Impact of Kinesiology Taping on Knee Osteoarthritis: Evaluating Effects on Pain, Stability, and Functional Performance in Patients

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Abstract

Objective: This study investigates the impact of kinesiology taping (KT) on pain, joint stability, and functional performance in patients with knee osteoarthritis (OA).

Methods: A randomized controlled trial was conducted with 50 participants diagnosed with knee OA, assigned to either KT (n=25) or a placebo taping group (n=25). KT was applied twice a week for 8 weeks. Outcomes were measured using the Visual Analog Scale (VAS) for pain, single-leg stance and functional reach tests for joint stability, and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and 6-minute walk test (6MWT) for functional performance.

Results: The KT group demonstrated significant reductions in pain (VAS: 3.1 ±1.0 vs. 5.2 ±1.2, $p < 0.001$), improved joint stability (single-leg stance: 27.8 ±6.3 seconds vs. 18.2 ±5.6 seconds, $p < 0.001$; functional reach: 18.2 ±4.2 cm vs. 14.7 ±4.0 cm, $p = 0.03$), and enhanced functional performance (WOMAC score: 32.7 ±11.8 vs. 45.3 ±13.0, $p = 0.02$; 6MWT distance: 500.4 ±60.2 meters vs. 440.3 ±55.2 meters, $p = 0.01$) compared to the control group.

Conclusion: KT effectively reduces pain, improves joint stability, and enhances functional performance in knee OA patients. These findings suggest that KT can be a valuable adjunctive treatment for managing knee OA symptoms.

Keywords: kinesiology taping, knee osteoarthritis, pain reduction, joint stability, functional performance, randomized controlled trial

Introduction

Knee osteoarthritis (OA) is a prevalent degenerative joint disease characterized by the progressive breakdown of cartilage, leading to pain, stiffness, and reduced mobility. It affects millions of people worldwide, significantly impairing their quality of life and daily functioning (Moskowitz, 2007). Traditional management strategies for knee OA often include pharmacological treatments, physical therapy, and lifestyle modifications, but these approaches may not always fully address the symptoms or functional limitations experienced by patients (Sinusas, 2012).

Kinesiology taping (KT) has emerged as a complementary intervention in the management of various musculoskeletal conditions, including knee OA. KT involves applying elastic therapeutic tape to the skin with the aim of providing support, reducing pain, and enhancing functional performance. The underlying mechanisms of KT are believed to involve the stimulation of sensory receptors in the skin, modulation of pain perception, and improvement of joint stability and proprioception (Mutlu et al., 2017; Montalvo et al., 2014). Despite its growing popularity, the evidence supporting the efficacy of KT for knee OA remains mixed. Some studies have reported positive outcomes, including reductions in pain and improvements in joint function and stability (Martins da Silva et al., 2020; Donec and Kubilius, 2019). Conversely, other research has raised questions about the long-term benefits and overall clinical significance of KT for knee OA (Melese et al., 2020). This discrepancy highlights the need for further investigation into the specific effects of KT on pain, stability, and functional performance in knee OA patients.

The purpose of this study is to evaluate the impact of kinesiology taping on knee osteoarthritis by assessing its effects on pain reduction, joint stability, and functional performance. By addressing these factors, we aim to provide a clearer understanding of the potential benefits of KT and its role in comprehensive knee OA management.

Literature Review

Knee Osteoarthritis: Knee osteoarthritis (OA) is a common form of degenerative joint disease characterized by the progressive degradation of articular cartilage, leading to pain, stiffness, and impaired function. It is a major cause of disability in older adults and significantly impacts daily activities and quality of life (Moskowitz, 2007). Traditional management strategies for knee OA include pharmacological treatments, physical therapy, and lifestyle modifications. However, these treatments may not always provide sufficient relief or address all aspects of the condition (Sinusas, 2012).

Kinesiology Taping: Kinesiology taping (KT) has been increasingly utilized as a non-invasive adjunct to traditional treatment modalities for various musculoskeletal conditions, including knee OA. KT involves the application of elastic therapeutic tape to the skin to provide support, reduce pain, and improve functional performance (Mutlu et al., 2017). The proposed mechanisms by which KT exerts its effects include stimulation of sensory receptors in the skin, modulation of pain perception, and enhancement of joint stability and proprioception (Montalvo et al., 2014).

Effects of Kinesiology Taping on Pain: Several studies have explored the impact of KT on pain management in knee OA. For example, a systematic review by Melese et al. (2020) found that KT can lead to significant reductions in pain for some patients with knee OA. This reduction in pain is thought to result from KT's ability to enhance proprioceptive feedback and alter pain perception. Similarly, Donec and Kubilius, (2019) reported that KT significantly decreased pain levels and improved overall knee function in individuals with knee OA. However, other research presents mixed results, suggesting that while KT may provide short-term pain relief, its long-term efficacy remains uncertain (Martins da Silva et al., 2020).

Effects on Joint Stability: KT is also believed to affect joint stability, which is crucial for managing knee OA. The application of KT may enhance joint stability by supporting weakened muscles and improving proprioceptive feedback (Mutlu et al., 2017). A study by Altaş et al. (2021) demonstrated that KT improved joint stability and balance in patients with knee OA, which could potentially reduce the risk of falls and further injury. However, the evidence is not universally consistent, and some studies have reported no significant improvements in joint stability following KT application (Melese et al., 2020).

Functional Performance: Functional performance, including activities of daily living and overall mobility, is a key outcome in knee OA management. KT has been suggested to improve functional performance by reducing pain and enhancing joint stability. Research by Mutlu et al. (2014) found that KT application led to significant improvements in functional performance, including gait and mobility, in patients with knee OA. Conversely, other studies have reported limited improvements in functional outcomes, questioning the clinical significance of KT in enhancing daily functional activities (Donec and Kubilius, 2019).

Overall, the literature indicates that kinesiology taping may have potential benefits in managing knee OA, particularly in terms of pain reduction and functional performance. However, the evidence is mixed regarding its effects on joint stability and long-term outcomes. While some studies support the use of KT as a complementary treatment for knee OA, others highlight the need for further research to establish its efficacy and optimize its application. Future studies should aim to clarify these effects through rigorous, well-designed trials and explore the potential mechanisms underlying KT's impact on knee OA.

Methodology

Study Design: This study employed a randomized controlled trial (RCT) design to evaluate the impact of kinesiology taping (KT) on pain, stability, and functional performance in patients with knee osteoarthritis (OA). Participants were randomly assigned to either the KT intervention group or the control group receiving a placebo taping.

Participants : A total of 50 participants with a clinical diagnosis of knee OA, were recruited for this study. Participants were included if they were between 40 and 75 years old, had moderate knee pain (Visual Analog Scale [VAS] score $\geq$ 4), and exhibited functional limitations. Exclusion criteria included previous knee

surgery within the past six months, other significant musculoskeletal disorders, or any contraindications to KT.

Intervention: Participants in the intervention group (n=25) received KT applied to the affected knee by a trained physiotherapist. The kinesiology tape was applied in a specific pattern designed to enhance proprioception, support the knee joint, and reduce pain. The taping protocol involved applying the tape with moderate tension around the knee joint and was performed twice a week for eight weeks. The control group (n=25) received placebo taping using non-elastic tape applied in a similar manner but without therapeutic tension.

Outcome Measures

Outcome measures were assessed at baseline, 4 weeks, and 8 weeks. The following assessments were conducted:

- **Pain:** Pain intensity was measured using the Visual Analog Scale (VAS), where participants rated their average knee pain over the past week on a scale from 0 (no pain) to 10 (worst pain imaginable).
- **Joint Stability:** Joint stability was assessed using the single-leg stance test and the functional reach test. The single-leg stance test measured the duration a participant could balance on one leg without support. The functional reach test assessed the distance a participant could reach forward while standing on one leg.
- **Functional Performance:** Functional performance was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and the 6-minute walk test (6MWT). The WOMAC index assessed pain, stiffness, and functional limitations related to knee OA. The 6MWT measured the distance participants could walk in six minutes as an indicator of overall functional capacity.

Data Collection and Analysis: Data were collected by trained research assistants who were blinded to group allocation. Descriptive statistics were used to summarize participant demographics and baseline characteristics. Between-group differences in outcome measures were analyzed using independent t-tests for continuous variables and chi-square tests for categorical variables.

Changes in pain, stability, and functional performance over time were evaluated using repeated measures analysis of variance (ANOVA) with time (baseline, 4 weeks, 8 weeks) as the within-subject factor and group (KT vs. control) as the between-subject factor. Post-hoc tests were conducted to determine specific group differences at each time point.

Ethical Considerations: The study was approved by the ethics committee. All participants provided written informed consent prior to their involvement in the study. The study adhered to ethical standards for research involving human subjects.

Findings

Participant Characteristic: The study included 50 participants with knee osteoarthritis, randomly assigned to either the kinesiology taping (KT) group (n=25) or the control group (n=25). There were no significant differences in baseline characteristics between the two groups (Table 1).

Table 1: Baseline Characteristics of Participants

Characteristic	KT Group (n=25)	Control Group (n=25)	p-value
Age (years)	61.2 ±8.4	60.9 ±7.8	0.82
Gender (Female)	16 (64%)	15 (60%)	0.75
BMI (kg/m²)	28.5 ±3.6	28.8 ±3.8	0.75
Duration of OA (years)	6.7 ±2.9	7.1 ±3.1	0.65
Baseline VAS Pain Score	6.3 ±1.2	6.2 ±1.1	0.89

Pain Reduction : Pain intensity, measured using the Visual Analog Scale (VAS), decreased significantly in the KT group compared to the control group over the 8-week period (Table 2). The KT group showed a reduction from 6.3 ±1.2 at baseline to 3.1 ±1.0 at 8 weeks, while the control group had a reduction from 6.2 ±1.1 to 5.2 ±1.2.

Table 2: Pain Intensity (VAS) Scores Over Time

Time Point	KT Group (n=25)	Control Group (n=25)	p-value
Baseline	6.3 ±1.2	6.2 ±1.1	0.89
4 Weeks	4.1 ±1.1	5.5 ±1.3	0.01
8 Weeks	3.1 ±1.0	5.2 ±1.2	<0.001

Joint Stability: Joint stability, assessed by the single-leg stance test and the functional reach test, improved significantly in the KT group (Table 3). The KT group showed an increase in balance duration from 15.2 ± 5.4 seconds at baseline to 27.8 ±6.3 seconds at 8 weeks, and an increase in functional reach from 12.5 ±3.0 cm to 18.2 ±4.2 cm. The control group showed smaller improvements.

Table 3: Joint Stability Measures Over Time

Measure	Time Point	KT Group (n=25)	Control Group (n=25)	p-value
Single-Leg Stance (s)	Baseline	15.2 ±5.4	14.8 ±5.1	0.76
	8 Weeks	27.8 ±6.3	18.2 ±5.6	<0.001
Functional Reach (cm)	Baseline	12.5 ±3.0	12.3 ±3.2	0.80
	8 Weeks	18.2 ±4.2	14.7 ±4.0	0.03

Functional Performance: Functional performance improved more significantly in the KT group compared to the control group. The KT group showed a notable improvement in WOMAC scores and 6-minute walk test (6MWT) distances (Table 4). WOMAC scores decreased from 52.4 ±12.3 at baseline to 32.7 ±11.8 at 8 weeks in the KT group, compared to a decrease from 53.1 ±12.1 to 45.3 ±13.0 in the control group. The 6MWT distance increased from 400.2 ±50.3 meters to 500.4 ±60.2 meters in the KT group, while the control group showed an increase from 395.8 ±48.6 meters to 440.3 ±55.2 meters.

Table 4: Functional Performance Measures Over Time

Measure	Time Point	KT Group (n=25)	Control Group (n=25)	p-value
WOMAC Score	Baseline	52.4 ±12.3	53.1 ±12.1	0.85
	8 Weeks	32.7 ±11.8	45.3 ±13.0	0.02
6MWT Distance (m)	Baseline	400.2 ±50.3	395.8 ±48.6	0.72
	8 Weeks	500.4 ±60.2	440.3 ±55.2	0.01

Discussion

This study investigated the impact of kinesiology taping (KT) on knee osteoarthritis (OA), focusing on pain reduction, joint stability, and functional performance. The results indicated that KT had a significant positive effect on all three outcomes compared to placebo taping.

Pain Reduction: The study found that KT significantly reduced pain in patients with knee OA, as evidenced by the Visual Analog Scale (VAS) scores. At 8 weeks, the KT group experienced a substantial decrease in pain levels compared to the control group. This finding is consistent with previous research that supports KT's role in pain management. For instance, Donec and Kubilius (2019), observed similar reductions in pain in OA

patients treated with KT. KT is believed to alleviate pain through mechanisms such as enhanced proprioceptive feedback and altered pain perception (Mutlu et al., 2017). The significant pain reduction observed in this study suggests that KT can be an effective adjunct to traditional pain management strategies in knee OA.

Joint Stability: Improvements in joint stability were also notable in the KT group. The single-leg stance and functional reach test results indicated better balance and stability among participants who received KT. This finding aligns with research by Altaş et al. (2021), who found that KT could improve joint stability and balance in OA patients. Enhanced joint stability is crucial in OA management as it can reduce the risk of falls and further joint damage. The KT's role in providing support and improving proprioception likely contributed to these stability improvements.

Functional Performance: The study demonstrated that KT led to significant improvements in functional performance, including reductions in WOMAC scores and increased 6-minute walk test (6MWT) distances. The KT group's improvements in functional performance are consistent with Mutlu et al. (2014) who reported similar gains in mobility and daily functioning following KT application. Functional performance enhancements are important as they directly impact patients' ability to perform daily activities and their overall quality of life. The improvements observed suggest that KT can enhance functional capabilities by reducing pain and improving joint stability.

Comparison with Existing Literature: The findings of this study are consistent with several studies supporting the efficacy of KT in managing knee OA symptoms. However, some literature presents mixed results, with certain studies reporting limited or no significant improvements with KT (Martins da Silva et al., 2020). The variation in outcomes may be attributed to differences in taping techniques, application protocols, and study designs. This study's rigorous methodology and significant results contribute to the growing body of evidence supporting KT's benefits in knee OA management.

Limitations : While this study provides valuable insights, it has some limitations. The sample size of 50 participants, while adequate for preliminary findings, may limit the generalizability of the results. Additionally, the study's short duration of 8 weeks does not address the long-term effects of KT. Future research with larger sample sizes and extended follow-up periods is needed to confirm these findings and explore the long-term efficacy of KT.

Conclusion

In conclusion, this study provides strong evidence that kinesiology taping is an effective intervention for reducing pain, improving joint stability, and enhancing functional performance in patients with knee osteoarthritis. KT can be a valuable addition to standard treatment regimens, offering patients significant benefits in managing their symptoms and improving their quality of life. Further research is warranted to explore the long-term effects and optimize KT application protocols for knee OA.

References:

1. Altaş, E. U., Günay Uçurum, S., & Ozer Kaya, D. (2021). Acute effect of kinesiology taping on muscle strength, tissue temperature, balance, and mobility in female patients with osteoarthritis of the knee. *Somatosensory & Motor Research*, *38*(1), 48-53.
2. Donec, V., & Kubilius, R. (2019). The effectiveness of Kinesio Taping® for pain management in knee osteoarthritis: a randomized, double-blind, controlled clinical trial. *Therapeutic advances in musculoskeletal disease*, *11*, 1759720X19869135.
3. Martins da Silva, L., Maciel Bello, G., Chuaste Flores, B., Silva Dias, L., Camargo, P., Mengue, L. F., ... & Daitx, R. B. (2020). Kinesio Tape In Shoulder Rotator Cuff Tendinopathy: A Randomized, Blind Clinical Trial. *Muscles, Ligaments & Tendons Journal (MLTJ)*, *10*(3).
4. Melese, H., Alamer, A., Hailu Temesgen, M., & Nigussie, F. (2020). Effectiveness of kinesio taping on the management of knee osteoarthritis: a systematic review of randomized controlled trials. *Journal of Pain Research*, 1267-1276.

5. Montalvo, A. M., Cara, E. L., & Myer, G. D. (2014). Effect of kinesiology taping on pain in individuals with musculoskeletal injuries: systematic review and meta-analysis. *The Physician and sportsmedicine*, *42*(2), 48-57.
6. Moskowitz, R. W. (Ed.). (2007). *Osteoarthritis: diagnosis and medical/surgical management*. Lippincott Williams & Wilkins.
7. Mutlu, E. K., Mustafaoglu, R., Birinci, T., & Ozdincler, A. R. (2017). Does Kinesio taping of the knee improve pain and functionality in patients with knee osteoarthritis?: a randomized controlled clinical trial. *American journal of physical medicine & rehabilitation*, *96*(1), 25-33.
8. Sinusas, K. (2012). Osteoarthritis: diagnosis and treatment. *American family physician*, *85*(1), 49-56.