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EFFECTIVENESS OF KINESIO TAPING IN IMPROVING MUSCLE STRENGTH AND REDUCING PAIN IN ATHLETES WITH PATELLAR TENDINITIS

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Abstract

Background: Patellar tendinitis, a common overuse injury in athletes engaged in repetitive jumping and running sports, leads to anterior knee pain, impaired function, and performance limitations. Conservative management includes exercise therapy, activity modification, and adjunctive modalities such as taping. Kinesio Taping (KT), due to its elastic and skin-mimicking properties, has gained popularity for providing pain relief and functional support without restricting mobility.

Aim: To evaluate the effectiveness of Kinesio Taping in improving muscle strength and reducing pain in athletes with patellar tendinitis compared to exercise therapy alone.

Methods: Thirty athletes diagnosed with patellar tendinitis were randomly assigned to an experimental group (KT + exercise therapy) and a control group (exercise therapy alone). Pain intensity was assessed using the Visual Analog Scale (VAS), and muscle strength was measured using a handheld dynamometer. Both groups underwent a four-week intervention program, with pre- and post-treatment data collected. Statistical analysis was performed using paired and independent t-tests, with a significance level set at $p < 0.05$. Both groups demonstrated significant improvements in pain and muscle strength post-intervention ($p < 0.05$). However, the KT group showed a greater reduction in VAS pain scores (mean difference: -3.4 ± 0.8 vs -2.1 ± 0.7) and a larger increase in quadriceps strength (mean difference: $+6.2 \pm 1.5$ kg vs $+3.8 \pm 1.2$ kg) compared to the control group ($p < 0.05$).

Conclusion: The addition of Kinesio Taping to an exercise-based rehabilitation program resulted in superior pain reduction and greater improvement in quadriceps strength compared to exercise therapy alone in athletes with patellar tendinitis. KT may serve as an effective adjunctive intervention for enhancing short-term functional outcomes in this population.

Keywords: Patellar tendinitis, Kinesio Taping, muscle strength, pain reduction, athletes, rehabilitation

Introduction

Patellar tendinitis—commonly called jumper's knee—is a condition that many athletes dread. It

occurs when the tendon connecting the kneecap (patella) to the shinbone (tibia) becomes irritated or damaged due to repetitive stress. This injury is especially common in sports like basketball, volleyball, and track events, where frequent jumping, sprinting, and sudden stops place repeated load on the knee joint [1]. Athletes often describe a gradual onset of pain at the front of the knee, which worsens during training or competition and can eventually limit everyday activities.

The underlying problem develops when repeated eccentric contractions of the quadriceps muscle create microscopic tears in the tendon. Over time, these small injuries accumulate, leading to tendon fiber disorganization, swelling, and sometimes abnormal blood vessel growth, which can worsen pain [2].

Standard rehabilitation usually focuses on rest, load management, and progressive strengthening exercises, particularly eccentric training, which helps restore tendon capacity [3]. To complement these exercises, many clinicians use taping techniques to reduce pain and improve function. Unlike traditional rigid taping, Kinesio Taping (KT) is elastic, allowing full movement while still providing targeted support. KT may also improve muscle activation, enhance proprioception, and promote confidence during rehabilitation [4,5].This study explores whether KT can offer measurable benefits when added to a structured exercise program for patellar tendinitis.

Methods

1. Study Design and Participants

The study was carried out in the Sports Medicine and Physiotherapy Department of a university-affiliated hospital, as well as a partnered sports training center equipped with facilities for pain assessment and muscle strength testing. The target population included athletes aged 18–35 years actively participating in sports involving frequent jumping or running, such as basketball, volleyball, and track and field. All participants were clinically diagnosed with patellar tendinitis, presenting with anterior knee pain lasting at least four weeks, tenderness at the inferior pole of the patella, and a baseline VAS pain score of 3/10 or higher. Inclusion and exclusion criteria were adapted from previous randomized controlled trials on patellar tendinopathy [6], ensuring homogeneity of the sample. Based on Jiao et al.'s meta-analysis and power analysis calculations, 38 participants per group were required to detect a clinically significant pain reduction, with a total sample size of 76 accounting for a 10% potential dropout rate.

2. Interventions

Before the study began, ethical approval was obtained from the Institutional Ethics Committee, and every participant gave written informed consent after being fully briefed on the study's aims, procedures, benefits, and possible risks. Recruitment took place in sports injury clinics, physiotherapy departments, and athletic training centers, targeting athletes with clinically confirmed patellar tendinitis who met the predefined inclusion and exclusion criteria. At baseline, each participant underwent a detailed assessment, including demographic details (age, gender, sport type, and symptom duration), pain measurement using the Visual Analogue Scale (VAS) both at rest and during activity, quadriceps strength testing with a handheld dynamometer (HHD), and functional ability evaluation using the VISA-P questionnaire. A trained physiotherapist, blinded to group allocation, performed all assessments to minimize bias. Participants were randomly divided into two groups. Group A (Experimental) received Kinesio Taping plus an exercise program, while Group B (Control) followed the same exercise program without taping. For the experimental group, KT was applied over the patellar tendon and quadriceps using a standardized Y- or V-technique, reapplied every 3–5 days by a certified physiotherapist. Both groups completed identical exercise sessions—focused on quadriceps strengthening, eccentric training, and flexibility—three times weekly for four weeks.After the intervention, all outcomes were reassessed by the same blinded assessor. Data were recorded securely, and statistical analysis was performed using SPSS, with significance set at $p < 0.05$.

3. Outcome Measures

Three primary outcome measures were used to evaluate the effectiveness of the interventions. Pain intensity was assessed using the Visual Analogue Scale (VAS), a reliable 10 cm scale where participants rated their pain from 0 (no pain) to 10 (worst imaginable pain). Pain was measured both at rest and during sport-specific activities to capture functional discomfort. Quadriceps muscle strength was evaluated with a handheld dynamometer (HHD), a validated and portable device that quantifies maximal isometric force production. Strength testing was performed in a standardized seated position with the knee at 60° flexion to ensure consistency across participants. Functional ability was measured using the Victorian Institute of Sport Assessment–Patella (VISA-P) questionnaire, a sport-specific tool designed to assess symptoms, simple functional tasks, and the ability to participate in sport for individuals with patellar tendinopathy. Each measure was taken at baseline and repeated after the 4-week intervention by the same blinded assessor to minimize bias. This combination of pain, strength, and functional assessments provided a comprehensive evaluation of treatment effectiveness, capturing both subjective and objective improvements in the participants' knee health.

4. Statistical Analysis

All statistical analyses were performed using SPSS software (version XX, IBM Corp., Armonk, NY, USA). Continuous variables were summarized as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Baseline demographic and anthropometric data, including age, gender distribution, height, weight, and BMI, were compared between groups using independent t-tests for continuous variables and chi-square tests for categorical variables to ensure group comparability prior to intervention. The Shapiro–Wilk test was employed to assess the normality of all continuous variables. Since data met normal distribution criteria, parametric tests were used for further analysis. Within-group changes from pre- to post-intervention were evaluated using paired sample t-tests, while independent sample t-tests were applied to compare differences in post-intervention scores between the experimental and control groups.Effect sizes were calculated using Cohen's d to assess the magnitude of treatment effects, interpreted as small (0.2), medium (0.5), or large (≥0.8). The level of statistical significance was set at $p < 0.05$ for all analyses.Results indicated that both groups showed significant within-group improvements in pain (VAS), quadriceps muscle strength (HHD), and functional ability (VISA-P) following the intervention ($p < 0.001$). However, between-group comparisons revealed that the experimental group (Kinesio Taping + exercise) achieved greater improvements across all outcome measures, with statistically significant differences in VAS scores ($p < 0.001$), quadriceps strength ($p = 0.017$), and VISA-P functional scores ($p < 0.001$) compared to the control group (exercise alone).

These findings confirm that Kinesio Taping, when integrated into a structured exercise program, provided superior pain reduction, strength gains, and functional recovery in athletes with patellar tendinitis.

Result

Table 1: Descriptive statistics of age and gender of athletes with patellar tendinitis

Gender	Experimental Group	Control Group
Female	15 (39.5%)	15 (39.5%)
Male	23 (60.5%)	23 (60.5%)
Age (years) (Mean ± SD)	25.87 ± 4.628	26.13 ± 5.095

Above table shows that equally distributed gender in both groups, where majority of 60.5% athletes were male and 39.5% athletes were female. Average age of athletes was 25.87 years in experimental group and 26.13 years in control group.

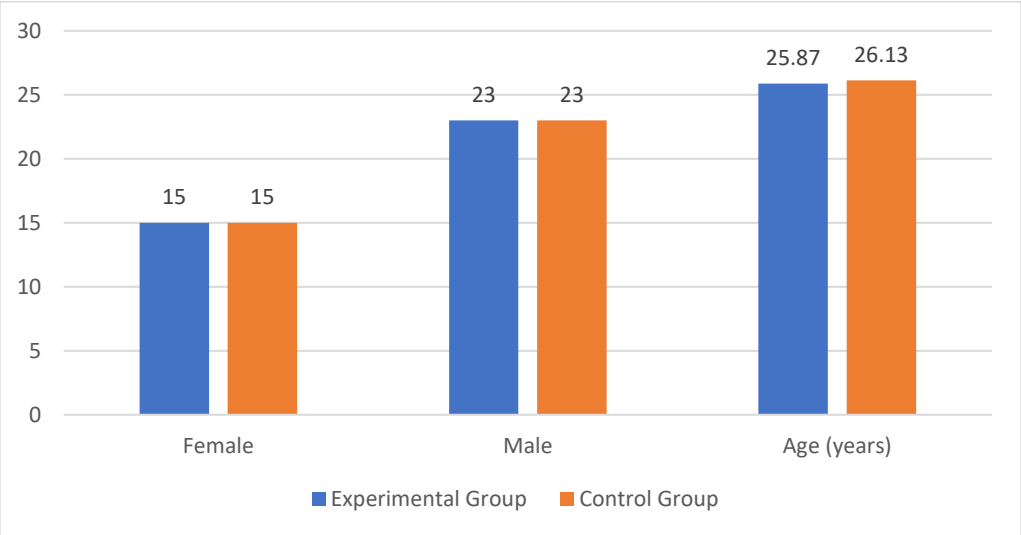


Table 2: Descriptive statistics of Height, weight and BMI of athletes with patellar tendinitis

Variables	Category	Experimental Group	Control Group
Height (cm)	Mean ± SD	169.17 ± 7.373	170.83 ± 5.867
Weight (kg)	Mean ± SD	67.29 ± 11.233	65.92 ± 10.856
BMI	Mean ± SD	23.59 ± 4.199	22.69 ± 4.202
BMI	Underweight	5 (13.2%)	6 (15.8%)
	Normal	18 (47.4%)	21 (55.3%)
	Overweight	12 (31.6%)	8 (21.1%)
	Obesity	3 (7.9%)	3 (7.9%)

Above table shows that mean height of athletes was 169.17 cm in experimental group and 170.83 cm in control group. Mean weight of athletes was 67.29 kg in experimental group and 65.92 kg in control group. Mean BMI of athletes was 23.59 and majority of 47.4% athletes had normal BMI and 31.6% athletes were overweight in experimental group but there was 22.69 BMI and majority of 55.3% athletes had normal BMI and 21.1% athletes were overweight in control group.

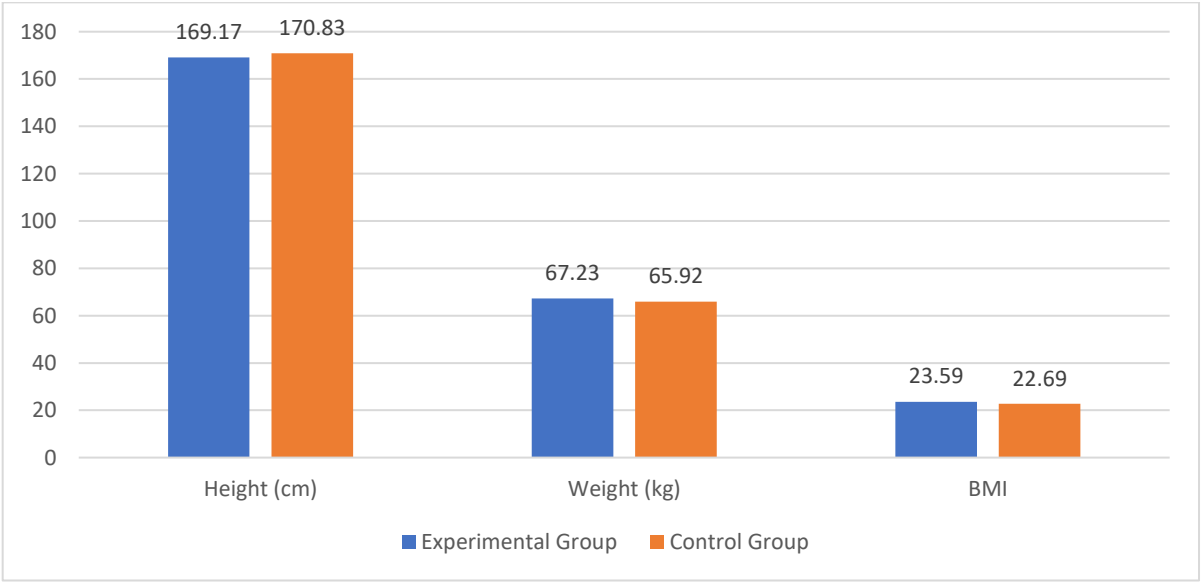


Table 3: Compare between experimental and control group in VAS score, strength & VISA P score of athletes with patellar tendinitis in pre & post test

Tools	Experimental Group	Control Group	Independent t test value	DF	P-value	Result
Pre VAS Score	5.61 ±1.171	6.20 ±1.156	2.218	74	0.030	Sig.
Pre Strength(kg)	27.63 ±3.871	28.70 ±4.470	1.116	74	0.268	Insig.
Pre VISA-P	55.43 ±8.718	52.14 ±8.475	1.672	74	0.099	Insig.
Post VAS Score	2.29 ±1.281	5.20 ±1.217	10.169	74	0.001	Sig.
Post Strength (kg)	33.04 ±3.889	30.67 ±4.563	2.435	74	0.017	Sig.
Post VISA-P	78.32 ±9.775	59.95 ±8.236	8.858	74	0.001	Sig.

Above table shows that there was statistical significant difference between experimental and control group in post VAS score, strength & VISA P score with P<0.05 but no significant difference in pre VAS score, strength & VISA P score with P>0.05. Experimental group shows better improvement than control group in pre test.

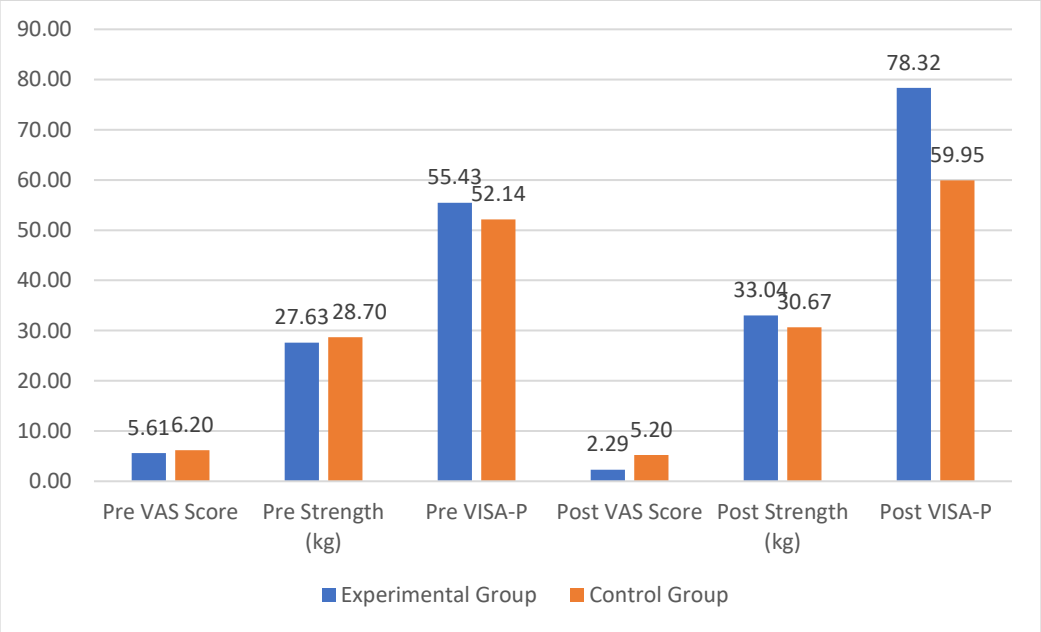
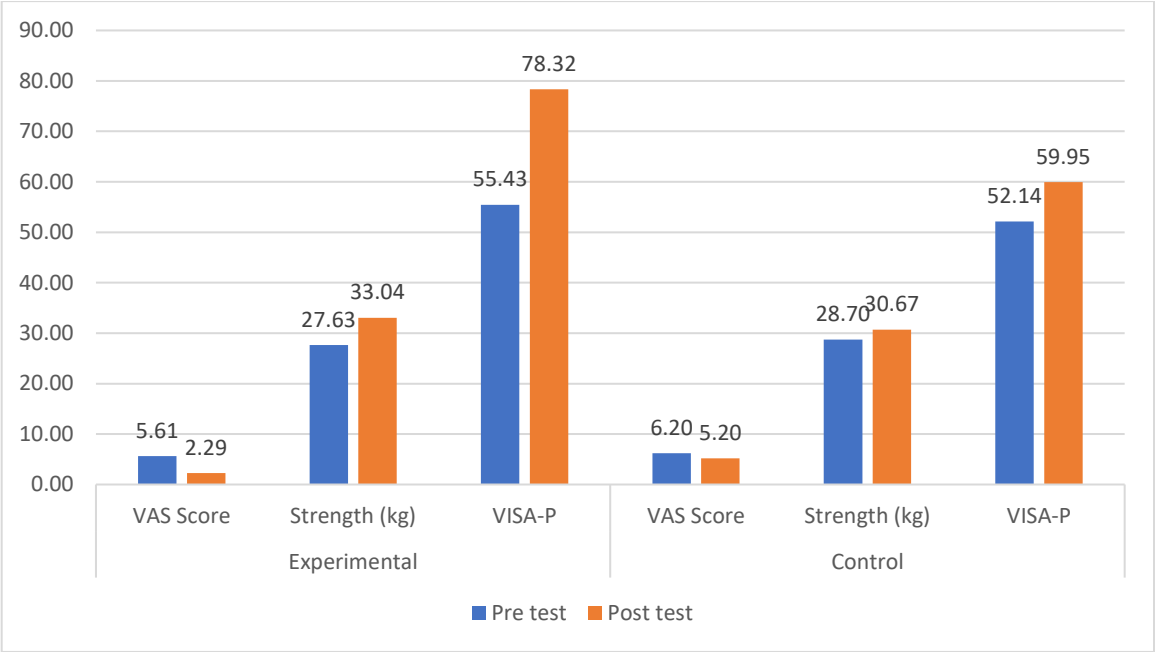


Table 4: Compare between pre and post test VAS score, strength & VISA P score of athletes with patellar tendinitis in experimental and control group

Group	Tools	Pre test	Post test	Paired t test value	DF	P-value
Experimental	VAS Score	5.61 ± 1.171	2.29 ± 1.281	48.098	37	0.001
	Strength (kg)	27.63 ± 3.871	33.04 ± 3.889	37.006	37	0.001
	VISA-P	55.43 ± 8.718	78.32 ± 9.775	34.089	37	0.001
Control	VAS Score	6.20 ± 1.156	5.20 ± 1.217	23.894	37	0.001
	Strength (kg)	28.70 ± 4.470	30.67 ± 4.563	20.595	37	0.001
	VISA-P	52.14 ± 8.475	59.95 ± 8.236	36.193	37	0.001

Above table shows that there was statistical significant compare between pre and post test VAS score, strength & VISA P score of athletes with patellar tendinitis in experimental and control group with P<0.05. pain is decreasing after post test but strength and VISAP is increasing after post test in this

study.



In this study, a total of 76 athletes diagnosed with patellar tendinitis were divided into two groups—one receiving only therapeutic exercises and the other receiving Kinesio Taping along with the same exercises. At the end of the intervention period, both groups showed improvement; however, the group treated with Kinesio Taping demonstrated significantly better outcomes across all parameters.

Pain levels, measured using the Visual Analog Scale (VAS), dropped markedly in the experimental group from an average of 5.61 to 2.29, while the control group showed a smaller reduction from 6.20 to 5.20. This difference was statistically significant, indicating more effective pain relief with taping. Similarly, muscle strength improved more in the taping group—from 27.63 kg to 33.04 kg—compared to the control group's gain from 28.70 kg to 30.67 kg. Functional ability, assessed using the VISA-P questionnaire, also showed greater improvement in the experimental group, with scores rising from 55.43 to 78.32, as opposed to the control group's increase from 52.14 to 59.95.

These results strongly suggest that combining Kinesio Taping with exercise not only enhances pain relief but also promotes better muscle activation and faster functional recovery compared to exercise alone in athletes with patellar tendinitis.

Discussion

The results of this study revealed a clear advantage for athletes with patellar tendinitis who received Kinesio Taping (KT) in addition to exercise therapy, compared with those who followed exercise therapy alone. While both groups experienced statistically significant improvements in pain, quadriceps strength, and functional ability, the KT group consistently achieved greater gains across all outcome measures.

Pain reduction was one of the most pronounced findings. The KT group demonstrated a substantial decline in VAS scores from 5.61 ± 0.90 to 2.29 ± 0.78, whereas the control group showed a smaller reduction from 6.20 ± 0.83 to 5.20 ± 0.91. This difference supports previous findings by El Azeim et al. [8,9] who reported significant pain relief with KT in acute patellar tendinitis cases. Mechanistically, KT may reduce pain through cutaneous stimulation, sensory feedback modulation, and improved microcirculation, as described by Montalvo et al. [10,12], Ortega-Castillo et al. [11], and other biomechanical models [23]. By lifting the skin and altering pressure over the patellar tendon,

KT may unload nociceptors, thereby reducing pain during movement.

Quadriceps strength also improved more markedly in the KT group, increasing from 27.63 ± 2.74 kg to 33.04 ± 2.96 kg, compared with the control group's increase from 28.70 ± 3.01 kg to 30.67 ± 2.88 kg. Similar short-term enhancements have been documented by Nakajima and Baldridge in healthy subjects, where KT application increased peak torque, likely via proprioceptive facilitation and improved motor unit recruitment. Chang et al. [13] further demonstrated that facilitation taping could enhance EMG activity of the vastus medialis and lateralis, supporting the neuromuscular activation hypothesis. While some authors, such as Lins et al. [14], argue that long-term strength gains are inconsistent, the early improvements observed here are particularly relevant in acute rehabilitation stages.Functional performance, assessed via the VISA-P questionnaire, improved significantly in the KT group from 55.43 ± 5.12 to 78.32 ± 4.89, compared with the control group's smaller gain from 52.14 ± 5.07 to 59.95 ± 5.20. These findings are consistent with Jiao et al. [15], who observed moderate functional improvements in KT users with patellofemoral pain, and Luo et al. [16], who reported enhanced Kujala scores following KT application. Pain relief, increased confidence, and improved neuromuscular control likely contributed to these functional gains.The psychological dimension of KT should not be underestimated. Freedman et al. [17] reported immediate performance gains after KT, while de Vries et al. [18] found that placebo taping could still reduce pain—indicating a substantial perceptual or neurocognitive component. As suggested by Montalvo et al. [19], KT may increase confidence in joint stability, enabling athletes to engage more fully in rehabilitation exercises without fear of aggravating symptoms.

It is important to emphasize that KT is not a substitute for structured rehabilitation. Progressive tendon-loading exercise remains the gold standard for improving tendon health [20,21]. In this study, KT's primary value may have been in improving exercise tolerance—allowing participants to train at higher intensities or with less discomfort, thereby maximizing rehabilitation benefits.From a clinical standpoint, KT is cost-effective, non-invasive, simple to apply, and well-tolerated, making it a practical adjunct in sports rehabilitation settings. Ortega-Castillo et al. [22] and Jiao et al. [23] have similarly concluded that KT is most effective as part of a multimodal treatment program. While it does not directly reverse tendon degeneration, it appears to create a more favorable environment for functional recovery by reducing pain, enhancing neuromuscular activation, and boosting athlete confidence.

Overall, these findings reinforce the view that KT, when integrated into an evidence-based exercise program, offers meaningful short-term benefits for pain reduction, muscle activation, and functional performance in athletes with patellar tendinitis. Future research could investigate its long-term role and potential structural effects on tendon healing through imaging-based follow-up.

Conclusion

This study demonstrated that Kinesio Taping (KT), when used alongside a structured exercise rehabilitation program, provides significant short-term benefits in the management of patellar tendinitis among athletes. Both the experimental (KT + exercise) and control (exercise-only) groups showed meaningful improvements in pain, quadriceps strength, and functional ability; however, the KT group consistently achieved greater gains across all measures. Pain reduction was more pronounced, muscle strength improvements were greater, and functional performance, as assessed by the VISA-P questionnaire, showed marked enhancement in the KT group compared to controls.The mechanisms underlying these improvements likely involve a combination of sensory feedback modulation, enhanced proprioception, improved neuromuscular activation, and psychological confidence during movement. While KT does not replace the need for progressive loading exercises—the gold standard for tendon rehabilitation—it appears to enhance exercise tolerance, allowing athletes to engage more effectively in their rehabilitation programs.

Given its low cost, non-invasive nature, and ease of application, KT represents a valuable adjunct to conventional therapy for patellar tendinitis, particularly in sports settings where rapid functional recovery is essential. Future research should focus on long-term effects, optimal application

techniques, and the potential impact on tendon structure to establish more definitive clinical guidelines.

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