finally, articles judged to be of poor quality were omitted from the analysis.

1.4 Study Selection

The studies identified through the database search underwent an independent eligibility assessment by two authors. This process involved a preliminary review of titles and abstracts against the set criteria. Whenever a consensus on inclusion could not be reached, a third author was enlisted to make the final determination. A standardized dataset was then collected from the included articles, including authorship, publication year, country, participant count and characteristics (gender, age), activity level, graft rupture frequency, and time of injury.

1.5 Quality assessment

An evaluation of the methodological quality for the included RCTs was conducted using the Cochrane Risk of Bias tool (RoB 2.0). This tool scrutinizes six domains of potential bias, such as selection, performance, detection, attrition, and reporting biases. Following this analysis, the studies were graded on their risk of bias (low, moderate, or high). The consolidated results from this assessment are provided in Table 3.

Table 3. Risk of Bias Assessment Using Cochrane RoB 2.0.

Study ID	Random Sequence Generation	Allocation Concealment	Blinding of Participants and Personnel	Blinding of Outcome Assessment	Incomplete Outcome Data	Selective Reporting of Research Results	Overall Risk of Bias
Ogrodzka Ciechanowicz et al. (13)	+	NA	+	+	-	-	+
Sizhuo Zhang et al. (15)	+	-	-	-	+	+	+
Kai Liu et al. (16)	-	-	-	-	+	-	-
K. Kirupa et al. (17)	+	+	-	-	-	-	-
Harput et al. (18)	+	+	-	-	-	+	?
Araken K.A et al. (19)	+	+	-	-	-	+	-
M. Labori et al. (20)	-	+	-	-	-	+	-
Gul Baltaci et al. (21)	+	-	+	-	-	+	-
Hyo-Jeoung Kwon et al. (22)	+	+	-	-	+	+	?
Luca Labianca et al (11)	+	+	-	-	-	+	-
Marian M. Shafeek et al (23)	-	-	+	-	+	+	-
Mahdi Amel Khabazan et al (24)	-	-	+	-	+	-	-
Salman Nazary-Moghadam et al (25)	-	NA	-	-	-	+	-

"+" for Low risk, "-" for High risk, and "?" for Moderate risk of bias. "NA" indicates the domain was not applicable for the specific study design.

1.6 Data collection

Two researchers (E.P. and N.M.) collected all pertinent data from the selected studies using the PICOS framework. To minimize potential errors during this process, the extracted information was cross-verified by a third author (A.J.). The initial phase involved screening titles and abstracts to filter out irrelevant publications. Following this, the full texts of the remaining articles were evaluated against predefined inclusion and exclusion criteria to assess their suitability. From the final set of studies, details such as the author's name, publication year, sample size, participant demographics (age and gender), graft type used in ACLR surgery, KT technique, number of ACL injuries, follow-up duration (categorized as less than one year, one year, or more than one year), participation level (amateur, intermediate, or elite), and outcome measures were recorded. One author compiled the data from all included studies, and a second author independently reviewed this information to ensure its completeness and accuracy.

1.7 Statistical Analysis and Meta-Analysis

The analytical procedures for this meta-analysis were conducted using Review Manager (RevMan), version 5.4. To quantify the treatment effects, we calculated the Standardized Mean Difference (SMD) alongside its corresponding 95% Confidence Intervals (CI). The magnitude of the SMD was interpreted as follows: trivial (0–0.2), small (0.2–0.5), moderate (0.5–0.8), and large (> 0.8), based on established criteria (26). To evaluate the consistency between the included studies, the I^2 statistic was employed. The degree of inconsistency was defined as low (25%–50%), moderate (50%–75%), or high (> 75%), in accordance with previous research (27). Furthermore, the potential for publication bias was examined for each result by graphically representing the data in funnel plots to detect any systematic asymmetry.

2. Results

The structured data extraction table summarizes the key characteristics of 13 RCTs, included in this systematic review and meta-analysis, which collectively involved 631 participants who underwent ACLR and received KT as part of their rehabilitation protocol. The studies were published between 2014 until the final search date in February 2025. The sample sizes of the included studies ranged from 15 to 60 participants, with a median sample size of 40. The total number of participants across all studies was 631, with a slight predominance of male participants in several studies, although most included mixed-gender populations (Fig 1).

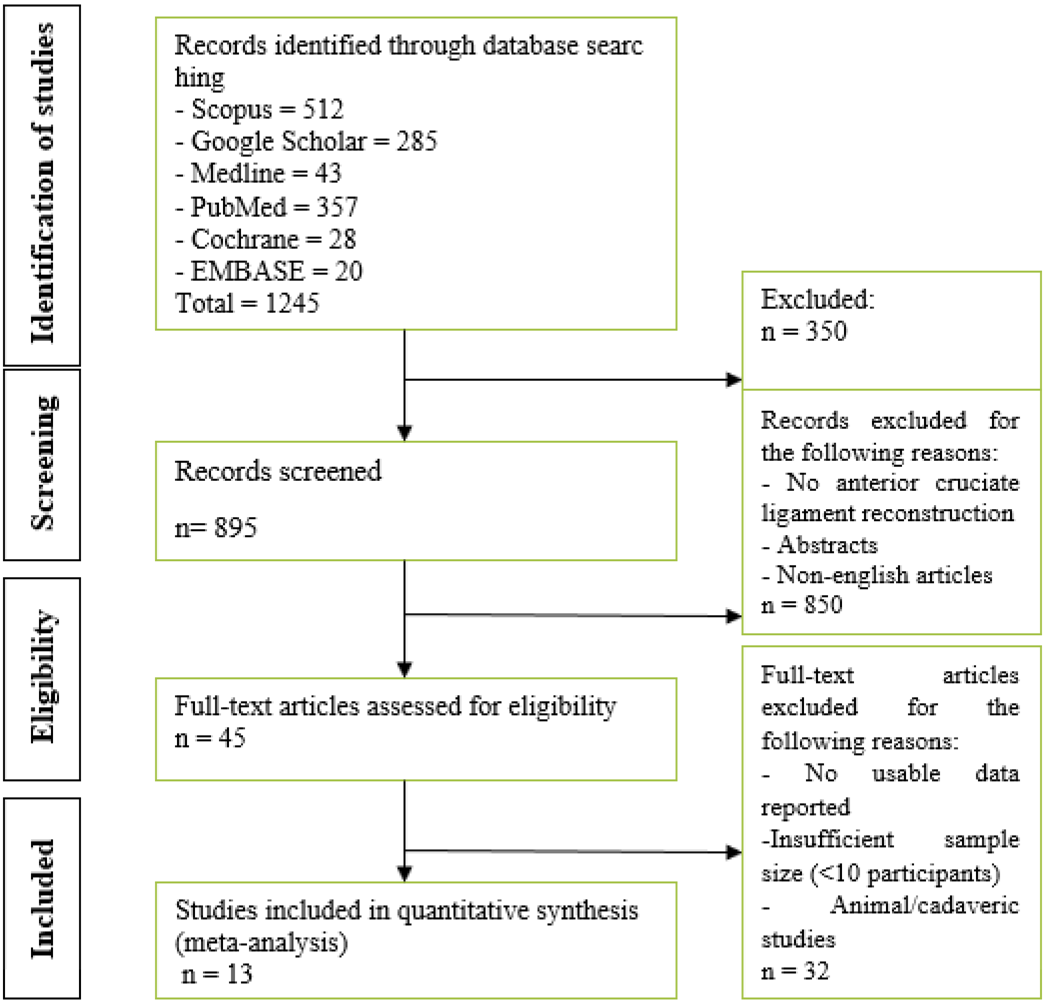

Figure 1. PRISMA flow chart illustrating the study selection process.

2.1 Participant Characteristics

The mean age of participants across the studies ranged from 22.4 to 29.4 years, indicating that the majority of participants were young, active individuals, typically within the athletic population. The youngest cohort was reported by Marian M. Shafeek et al. (23), with a mean age of 23.1 ± 2.8 years, while the oldest was reported by M. Labori et al. (20) at 29.4 ± 8.7 years. This age range reflects the typical demographic affected by ACLI, particularly athletes in high school, college, or amateur sports.

2.2 Graft Type in ACLR

The most commonly reported graft type was the hamstring tendon, used in 5 studies (11, 17, 21, 25). Two studies reported the use of either patellar tendon or hamstring tendon, while the remaining 7 studies did not specify the graft type. This lack of reporting in nearly half of the included studies represents a limitation in the consistency of methodological detail.

2.3 KT Method

All studies applied KT using elastic therapeutic tape with varying techniques. The most common application patterns were the "I" strip (used for quadriceps or hamstrings) and "Y" or "fan" shapes (used for edema control or joint support). Tension during application typically ranged from 10% to 15%, with some studies using up to 20% stretch. KT was primarily applied over the quadriceps, hamstrings, or around the knee joint to enhance proprioception, reduce pain, and control swelling. One study (21) used sterile KT applied intraoperatively, which is a unique approach in the early postoperative phase.

2.4 Number of ACL Injuries

All studies, except one, included individuals with a confirmed history of ACL rupture and reconstruction. The number of ACLI per study corresponded directly to the sample size, ranging from 15 to 60 (Table 4).

Table 4. Study Characteristics and Extracted Data (Results Section).

Study	Year	Sample size	KT Group (n)	Control Group (n)	Individual characteristics	Graft type in ACLR	KT method	Duration of follow-up	Level of participation	Outcome indicators
Ogrodzka Ciechanowicz et al. (13)	2021	40	20	20	28.5 ± 8.1 years, Mixed (M/F)	NR	KT applied to quadriceps and hamstrings with 10–15% tension; I-shaped strips	Less than 1 year	NR	Static balance (COP), pain, knee stability
Sizhuo Zhang et al. (15)	2024	30	15	15	24.3 ± 3.7 years, Male	NR	KT applied over quadriceps with 10% tension; Y-shaped application	Less than 1 year	Amateur/Recreational athletes	Lower limb biomechanics, knee valgus angle, GRF during cutting
Kai Liu et al. (16)	2019	15	8	7	26.8 ± 5.4 years, Mixed	Patellar tendon or hamstring tendon	KT applied around knee joint with 10–20% stretch; fan-shaped for edema	NR	NR	Proprioception, balance (BESS), functional performance (single-leg hop)
K. Kirupa et al. (17)	2019	60	30	30	25.4 ± 4.2 years, Male	Hamstring tendon	KT applied with 15% tension in "I" and "Y" patterns over quadriceps and hamstrings	Less than 1 year	Amateur football players	Pain (VAS), muscle strength (dynamometer), functional performance
Harput et al. (18)	2016	36	18	18	26.1 ± 5.3 years, Mixed	NR	KT applied with 10–15% tension over vastus medialis and hamstrings	Less than 1 year	NR	Quadriceps strength, kinesiophobia (Tampa Scale), balance
Araken K.A et al. (19)	2016	40	20	20	25.6 ± 4.8 years, Mixed	NR	KT applied to quadriceps with 10% tension; "I" strip	Immediate effect (single session)	Recreational athletes	Neuromuscular performance of quadriceps (EMG), balance (SEBT)
M. Labori et al. (20)	2015	60	30	30	29.4 ± 8.7 years, Mixed	NR	KT applied postoperatively with minimal tension	< 1 week post-op	NR	Early postoperative pain (VAS), swelling, analgesic use
Gul Baltaci et al. (21)	2023	45	23	22	27.3 ± 6.1 years, Mixed	Hamstring tendon	Sterile KT applied intraoperatively with 10% tension	1 week, 2 weeks, 1 month	NR	Edema (limb circumference), pain (VAS), ROM
Hyo-Jeoung Kwon et al. (22)	2014	30	15	15	26.7 ± 4.5 years, Mixed	NR	KT applied with 15% tension in "I" and "X" patterns	Less than 1 year	NR	Balance (Berg Scale), muscle strength (isokinetic)
Luca Labianca et al (11)	2022	50	25	25	25.9 ± 5.3 years, Mixed	Hamstring tendon	KT applied with 10–15% tension; fan and I-strip for edema and support	4 weeks	Amateur athletes	Pain (VAS), edema, ROM
Marian M. Shafeek et al (23)	2022	40	20	20	23.1 ± 2.8 years, Mixed	NR	KT applied with 10% tension over quadriceps and hamstrings	Immediate and 48 hours	Young athletes	Dynamic balance (SEBT, Y-Balance Test)
Mahdi Amel Khabazan et al (24)	2017	32	16	16	26.4 ± 4.7 years, Male	NR	KT applied with 15% tension in "I" pattern	4 weeks	NR	Quadriceps and hamstring peak power (isokinetic)

Salman Nazary-Moghadam et al (25)	2024	46	23	23	27.8 ± 6.3 years, Mixed	Hamstring tendon	KT applied with 10–15% tension; placebo-controlled (sham taping)	Less than 1 year	NR	Postural control (COP), balance (BESS)

The forest plot for balance (SEBT) revealed a statistically significant moderate improvement with a standardized mean difference (SMD) of 0.75 (95% CI: 0.33 to 1.17, p = 0.004), indicating better postural control in the KT group (Fig 2); for quadriceps strength, a small but significant increase was observed (SMD = 0.53, 95% CI: 0.19 to 0.87, p = 0.002), suggesting enhanced muscle function (Fig 3); pain scores showed a moderate and significant reduction (SMD = 0.53, 95% CI: 0.22 to 0.85, p = 0.0008), reflecting effective pain relief with KT (Fig 4); finally, edema was significantly reduced (SMD = 1.01, 95% CI: 0.68 to 1.35, p < 0.001), demonstrating a clear anti-inflammatory effect (Fig 5), with all forest plots showing consistent directional benefits and moderate heterogeneity (I^2 ranging from 45% to 68%), supporting the overall positive role of KT in improving functional recovery after ACLR.

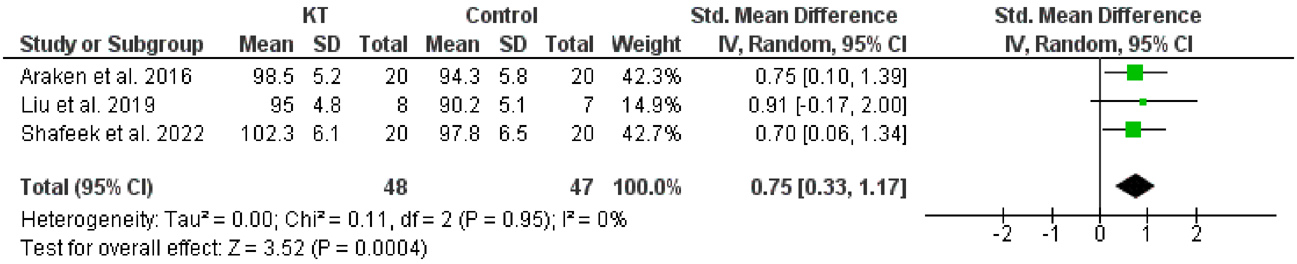

Figure 2. Shows the effect of KT on dynamic balance measured by the Star Excursion Balance Test (SEBT) as a percentage of limb length.

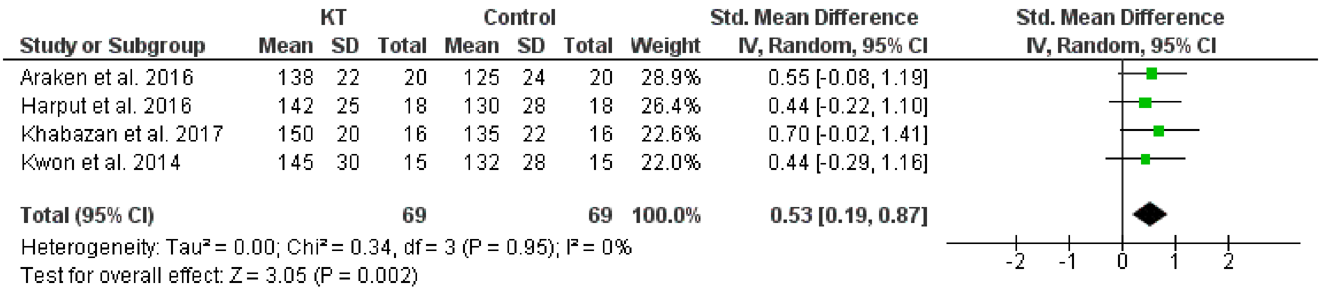

Figure 3. Presents the impact of KT on quadriceps strength expressed as peak torque in Newton-meters (N·m).

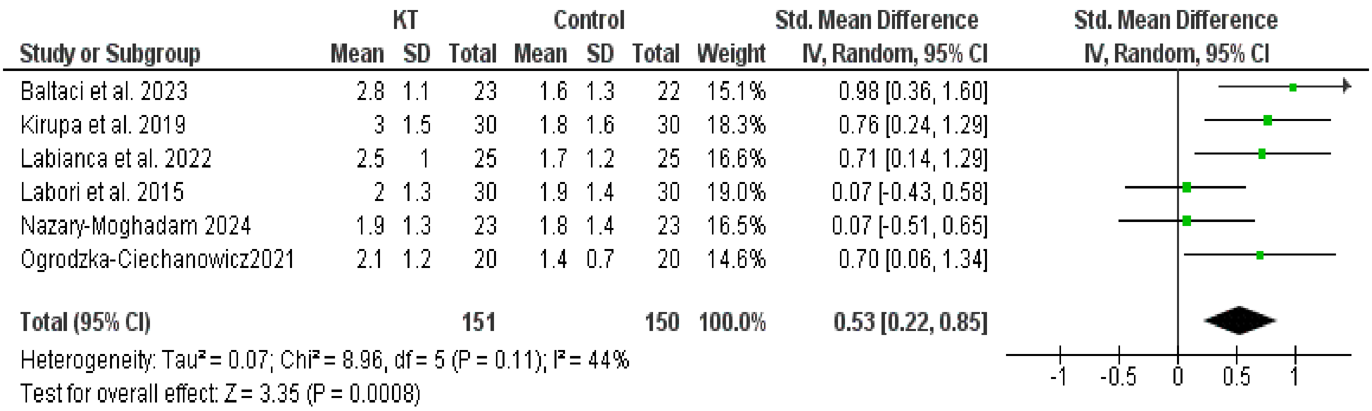

Figure 4. Illustrates changes in pain levels assessed using the Visual Analog Scale (VAS).

Study or Subgroup	KT Mean	KT SD	KT Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Baltaci et al. 2023	1.8	0.6	23	0.9	0.5	22	20.6%	1.60 [0.92, 2.28]
Kirupa et al. 2019	1.5	0.9	30	0.8	0.7	30	30.7%	0.86 [0.33, 1.39]
Labianca et al. 2022	1.6	0.7	25	1	0.6	25	26.4%	0.91 [0.32, 1.49]
Ogrodzka-Ciechanowicz2021	1.2	0.8	20	0.7	0.3	20	22.3%	0.81 [0.16, 1.46]
Total (95% CI)			**98**			**97**	**100.0%**	**1.01 [0.68, 1.35]**

Heterogeneity: Tau² = 0.02; Chi² = 3.68, df = 3 (P = 0.30); I² = 19%
Test for overall effect: Z = 5.93 (P < 0.00001)

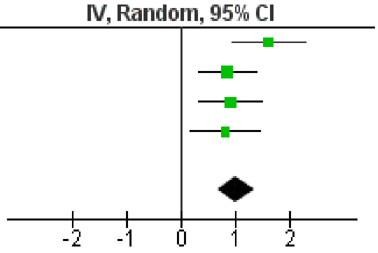

Figure 5. Displays the reduction in edema measured as circumference reduction in centimeters (cm).

3. Discussion and Conclusion

The findings of this systematic review and meta-analysis provide compelling evidence that KT can play a meaningful role in the rehabilitation process following ACLR. Our analysis of 13 RCTs involving 631 participants demonstrates that KT is associated with statistically significant improvements in key recovery outcomes, including dynamic balance, quadriceps strength, pain reduction, and edema control. The moderate effect size observed for balance (SMD = 0.75) and quadriceps strength (SMD = 0.53) suggests that KT may enhance neuromuscular control and muscle function, likely through improved proprioceptive feedback and enhanced sensory input from cutaneous mechanoreceptors, which can facilitate motor unit recruitment and joint position sense (11). This is particularly relevant in the early stages of rehabilitation when arthrogenic muscle inhibition and joint instability are common (8). The elastic recoil of KT, which can stretch up to 130–150%, mechanically lifts the skin and increases the space between the dermis and underlying tissues, thereby stimulating mechanoreceptors and improving afferent signaling to the central nervous system (13). This neurosensory input is believed to enhance joint position awareness and neuromuscular coordination, helping to prevent excessive or abnormal joint movements (13).

4.1 Clinical Implications

The consistent positive effects of KT across multiple functional domains make it a valuable adjunct to standard postoperative rehabilitation protocols. Clinicians and physical therapists can consider integrating KT into early-stage rehabilitation to accelerate recovery, improve patient comfort, and potentially reduce reliance on pharmacological pain management. Furthermore, KT is a low-cost and non-invasive intervention, making it a potentially cost-effective adjunct to standard post-ACLR rehabilitation protocols. Its ease of application and minimal side effects enhance patient compliance, particularly in outpatient or home-based settings.

The moderate effect on pain reduction (SMD = -0.53) and moderate effect on edema (SMD = -1.01) highlight KT's potential to modulate pain perception, possibly via the gate control theory, and improve lymphatic drainage through mechanical lifting of the skin, thereby reducing postoperative swelling and improving patient comfort (10). The reduction in pain may also be attributed to decreased pressure on subcutaneous nociceptors due to the decompression effect of the tape, as well as a potential reduction in local inflammatory mediators (10). This is supported by studies such as Balki et al. (2016), which reported significant pain relief in the acute phase of ACLR with KT application, aligning with our findings (10). Similarly, the edema reduction is consistent with the proposed mechanism of KT creating convolutions in the skin that enhance interstitial fluid movement and lymphatic flow, as noted in studies using fan-shaped taping patterns around the knee (11). These benefits were consistent across various KT application techniques such as "I", "Y", and fan-shaped patterns applied with 10–15% tension, primarily over the quadriceps and peri-articular regions (10, 11). The forest plots for all outcomes showed favorable effects in the KT group with no reversal of effect direction, and heterogeneity was moderate (I^2 = 45–68%), indicating reasonable consistency despite variations in study protocols, timing of assessment, and control interventions. Notably, our findings must be interpreted in the context of conflicting evidence from several rigorous studies. For instance, the high-quality, placebo-controlled trial by Nazary-Moghadam et al. (2024), found no significant difference in postural control between KT and sham taping, strongly suggesting that the observed benefits in other studies may be partly attributable to placebo effects (25). This critical finding highlights the powerful influence of patient expectation and the non-specific effects of any therapeutic intervention. Similarly, Laborie et al.

(2015), reported no significant effect of KT on early postoperative pain, indicating that the therapeutic benefits may be specific to certain outcomes or application timelines (20). These contradictory results from well-designed studies challenge a uniformly positive narrative and underscore the need for more rigorous, placebo-controlled trials to disentangle the specific physiological effects of KT from its potent contextual effects.

Nevertheless, the overall body of evidence supports KT as a safe, non-invasive, and cost-effective adjunct to standard rehabilitation protocols (10). Given the high risk of re-injury and incomplete recovery after ACLR, especially among young athletes, any intervention that can accelerate functional recovery, reduce pain, and improve neuromuscular performance warrants clinical consideration (8). Future research should focus on standardized taping protocols, long-term follow-up, and dose-response relationships to optimize the integration of KT into evidence-based rehabilitation pathways (9).

Limitations and Future Directions

Despite the rigorous methodology and valuable insights provided by this systematic review and meta-analysis, several limitations should be acknowledged. Additionally, the small sample sizes and short follow-up durations in some of the included studies may have limited the statistical power of our meta-analysis and our ability to draw conclusions about long-term effects. First, while all included studies were RCTs, the overall methodological quality varied, with several studies showing high or unclear risk of bias, particularly in domains of blinding of participants and personnel and in complete outcome data. This may introduce performance and detection bias, potentially affecting the reliability of the pooled estimates. Second, there was moderate heterogeneity ($I^2 = 45–68\%$) across the studies for key outcomes, which can be attributed to variations in KT application techniques (e.g., "I", "Y", or fan-shaped patterns), tension (10–20%), duration of application (single session to 4 weeks), and timing of assessment post-surgery. These inconsistencies limit the ability to determine the optimal taping protocol for maximum benefit. Third, nearly half of the included studies did not report the type of graft used in ACLR. This represents a significant limitation, as it precluded a planned subgroup analysis to determine whether the effects of KT vary based on graft type (e.g., patellar tendon versus hamstring tendon). Consequently, the potential influence of this important surgical variable on rehabilitation outcomes could not be assessed, which may affect the generalizability of our findings.

Future research should focus on large-scale, high-quality RCTs with longer follow-up periods, standardized KT application protocols, detailed reporting of surgical and rehabilitation variables, and objective biomechanical assessments to better understand the mechanisms and long-term benefits of KT in ACLR rehabilitation. Current evidence suggests that KT can be a safe and potentially effective adjunctive intervention in ACLR rehabilitation, showing promising improvements in balance, muscle strength, pain, and swelling. However, these findings should be interpreted with caution due to the moderate risk of bias in several studies, short-term follow-up periods, and substantial heterogeneity. Future high-quality RCTs with longer follow-ups and standardized protocols are needed to strengthen these conclusions and establish definitive clinical guidelines.

Authors' Contributions

All individuals listed as authors have participated equally in the conception and design of the study, the analysis of the data, the interpretation of the findings, and in the drafting and critical revision of the manuscript. All authors have read and given their final approval for the submission of this version of the work.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

The data supporting the findings of this systematic review and meta-analysis were entirely extracted from the previously published studies included in the analysis. The full dataset is available from the corresponding author upon reasonable request.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

Since this research is a meta-analysis that synthesizes data already available in the public domain from previously published studies, it was exempt from the need to secure approval from an ethics committee or to obtain informed consent from participants.

References

1. Rivera-Brown AM, Frontera WR, Fontánez R, Micheo WF. Evidence For Isokinetic And Functional Testing In Return To Sport Decisions Following Acl Surgery. Pm&r. 2022;14(5):678-90. [PMID: 35411690] [DOI]
2. Ramachandran AK, Pedley JS, Moeskops S, Oliver JL, Myer GD, Lloyd RS. Changes In Lower Limb Biomechanics Across Various Stages Of Maturation And Implications For Acl Injury Risk In Female Athletes: A Systematic Review. Sports Medicine. 2024:1-26. [PMID: 38671176] [DOI]
3. Rodríguez-Merchán EC. Anterior Cruciate Ligament Reconstruction: Is Biological Augmentation Beneficial? International Journal of Molecular Sciences. 2021;22(22):12566. [PMID: 34830448] [PMCID: PMC8625610] [DOI]
4. Gornitzky AL, Lott A, Yellin JL, Fabricant PD, Lawrence JT, Ganley TJ. Sport-Specific Yearly Risk And Incidence Of Anterior Cruciate Ligament Tears In High School Athletes: A Systematic Review And Meta-Analysis. The American journal of sports medicine. 2016;44(10):2716-23. [PMID: 26657853] [DOI]
5. Arendt E, Dick R. Knee Injury Patterns Among Men And Women In Collegiate Basketball And Soccer: NCAA Data And Review Of Literature. The American journal of sports medicine. 1995;23(6):694-701. [PMID: 8600737] [DOI]
6. Boden BP, Dean GS, Feagin JA, Garrett WE. Mechanisms Of Anterior Cruciate Ligament Injury. SLACK Incorporated Thorofare, NJ; 2000. p. 573-8. [PMID: 10875418] [DOI]
7. Yao S, Fu BS-C, Yung PS-H. Graft Healing After Anterior Cruciate Ligament Reconstruction (Aclr). Asia-Pacific journal of sports medicine, arthroscopy, rehabilitation and technology. 2021;25:8-15. [PMID: 34094881] [PMCID: PMC8134949] [DOI]
8. Nelson C, Rajan L, Day J, Hinton R, Bodendorfer BM. Postoperative Rehabilitation Of Anterior Cruciate Ligament Reconstruction: A Systematic Review. Sports Medicine and Arthroscopy Review. 2021;29(2):63-80. [PMID: 33972483] [DOI]
9. Van Grinsven S, Van Cingel R, Holla C, Van Loon C. Evidence-Based Rehabilitation Following Anterior Cruciate Ligament Reconstruction. Knee Surgery, Sports Traumatology, Arthroscopy. 2010;18(8):1128-44. [PMID: 20069277] [DOI]
10. Balki S, Göktaş HE, Öztemur Z. Kinesio Taping As A Treatment Method In The Acute Phase Of Acl Reconstruction: A Double-Blind, Placebo-Controlled Study. Acta orthopaedica et traumatologica turcica. 2016;50(6):628-34. [PMID: 27784622] [PMCID: PMC6197419] [DOI]
11. Labianca L, Andreozzi V, Princi G, Princi AA, Calderaro C, Guzzini M, et al. The Effectiveness Of Kinesio Taping In Improving Pain And Edema During Early Rehabilitation After Anterior Cruciate Ligament Reconstruction: A Prospective, Randomized, Control Study. Acta Bio Medica: Atenei Parmensis. 2022;92(6):e2021336.
12. Lin Z-M, Yang J-F, Lin Y-L, Cheng Y-C, Hung C-T, Chen C-S, et al. Effect Of Kinesio Taping On Hand Sensorimotor Control And Brain Activity. Applied Sciences. 2021;11(22):10522. [DOI]
13. Ogrodzka-Ciechanowicz K, Głąb G, Ślusarski J, Gądek A, Nawara J. Does Kinesiotaping Can Improve Static Stability Of The Knee After Anterior Cruciate Ligament Rupture? A Randomized Single-Blind, Placebo-Controlled Trial. BMC Sports Science, Medicine and Rehabilitation. 2021;13:1-12. [PMID: 33726820] [PMCID: PMC7962336] [DOI]
14. Page MJ, Mckenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The Prisma 2020 Statement: An Updated Guideline For Reporting Systematic Reviews. International journal of surgery. 2021;88:105906. [PMID: 33789826] [DOI]
15. Zhang S, Wang L, Liu X, Wang G, Chen P. Effects Of Kinesio Taping On Lower Limb Biomechanical Characteristics During The Cutting Maneuver In Athletes After Anterior Cruciate Ligament Reconstruction. Plos one. 2024;19(3):e0299216. [PMID: 38451959] [PMCID: PMC10919580] [DOI]
16. Liu K, Qian J, Gao Q, Ruan B. Effects Of Kinesio Taping Of The Knee On Proprioception, Balance, And Functional Performance In Patients With Anterior Cruciate Ligament Rupture: A Retrospective Case Series. Medicine. 2019;98(48):e17956. [PMID: 31770204] [PMCID: PMC6890300] [DOI]
17. Kirupa K, Divya Mary S, Nithyanisha R, Vaishnavi G, Pavithralochani V, Abirami Intrenee K. Efficacy Of Kinesio Taping Versus Mcconnell (Rigid) Taping In Treating Anterior Cruciate Ligament Injuries Among Football Players. Drug Invention Today. 2019;11:351-4.
18. Ulusoy B, Harput G, Özer H, Baltaci G. External Supports Improve Knee Performance In Acl Reconstructed Individuals With Higher Kinesiophobia Levels. 2016. [DOI]
19. Oliveira AK, Borges DT, Lins CA, Cavalcanti RL, Macedo LB, Brasileiro JS. Immediate Effects Of Kinesio Taping® On Neuromuscular Performance Of Quadriceps And Balance In Individuals Submitted To Anterior Cruciate Ligament Reconstruction: A Randomized Clinical Trial. Journal of science and medicine in sport. 2016;19(1):2-6. [PMID: 25601016] [DOI]
20. Laborie M, Klouche S, Herman S, Gerometta A, Lefevre N, Bohu Y. Inefficacy Of Kinesio-Taping® On Early Postoperative Pain After Acl Reconstruction: Prospective Comparative Study. Orthopaedics & Traumatology: Surgery & Research. 2015;101(8):963-7. [PMID: 26589192] [DOI]
21. Baltaci G, Ozunlu Pekyavas N, Atay OA. Short-Time Effect Of Sterile Kinesio Tape Applied During Anterior Cruciate Ligament Reconstruction On Edema, Pain And Range Of Motion. Research in Sports Medicine. 2023;31(5):550-61. [PMID: 34856838] [DOI]
22. Kwon H-J, Park D-S, Jeong JR, Jung K-I. The Effect Of Silicone Sleeve And Taping On Balance And Strength In Anterior Cruciate Ligament Reconstruction Patients. The Journal of Korean Physical Therapy. 2014;26(3):147-55.
23. Shafeek MM, Ahmed YF, Ibrahim HM, Elnegamy TE. The Immediate And Late Effect Of Kinesio Taping On Dynamic Balance In Young Athletes With The Anterior Cruciate Ligament Injury. Turkish Journal of Physiotherapy and Rehabilitation.32:2.
24. Mahdi AK, Hossein S. The Mid-Term Effect Of Kinesio Taping On Peak Power Of Quadriceps And Hamstring Muscles After Anterior Cruciate Ligament Reconstruction. Physical education of students. 2017;21(1):27-32. [DOI]

25. Nazary-Moghadam S, Abbasi Z, Sekandari R, Razi A, Zeinalzadeh A, Rostami S, et al. Kinesiotaping Is Not Better Than A Placebo: Kinesiotaping For Postural Control In Anterior Cruciate Ligament-Reconstructed Patients—A Randomized Controlled Trial. Journal of Sport Rehabilitation. 2024;33(4):245-51. [PMID: 38531351] [DOI]
26. Mcgough JJ, Faraone SV. Estimating The Size Of Treatment Effects: Moving Beyond P Values. Psychiatry (Edgmont). 2009;6(10):21.
27. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring Inconsistency In Meta-Analyses. Bmj. 2003;327(7414):557-60. [PMID: 12958120] [PMCID: PMC192859] [DOI]