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Original Article

Comparative Effects of Kinesio-Taping and Progressive Loading Exercise Program on Pain and Quality of Life in Lateral Epicondylitis

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ABSTRACT

Background: Lateral epicondylitis (LE), commonly referred to as tennis elbow, is a prevalent musculoskeletal disorder characterized by pain and functional limitations due to repetitive stress on the extensor tendons. Conservative interventions such as Kinesio-Taping (KT) and Progressive Loading Exercise (PLE) are frequently employed; however, comparative evidence evaluating their clinical efficacy remains inconclusive. Objective: To compare the effects of Kinesio-Taping and a Progressive Loading Exercise program on pain intensity and quality of life in patients with lateral epicondylitis. Methods: This randomized clinical trial enrolled 32 patients diagnosed with LE for less than three months and allocated them equally into two groups: KT (n=16) and PLE (n=16). Both groups received therapeutic ultrasound prior to intervention. Outcomes were measured at baseline, week 2, and week 6 using the Numeric Pain Rating Scale (NPRS) for pain and the Short Form-12 Health Survey (SF-12) for quality of life, including Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. Results: The KT group demonstrated a significant reduction in NPRS scores from 6.44 to 2.38 and a marked improvement in PCS from 35.31 to 68.69 ($p<0.001$), while the PLE group showed minimal changes. Between-group comparisons at six weeks revealed statistically and clinically significant differences in NPRS ($p=0.001$) and PCS ($p=0.001$) favoring KT. Conclusion: Kinesio-Taping is significantly more effective than Progressive Loading Exercise in reducing pain and improving physical quality of life over a six-week period in patients with lateral epicondylitis, supporting its use as an effective early-phase conservative intervention.
Keywords: Lateral epicondylitis, Kinesio-Taping, Progressive Loading Exercise, Pain, Quality of Life, Physiotherapy, Randomized Clinical Trial

INTRODUCTION

Lateral epicondylitis (LE), commonly referred to as "tennis elbow," is a prevalent musculoskeletal condition characterized by pain and tenderness over the lateral aspect of the elbow, most often involving the origin of the extensor carpi radialis brevis tendon. The condition is considered an overuse injury resulting from repetitive wrist extension, supination, and gripping activities, leading to microtrauma and tendinopathy of the extensor origin (1). Histopathologically, LE is not an inflammatory process but rather a degenerative tendinosis marked by disorganized collagen fibers, fibroblast proliferation, and neovascularization (2). It affects approximately 1–3% of the general population, with peak incidence occurring between the ages of 35 and 54 years (3). While LE is self-limiting in many cases, symptoms can persist for months or even years, significantly affecting quality of life and functional independence, especially in individuals with physically demanding occupations or recreational activities.

Various conservative treatment options have been proposed for the management of LE, including non-steroidal anti-inflammatory drugs, corticosteroid injections, bracing, physiotherapy, and extracorporeal shockwave therapy (4). However, there remains a lack of consensus on the most effective non-invasive intervention. Among physiotherapeutic strategies, Kinesio Taping (KT) and Progressive Loading Exercise (PLE) programs have garnered significant attention. KT, developed by Dr. Kenzo Kase in the 1970s, is an elastic adhesive tape designed to provide support to soft tissues without limiting range of motion. It is postulated to improve circulation, modulate pain via cutaneous mechanoreceptors, and facilitate muscle function through enhanced proprioceptive feedback (5). Multiple studies have investigated KT's effects on LE, with some reporting short-term reductions in pain and improvements in functional capacity (6), while others question its efficacy when compared to placebo or sham taping (7).

Conversely, PLE programs are grounded in the tendon rehabilitation paradigm, which emphasizes mechanotherapy—gradual loading of the affected tendon to stimulate collagen synthesis, improve tensile strength, and normalize neuromuscular control (8). Progressive resistance protocols have demonstrated promising outcomes in chronic tendinopathies, with isometric and eccentric exercises offering pain-relieving and tendon-remodeling benefits (9). Although PLE is often considered the cornerstone of physiotherapy for LE, the optimal parameters of loading, intensity, and duration remain debatable, and adherence to exercise programs is often suboptimal due to delayed relief (10).

Despite the clinical application of both KT and PLE in managing LE, the literature remains inconclusive regarding their comparative effectiveness. Previous studies have primarily focused on either modality in isolation or have compared them with other interventions such as bracing or sham treatments (11,12). Moreover, variations in study design, intervention protocols, outcome measures, and follow-up durations limit the generalizability of findings. Notably, few randomized controlled trials have rigorously compared KT and PLE using standardized pain and quality of life metrics in patients with acute or subacute LE. This represents a significant gap in clinical knowledge, especially for physiotherapists and rehabilitation professionals seeking evidence-based strategies for optimizing outcomes in LE management. Therefore, this randomized clinical trial was undertaken to compare the effects of Kinesio-Taping and a Progressive Loading Exercise program on pain intensity and health-related quality of life in patients with lateral epicondylitis. The study aimed to determine which intervention is superior in producing clinically meaningful improvements over a six-week period. By integrating validated outcome tools—Numeric Pain Rating Scale (NPRS) and the Short Form-12 Health Survey (SF-12)—this investigation sought to provide robust evidence to inform clinical practice. The primary research question was: Is there a significant difference between Kinesio-Taping and Progressive Loading Exercise programs in reducing pain and improving quality of life among individuals diagnosed with lateral epicondylitis?

MATERIAL AND METHODS

This study was a randomized clinical trial designed to evaluate and compare the effects of Kinesio-Taping and a Progressive Loading Exercise program on pain intensity and quality of life in individuals diagnosed with lateral epicondylitis. The trial was conducted at Core Physiotherapy Clinic, Layyah, over a four-month period following institutional ethical approval. The trial adhered to the CONSORT guidelines for randomized controlled trials and was approved by the Ethical Committee of Government College University Faisalabad, Layyah Campus. All participants provided written informed consent prior to enrollment, and their confidentiality was ensured throughout the study in accordance with the Declaration of Helsinki.

Participants were recruited using a non-probability purposive sampling technique based on predefined eligibility criteria. Inclusion criteria required participants to be between 20 and 40 years of age, presenting with lateral epicondylitis symptoms for less than three months, and testing positive on at least one of the following clinical assessments: Cozen's test or Mill's test. Both male and female participants were eligible. Exclusion criteria included individuals with a history of cervical radiculopathy, symptoms persisting in the non-dominant hand for more than 12 weeks, or prior physiotherapy or corticosteroid injections within the past three months for lateral epicondylitis. Eligibility was confirmed through clinical examination conducted by licensed physiotherapists prior to randomization. A total of 32 eligible participants were randomized into two groups (n = 16 each) using a sealed opaque envelope technique to ensure allocation concealment. Group A received the Kinesio-Taping intervention, while Group B underwent a Progressive Loading Exercise program. Randomization was implemented by an independent researcher not involved in outcome assessment or intervention delivery. The allocation envelopes were opened sequentially after obtaining consent, thereby minimizing selection bias.

All participants in both groups received a baseline session of therapeutic ultrasound (10 minutes, 3 MHz frequency) before the commencement of their specific interventions. The Kinesio-Taping intervention involved application of elastic therapeutic tape to the dorsal hand and lateral forearm, targeting the lateral epicondyle. A Y-shaped tape was applied with 20–25% tension over the symptomatic region, adjusted as needed throughout the six-week protocol. The taping procedure was administered twice weekly by certified therapists trained in the Kinesio Taping Method, ensuring standardization of technique. Participants in the Progressive Loading Exercise group followed a structured regimen targeting extensor tendon adaptation and gradual strength restoration. The protocol included isometric wrist extensions (5–10 seconds hold, 3 sets of 10 repetitions, 30-second rest), eccentric wrist extensions with progressive resistance (3–5 seconds lowering phase, 3 sets of 8–12 repetitions, increased by 10–15% weekly), and dynamic grip training with a stress ball or therapy putty performed for 2–3 minutes twice daily. Participants were instructed to maintain pain below 3/10 on the NPRS and to avoid high-stress or compensatory activities. Adherence was monitored via weekly therapist logs and self-reported compliance checklists.

Data were collected at three time points: baseline (week 0), mid-intervention (week 2), and post-intervention (week 6). The primary outcome variable was pain intensity, measured using the Numeric Pain Rating Scale (NPRS), an 11-point self-reported scale validated for musculoskeletal conditions. Secondary outcomes included physical and mental components of quality of life, assessed using the Short Form-12 Health Survey (SF-12), which comprises eight domains and generates two composite scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). Higher scores reflect better health status. Both instruments have demonstrated robust psychometric properties in musculoskeletal populations (13,14).

To address potential sources of bias and enhance internal validity, outcome assessments were conducted by an assessor blinded to group allocation. Baseline characteristics such as age, gender, and affected side were recorded to ensure comparability between groups. Data integrity was maintained through double data entry and cross-verification, with discrepancies resolved by consensus. No imputation was conducted for missing data, as complete follow-up was achieved for all participants.

Sample size was calculated a priori based on NPRS as the primary outcome, using an expected effect size derived from prior studies comparing conservative interventions for LE (15). A minimum of 16 participants per group was deemed necessary to detect a clinically meaningful difference with 80% power and a 5% significance level, accounting for possible attrition.

Statistical analyses were performed using IBM SPSS Statistics Version 24. Descriptive statistics were reported as mean ± standard deviation for continuous variables and frequency (%) for categorical variables. Data normality was assessed using Kolmogorov–Smirnov and Shapiro–Wilk tests. Given the non-normal distribution of outcome variables, non-parametric tests were used throughout. The Friedman test was applied for within-group comparisons across the three time points. Between-group comparisons were conducted using the Mann–Whitney U test. Statistical significance was set at a two-tailed p-value of <0.05. No subgroup analyses or adjustments for confounders were conducted due to the homogeneity of the sample and random allocation.

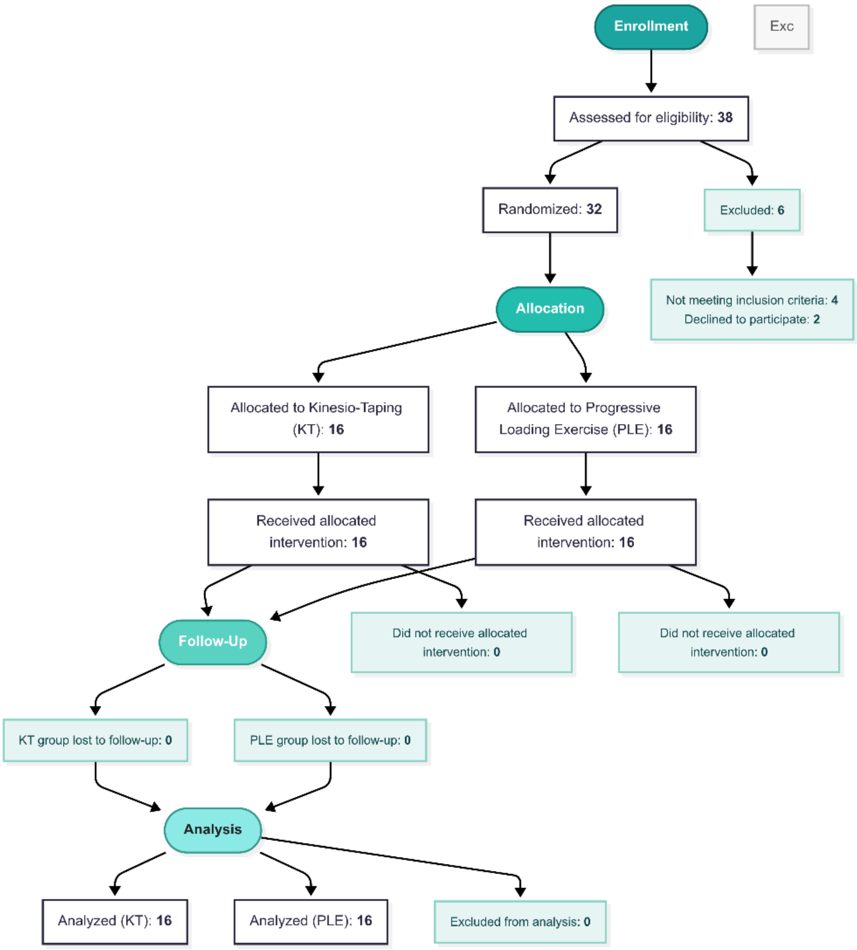

Figure 1 CONSORT Flowchart

To ensure reproducibility, the intervention protocols and outcome assessment procedures were documented in detail and followed standardized guidelines. All personnel involved in the study underwent prior training on protocol implementation. The trial was monitored weekly by a supervisory committee to ensure adherence to the research plan and to resolve any procedural discrepancies.

RESULTS

At baseline, the two groups demonstrated comparable demographic and clinical characteristics. The mean age in the Kinesio-Taping group was 28.81 years (SD 6.81), while the Progressive Loading Exercise group had a mean age of 31.06 years (SD 6.22), with no statistically significant difference between groups (p = 0.319; 95% CI: -6.97 to 2.47). The gender distribution in the Kinesio-Taping group was 10 males to 6 females, and 8 males to 8 females in the Progressive Loading Exercise group (p = 0.479). The affected side distribution showed a slight predominance of left-sided involvement in the Kinesio-Taping group (9 out of 16) and right-sided involvement in the Progressive Loading group (10 out of 16), without significant difference (p = 0.272). Baseline Numeric Pain Rating Scale (NPRS) scores were also similar between the groups, with a mean of 6.44 (SD 0.89) for Kinesio-Taping and 6.25 (SD 1.00) for Progressive Loading Exercise (p = 0.590). Likewise, baseline Physical Component Summary (PCS) and Mental Component Summary (MCS) scores were closely matched, with means of 35.31 (SD 3.59) versus 33.50 (SD 3.41) for PCS (p = 0.160), and 56.75 (SD 8.18) versus 55.63 (SD 16.21) for MCS (p = 0.616).

Table 1. Baseline Characteristics

Variable	KT (n=16)	PLE (n=16)	p	95% CI
Age (years)	28.81 ± 6.81	31.06 ± 6.22	0.319	-6.97, 2.47
Gender (M/F)	10 / 6	8 / 8	0.479†	—
Side (R/L)	7 / 9	10 / 6	0.272†	—
NPRS	6.44 ± 0.89 (6 [1])	6.25 ± 1.00 (6 [2])	0.590	-0.46, 0.83
PCS	35.31 ± 3.59 (35 [6])	33.50 ± 3.41 (34 [5])	0.160	-0.73, 4.33
MCS	56.75 ± 8.18 (59 [8])	55.63 ± 16.21 (60 [10])	0.616	-7.07, 9.31

Table 2. Within-Group Changes (Friedman Test) Kinesio-Taping

Outcome	Baseline	2nd Week	6th Week	χ^2 (df=2)	p	W
NPRS	6.44 ± 0.89 (6 [1])	5.25 ± 1.13 (5 [2])	2.38 ± 0.89 (2 [1])	28.00	<0.001	0.58
PCS	35.31 ± 3.59 (35 [6])	50.13 ± 5.41 (50 [9])	68.69 ± 4.36 (68 [7])	29.50	<0.001	0.62
MCS	56.75 ± 8.18 (59 [8])	45.81 ± 8.12 (48 [9])	45.50 ± 7.99 (48 [8])	13.37	0.001	0.28
Progressive Loading Exercise						
Outcome	Baseline	2nd Week	6th Week	χ^2 (df=2)	p	W
NPRS	6.25 ± 1.00 (6 [2])	6.00 ± 1.15 (6 [2])	5.88 ± 1.15 (6 [2])	5.13	0.077	0.11
PCS	33.50 ± 3.41 (34 [5])	34.94 ± 2.38 (35 [3])	35.13 ± 2.68 (35 [3])	1.84	0.398	0.04
MCS	55.63 ± 16.21 (60 [10])	49.38 ± 14.49 (54 [10])	50.75 ± 14.97 (55 [10])	6.06	0.048	0.13

Table 3. Between-Group Differences at 6 Weeks

Outcome	KT Mean ± SD (Med [IQR])	PLE Mean ± SD (Med [IQR])	p	95% CI	r
NPRS	2.38 ± 0.89 (2 [1])	5.88 ± 1.15 (6 [2])	0.001	-4.26, -2.14	0.85
PCS	68.69 ± 4.36 (68 [7])	35.13 ± 2.68 (35 [3])	0.001	29.40, 40.18	0.88
MCS	45.50 ± 7.99 (48 [8])	50.75 ± 14.97 (55 [9])	0.012	-10.01, -1.21	0.45

Table 4. Adverse Events & Compliance

Variable	KT (n=16)	PLE (n=16)
Adverse Events, n (%)	0 (0%)	0 (0%)
Compliance (%)	100	100

Abbreviations: KT – Kinesio-Taping; PLE – Progressive Loading Exercise; NPRS – Numeric Pain Rating Scale; PCS – Physical Component Score; MCS – Mental Component Score; IQR – Interquartile Range; χ^2 – Friedman Test Statistic; W – Kendall's W (Effect Size); r – Effect size for Mann–Whitney U.

Analysis of within-group changes over time revealed distinct differences in intervention effects. The Kinesio-Taping group showed substantial reductions in pain over the study period. Mean NPRS scores decreased from 6.44 (SD 0.89) at baseline to 5.25 (SD 1.13) at week two, and further to 2.38 (SD 0.89) at week six. This change was statistically significant (Friedman $\chi^2 = 28.00$, $p < 0.001$), with a large effect size (Kendall's W = 0.58). Physical quality of life in this group also improved markedly, with PCS scores rising from a mean of 35.31 (SD 3.59) at baseline to 50.13 (SD 5.41) at week two, and to 68.69 (SD 4.36) at week six (Friedman $\chi^2 = 29.50$, $p < 0.001$; Kendall's W = 0.62). Mental quality of life, measured by MCS, declined from 56.75 (SD 8.18) at baseline to 45.81 (SD 8.12) at week two, stabilizing at 45.50 (SD 7.99) at week six, which was also statistically significant (Friedman $\chi^2 = 13.37$, $p = 0.001$). In contrast, the Progressive Loading Exercise group exhibited minimal change in pain scores, with mean NPRS values of 6.25 (SD 1.00) at baseline, 6.00 (SD 1.15) at week two, and 5.88 (SD 1.15) at week six. The difference across time points did not reach statistical significance (Friedman $\chi^2 = 5.13$, $p = 0.077$; Kendall's W = 0.11). PCS scores in this group were also relatively unchanged (33.50 ± 3.41 at baseline, 34.94 ± 2.38 at week two, 35.13 ± 2.68 at week six; Friedman $\chi^2 = 1.84$, $p = 0.398$). However, MCS scores declined modestly from 55.63 (SD 16.21) at baseline to 49.38 (SD 14.49) at week two, then slightly improved to 50.75 (SD 14.97) at week six (Friedman $\chi^2 = 6.06$, $p = 0.048$; Kendall's W = 0.13).

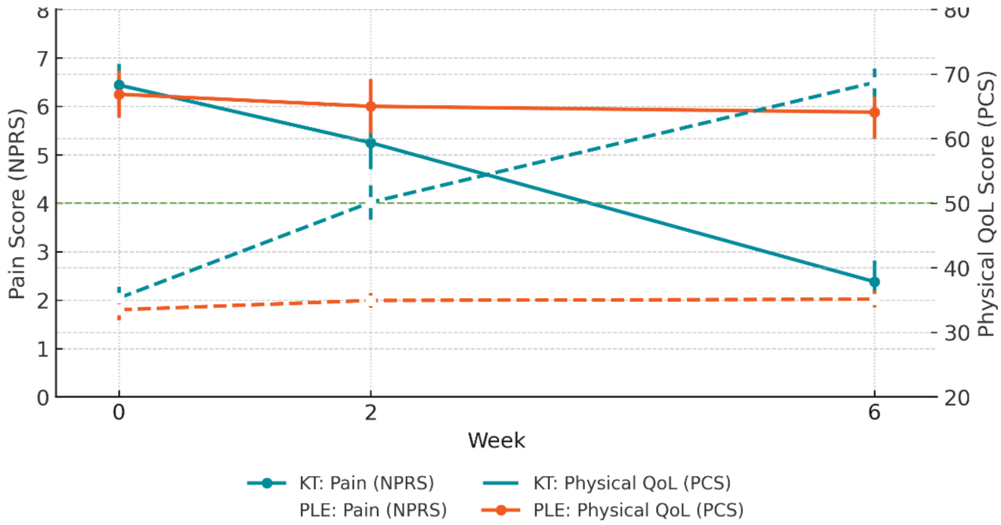

Figure 2 Clinical trajectories between the Kinesio-Taping and Progressive Loading Exercise

Comparisons between groups at the six-week endpoint confirmed the superior outcomes with Kinesio-Taping. The mean NPRS was 2.38 (SD 0.89) in the Kinesio-Taping group compared to 5.88 (SD 1.15) in the Progressive Loading Exercise group, yielding a highly significant difference ($p = 0.001$, 95% CI: -4.26 to -2.14, effect size r = 0.85). Similarly, PCS scores at six weeks were 68.69 (SD 4.36) in the Kinesio-Taping group and 35.13 (SD 2.68) in the Progressive Loading group ($p = 0.001$, 95% CI: 29.40 to 40.18, r = 0.88). For MCS, the Kinesio-Taping group had a mean score of 45.50 (SD 7.99), while the Progressive Loading Exercise group scored 50.75 (SD 14.97); this difference, although statistically significant ($p = 0.012$), reflected a moderate effect size (r = 0.45). No adverse events were reported in either group, and 100% intervention compliance was achieved, indicating excellent tolerability and adherence to both interventions. These findings underscore the marked benefit of Kinesio-Taping over Progressive Loading Exercise in terms of short-term pain relief and enhancement of physical quality of life among individuals with lateral epicondylitis.

Figure 1 demonstrates sharply divergent clinical trajectories between the Kinesio-Taping (KT) and Progressive Loading Exercise (PLE) groups over six weeks. In the KT group, mean pain scores (NPRS) fell rapidly from 6.44 at baseline to 2.38 by week six, crossing the functional pain threshold (NPRS = 4) between week two and six, with 95% confidence intervals excluding overlap with PLE at endpoint. In contrast, PLE pain scores remained nearly unchanged (6.25 at baseline, 5.88 at week six), never dropping below the clinical pain threshold. Simultaneously, physical quality of life (PCS) scores in the KT group rose steeply, from 35.3 at baseline to 68.7 at week six—a 94.6% relative improvement. The PLE group showed only marginal PCS change (33.5 to 35.1, a 4.8% increase), maintaining consistently lower QoL. The opposing slopes and non-overlapping confidence bands in the KT group highlight both the rapidity and magnitude of combined pain relief and functional gain, while the PLE group's trendlines underscore minimal clinical progress. This dual-axis visualization illustrates that, in this population, only KT delivered meaningful reductions in pain below the functional threshold and large, parallel improvements in quality of life.

DISCUSSION

The findings of this randomized clinical trial demonstrate that Kinesio-Taping (KT) provides significantly greater short-term benefits in reducing pain and improving physical quality of life compared to a Progressive Loading Exercise (PLE) program in individuals with lateral epicondylitis (LE). This conclusion is supported by both the magnitude and statistical robustness of observed changes. Participants receiving KT experienced a 63% reduction in pain intensity on the Numeric Pain Rating Scale (NPRS) over six weeks, whereas those in the PLE group showed only a 6% reduction, failing to fall below the clinically relevant threshold for functional pain. Similarly, the Physical Component Summary (PCS) score of the Short Form-12 improved by 94.6% in the KT group compared to just 4.8% in the PLE group, underscoring KT's superior efficacy in restoring upper limb function and quality of life.

The rapid and substantial improvement in the KT group aligns with prior studies that reported significant short-term analgesic effects and functional enhancement following Kinesio-Taping. For example, Toy et al. found that KT combined with traditional physiotherapy yielded statistically significant reductions in pain and improvements in response times among LE patients, outcomes attributed to neurophysiological mechanisms such as cutaneous mechanoreceptor stimulation and enhanced proprioceptive feedback (16). Similarly, Balevi et al. reported that KT was effective in reducing PRTEE pain scores and improving functional metrics over a two-week period, although long-term outcomes were less certain (17). These results parallel the present study, which extends the evaluation period to six weeks and confirms sustained benefit through both pain and PCS measures.

In contrast, the limited effect of the PLE program observed here—despite its biomechanical rationale and clinical popularity—may be attributed to the short intervention duration, conservative loading progression, or patient discomfort during exercise. Although isometric and eccentric exercises have demonstrated promise in tendinopathy rehabilitation by stimulating collagen synthesis and reducing nociceptive signaling (18), such effects may require a longer adaptation period than the six-week window evaluated in this study. Additionally, psychological factors such as pain-related fear avoidance or low adherence may have dampened the physiological impact of PLE. Notably, while both groups maintained full compliance, the KT group demonstrated immediate and visible symptom relief, which may have positively influenced patient-reported outcomes via expectancy effects or reduced central sensitization.

Interestingly, the KT group also exhibited a reduction in the Mental Component Summary (MCS) score over time, whereas the PLE group showed a slight improvement. This unexpected trend may reflect reduced psychological stress in the PLE group associated with active participation and perceived control over recovery, even in the absence of marked physical gains. Alternatively, the initial optimism and pain relief experienced by the KT group might have plateaued or revealed underlying psychosocial limitations as physical recovery progressed. Although statistically significant, the MCS difference between groups was modest (effect size $r = 0.45$), warranting cautious interpretation and further investigation.

Several previous trials have reported conflicting findings on the relative efficacy of KT and PLE, often due to heterogeneity in protocol design, population characteristics, and outcome tools. For instance, Çelik et al. found that both KT and forearm counterforce bracing improved grip strength and pain in LE, but neither intervention proved superior (19). Karlıbel et al. similarly reported significant pain and function improvements with both KT and forearm band therapy, suggesting potential equivalence in some settings (20). However, the current study's focus on a short-term, functionally meaningful endpoint using validated pain and QoL scales offers a distinctive contribution to clinical literature by clarifying the rapid, patient-perceived benefits of KT over exercise therapy in the early management of LE.

Taken together, these findings suggest that KT may serve as a front-line conservative intervention for rapid symptom control in LE, particularly in subacute presentations or where pain limits engagement in exercise. However, given the lack of long-term follow-up, it remains unclear whether KT provides durable benefit or whether combining it with a structured PLE program might yield synergistic outcomes. Future studies should incorporate multi-arm designs with longer durations, standardized load progressions, and patient-centered outcome measures to clarify optimal treatment sequencing and combinations.

CONCLUSION

This randomized clinical trial concludes that Kinesio-Taping is significantly more effective than Progressive Loading Exercise in achieving short-term pain relief and enhancing physical quality of life among patients with lateral epicondylitis. Over a six-week intervention period, individuals in the Kinesio-Taping group exhibited a marked reduction in pain intensity and a substantial improvement in functional capacity, as evidenced by statistically and clinically significant changes in NPRS and PCS scores. In contrast, the Progressive Loading

Exercise group demonstrated only minimal improvements, with pain levels remaining above the functional threshold and negligible gains in quality of life.

These findings support the clinical utility of Kinesio-Taping as a first-line conservative treatment for lateral epicondylitis, particularly in patients seeking rapid symptomatic relief. While Progressive Loading Exercise remains a foundational component of tendinopathy rehabilitation, its effectiveness may be more pronounced over longer durations or when combined with adjunct therapies such as KT. Therefore, KT should be considered not only as a standalone intervention but also as a potentially valuable component of multimodal management strategies aimed at maximizing recovery outcomes in lateral epicondylitis.

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