

Effect of manual therapy versus kinesio taping on tension-type headache in Jouf University female students: A randomized controlled trial

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ABSTRACT

This study aimed to evaluate the effectiveness of manual therapy versus Kinesio taping (KT) in treating tension-type headaches (TTH) as they are the most common complaint among university students, significantly impacting their academic performance. A randomized controlled study was conducted, including 45 female students. They were 18-25 years, divided into three groups. The first group (Manual therapy) received manual therapy and relaxation training, the second group (KT) received KT every 72 hours and relaxation exercises while the third group (Control) received relaxation exercises, all for three times/week for 8 weeks. The primary outcome was assessed using the Visual Analogue Scale (VAS) for headache intensity. The secondary measure was the HIT-6 to evaluate the impact of TTH. Post-treatment, all three groups showed a significant reduction in VAS scores compared to pre-treatment ($p < 0.05$). HIT-6 scores significantly decreased in the manual therapy and KT groups ($p < 0.05$), whereas the control group showed no significant change ($p > 0.05$). Additionally, the manual therapy group showed a significantly greater reduction in VAS scores compared to the KT group ($p < 0.05$), although no discernible change was observed in HIT-6 scores ($p > 0.05$). Both manual therapy and KT are useful for treating TTH. However, manual treatment alleviates pain intensity more effectively.

KEYWORDS

Manual Therapy; Kinesio Taping; Relaxation Exercises; Tension-type Headache; University Students

1. INTRODUCTION

Throughout the world, tension-type headaches (TTH) are the most common neurological condition. Bilateral location, frequent headaches of mild to moderate intensity, and a tight or pressing sensation are its defining characteristics (Ashina et al., 2021a).

According to estimates, 66% of people will experience headaches throughout their lives, with TTH making up 36-78% of cases. One in four people have TTH once a week, and 90% of people have had a headache at least once in their lifetime (Turkistani et al., 2021). As a result, they are the most prevalent kind of primary headache and the second most prevalent chronic illness (Onan et al., 2023).

The most common complaint among students is headaches. Most headaches have a variety of causes. The intensity of headaches has a major influence on behavior, attitudes, and academic achievement (Sabah et al., 2022).

The potential pathophysiology of TTH has been linked to myofascial trigger points. Trigger points are specific locations, typically found at the skeletal muscle level that can cause pain in certain body areas when pressed. These trigger sites can become latent over time, causing pain to radiate only when palpated, or active, causing pain all the time (Do et al., 2018).

Pharmacological medications, physical therapy, and relaxation/cognitive treatments are the most often utilized therapeutic techniques for the treatment of headaches (Fernández et al., 2014). Conservative non-drug care, such as physical therapy in the form of manual therapy and acupuncture, should always be taken into consideration, according to the European Federation of Neurological Societies' clinical guidelines on the treatment of TTH. However, their scientific basis is still weak (Bendtsen et al., 2010). Cervical muscle training, posture correction, spinal mobilization, and other physical therapy modalities may also help to alleviate symptoms (Shah & Hameed, 2023).

The 1973-proposed Kinesio taping technique has proven to be quite successful in treating pain brought on by soft tissue damage, and even after prolonged use, the tapes were well tolerated (Kase et al., 2013). The unique characteristics and needs of university female students, who often experience high stress levels and prolonged screen time that may contribute to TTH have been largely overlooked in current research (Gouhar et al., 2018; Khairoalsindi et al., 2018). The best choice of physical therapy modality for TTH treatment is still controversial. This study aims to compare the effects of manual therapy and Kinesio taping (KT) on TTH in female students at Jouf University.

2. METHODS

2.1. Design

This was a randomized controlled study; 45 female students were recruited from Jouf University and the study took place at Jouf University's College of Applied Medical Sciences. They were selected according to the specialist physician's diagnosis and the criteria for inclusion and exclusion. The study was executed between November 2024 and January 2025. The present study was enrolled in the Clinical Trials Registry (NCT06675019). This study's procedures and design were permitted by the Hail Health Cluster Medical Ethics Committee, Research and Studied Department, Institutional Review Board (IRB), Hail, Saudi Arabia (IRB Log Number: 2024-92).

2.2. Study Population

Inclusion criteria: Students between 18 and 25 years old participated in the study after receiving their consent and being notified of the study's aims and procedures. If they had TTH according to the International Headache Society (IHS) headache classification in the third edition of the International Classification of Headache Disorders (ICHD-3): The following requirements are met by ten or more headache episodes: At least two of the following symptoms are present in the headache, which can last from thirty minutes to seven days: 1. Both sides, 2. Tightening or pressing (non-pulsating) nature, 3. Mild to moderate severity, 4. Not made worse by regular exercise like walking or climbing stairs, and both of the following: 1. No more than one of photophobia or phonophobia, 2. No moderate to severe nausea or vomiting.

Our study covered both frequent episodic TTH (at least 10 headache episodes happening on average 1–14 days per month for more than 3 months (≥ 12 and < 180 days per year) and chronic TTH: headache occurring on average ≥ 15 days per month for more than 3 months (more than 180 days per year).

Exclusion criteria: Participants with history of cervical surgery, cervical trauma, any systemic disease targeting the cervical area, headache from another source (such as arthritis, hypertension, arteriosclerosis, vascular malformation, cerebral hemorrhage, cerebral embolism, cerebral thrombosis, or subarachnoid hemorrhage), neurological, mental, or hemorrhagic disease, psychological disorders (e.g., severe anxiety and depression), severe impairments in the kidney, liver, heart, and other organs, suspected malignancy, pregnancy, skin diseases, skin allergy, open wounds, recent dental intervention, temporomandibular Joint disorders, sinusitis, prophylactic headache

medications in the last 3 month and engagement of physical therapy treatment within 2 months prior to their enrollment in the study.

2.2.1. Sample Size

Size estimation was tested using G*POWER statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) [F tests-MANOVA: Special effects and interaction, $\alpha=0.05$, $\beta=0.20$, number of predictors=2, number of dependents=2], and effect size=0.15] and revealed that the appropriate sample size for this study was N=43]. This effect size calculated from Cohen's guidelines. For f^2 , his suggestions were: 0.02, 0.15, 0.35 for "small," "medium," and "large," respectively (Fig.1).

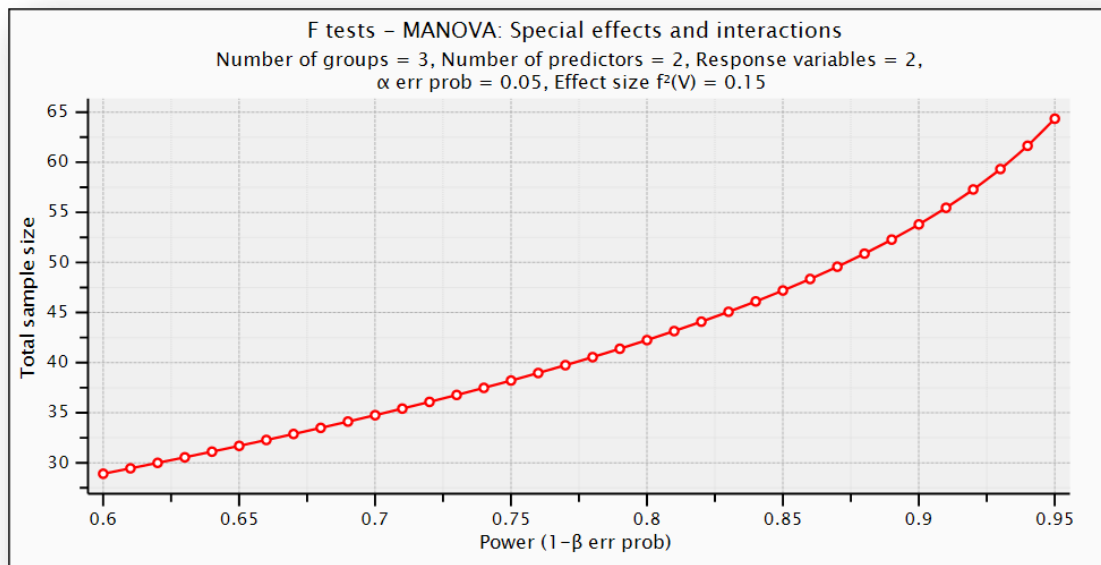


Figure 1. Plot for sample size estimation

2.3. Randomization and Blinding

The nature of the study, its goals, its value, the participants' right to voluntarily withdraw, and the confidentiality of the collected data were all explained in detail to each participant. Out of the initial 55 patients, 45 satisfied all inclusion criteria and were allocated into three equally sized groups at random: Manual therapy, Kinesio taping, and control groups using computerized randomization software. Outcome assessors and data analysts were blinded to group assignments to minimize potential bias in assessing and interpreting outcomes. No subject dropout was reported after randomization in either group (Fig.2).

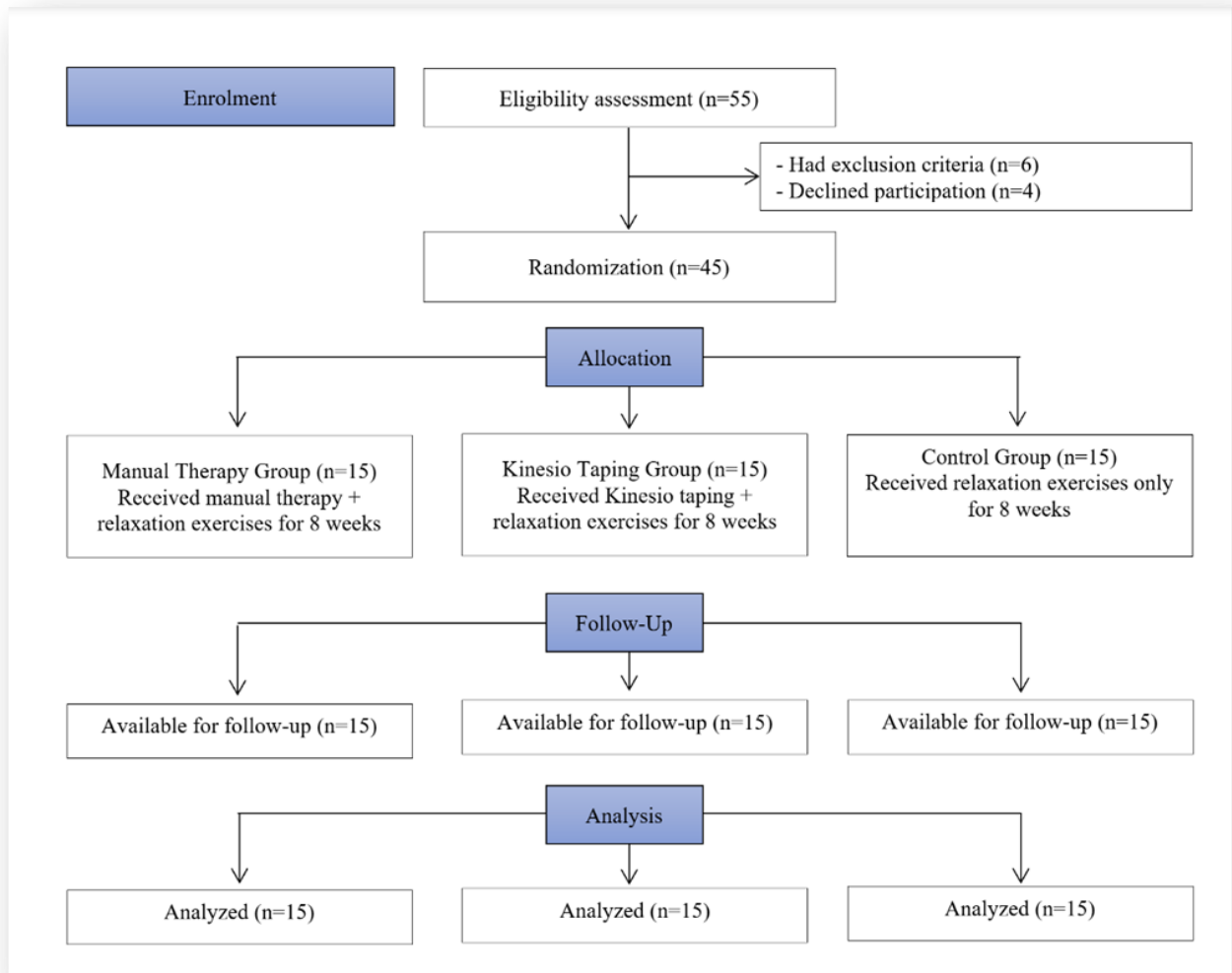


Figure 2. Flow chart of the participants during the trial

2.4. Interventions

The participants were divided into three groups: The manual therapy group included 15 participants who received manual therapy and relaxation exercises for 8 weeks, the Kinesio taping group included 15 participants who received Kinesio taping and relaxation exercises for 8 weeks, and the control group included 15 participants who received only relaxation exercises.

2.4.1. Manual therapy

Each participant in the manual therapy group received manual therapy three times per week for 8 weeks. Manual therapy included: Stretching exercises, strengthening exercises, soft tissue manipulation, and postural correction. Stretching exercises were performed to the trapezius, scaleni,

suboccipital muscles, sternocleidomastoids, and pectoral muscles. From the sitting position each muscle was stretched for 30-45 seconds, relaxed for 30 seconds, and 3 repetitions were done. Strengthening exercises were performed to deep neck flexor muscles by lying on back with the head resting and gently nodding the head as if saying “yes”, feeling the muscles at the front of the neck engage, while holding the chin tuck, lifting the head in the air about 2 inches. Hold for 10 seconds. Perform 2-3 sets of 10 repetitions. Soft tissue manipulation was applied in the form of myofascial release and deep friction massage, the postural correction was done in the standing, sitting, and lying positions, and participants were advised about their ergonomics at home and while studying (Castien et al., 2009; Castien et al., 2011; Fernández et al., 2014).

2.4.2. Kinesio Taping

Each participant in the Kinesio taping group received Kinesio taping (KT) (Kinesiology tape, Sportstape, China) every 72 hours three times per week for 8 weeks, after skin preparation (cleaning with alcohol), One I-shaped tape was used to apply KT to the upper trapezius muscle on each side that was 5 cm broad and 0.5 mm thick. The upper trapezius fibers were stretched, which involved flexing and rotating the cervical vertebrae to the other side and applying the tape on the same side. The tape was measured from the acromion to the hairline in the back. In its initial resting position, the band was secured to the acromion's insertion point. After lengthening the muscle and securing the band with the first skin shift, the band was stretched by 10% and secured to the muscle's hairline origin and it was rubbed with the muscle in the extended position (Duymaz, 2021). Each time the tape was applied, participants were informed to come in after 72 hours from applying the tape to remove it and to check their skin for any sign of allergy or skin breakdown.

2.4.3. Relaxation Exercises

They were received by the three groups. Relaxation exercises included Progressive Muscle Relaxation (PMR) and deep breathing exercises for 20 minutes 3 times per week for 8 weeks, while the participant was in a relaxed sitting position in a quiet, comfortable room with suitable light, humidity, and temperature. The participant inhaled, contracted one muscle group (for example your upper thighs) then exhaled and suddenly released the tension in that muscle group. After three deep breaths, the session will move on to a relaxation exercise. A series of contractions and relaxations were performed on the hand, arm, face, shoulder, neck, chest, belly, back, thigh, hip, legs, and feet. Five seconds were spent in contraction, and ten seconds were spent in relaxation. Following the sequential contraction and relaxation of each muscle, the entire body should be simultaneously

clenched and relaxed while breathing. Participants were instructed to close their eyes during the session in order to relax and avoid negative thoughts (Gopichandran et al., 2022; Ovgun & Tuzun, 2023).

2.5. Outcome Measures

2.5.1. Primary Outcome Measure

A standardized 10-cm horizontal visual analogue scale (VAS) was used to evaluate the severity of pain with facial expressions at the anchor points. A happy face representing "no pain" (0) was shown on the left anchor, while a crying face representing "worst possible pain" (10), was shown on the right anchor. On the scale, participants were asked to indicate their present level of pain. A ruler was used to measure the distance, to the closest millimeter, between the participant's mark and the left anchor. VAS has been shown to be valid and reliable in the assessment of headaches (Lundqvist et al., 2009; Mohd Sallehuddin et al., 2018).

2.5.2. Secondary Outcome Measure

The 6-item headache questionnaire was examined before and after the end of the intervention to evaluate the headache impact on daily life; There are five potential responses for each of the six categories (pain severity, usual daily activities, vitality, role functioning, psychological distress, and cognitive functioning). The total score ranges from 36 to 78 points, with never receiving: 6 points, rarely receiving: 8 points, sometimes receiving: 10 points, frequently receiving: 11 points, and always receiving: 13 points. Test-retest reliability and internal consistency (Cronbach alpha: 0.89). (ICC: 0.78 to 0.90) have been shown to be satisfactory (Pradela et al., 2021).

2.6. Data Analysis

One Way ANOVA test was conducted for comparison of age and BMI between groups. Fisher's Exact Test was conducted for comparison of marital status, frequency and duration of headache between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity amongst groups. The effects on VAS and HIT-6 within and between groups were compared using mixed MANOVA. For subsequent multiple comparison, post-hoc tests were conducted using the Bonferroni correction. For all statistical tests, the significance level was set at $p < 0.05$. The statistical package for social studies (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA) was used for all statistical analyses.

3. RESULTS

Table 1 shows the subject characteristics of control, manual therapy, and Kinesio taping groups. There was no significant difference between groups in age, BMI, marital status, frequency, and duration of headache in the past month ($p > 0.05$) (Table 1).

Table 1. Basic characteristics of participants

	Control group mean ± SD	Manual therapy mean ± SD	Kinesio taping mean ± SD	F-value	p-value
Age (years)	20.13 ± 1.73	20.40 ± 1.35	20.80 ± 1.37	0.76	0.48
BMI (kg/m²)	22.73 ± 4.27	23.60 ± 5.75	23.93 ± 4.06	0.26	0.78
Marital status, n (%)					
Single	15 (100%)	14 (93.3%)	14 (93.3%)	Fisher's Exact Test = 1.28	1
Married	0 (0%)	1 (6.7%)	1 (6.7%)		
Frequency of headaches in the past month, n (%)					
1-3 days	6 (40%)	5 (33.3%)	8 (53.3%)	Fisher's Exact Test = 1.78	0.91
4-6 days	8 (53.3%)	9 (60%)	6 (40%)		
More than 6 days	1 (6.7%)	1 (6.7%)	1 (6.7%)		
Duration of headaches in the past month, n (%)					
Less than 2 h	5 (33.3%)	7 (46.7%)	7 (46.7%)	Fisher's Exact Test = 4.37	0.79
2-4 h	9 (60%)	7 (46.7%)	8 (53.3%)		
4-24 h	0 (0%)	1 (6.7%)	0 (0%)		
24-72 h	1 (6.7%)	0 (0%)	0 (0%)		

NOTE: SD, standard deviation; p-value, level of significance

3.1. The Effect of Treatment on VAS and HIT-6

Mixed MANOVA revealed that there was a significant interaction of treatment and time ($F = 26.45$, $p = 0.001$, $\eta^2 = 0.56$). There was a significant main effect of time ($F = 290.92$, $p = 0.001$, $\eta^2 = 0.93$). There was a significant main effect of treatment ($F = 16.34$, $p = 0.001$, $\eta^2 = 0.44$).

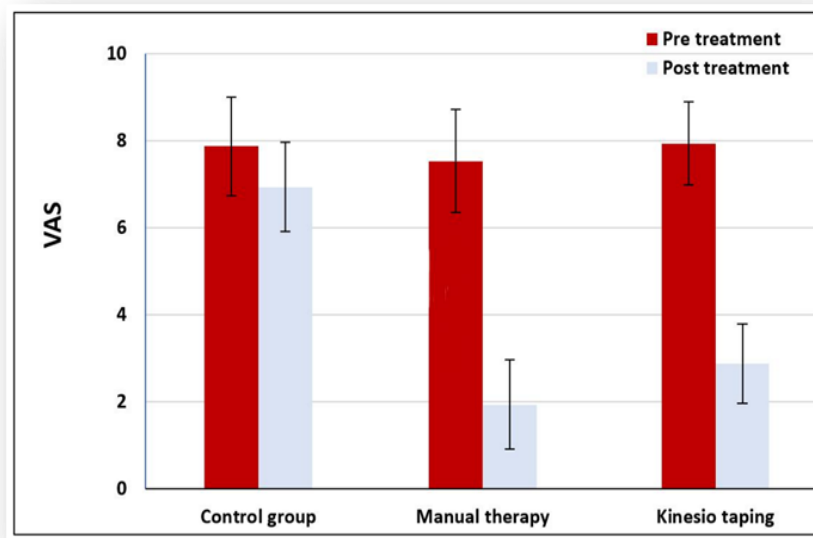
3.2. Within Group Comparison

There was a significant decrease in VAS in the three groups post-treatment compared with that pre-treatment ($p < 0.001$). There was a significant decrease in HIT-6 in manual therapy and Kinesio taping group post-treatment compared with that pre-treatment ($p < 0.001$), while there was no significant change in HIT-6 of control group ($p > 0.05$) (Fig. 3&4) (Table 2).

Table 2. Mean VAS and HIT-6 pre- and post-treatment of control, manual therapy, and Kinesio taping groups

	Control group mean $\pm$ SD	Manual therapy mean $\pm$ SD	Kinesio taping mean $\pm$ SD
VAS			
Pre-treatment	7.87 $\pm$ 1.13	7.53 $\pm$ 1.19	7.93 $\pm$ 0.96
Post-treatment	6.93 $\pm$ 1.03	1.93 $\pm$ 1.03	2.87 $\pm$ 0.92
MD (% of change)	0.94 (11.94%)	5.60 (74.37%)	5.06 (63.81%)
95% CI	0.32: 1.54	4.99: 6.21	4.46: 5.68
	<i>p</i> = 0.004	<i>p</i> = 0.001	<i>p</i> = 0.001
HIT-6			
Pre-treatment	66.00 $\pm$ 3.64	65.87 $\pm$ 4.82	65.80 $\pm$ 5.63
Post-treatment	63.67 $\pm$ 4.45	49.33 $\pm$ 4.76	51.40 $\pm$ 3.98
MD (% of change)	2.33 (3.53%)	16.54 (25.11%)	14.40 (21.88%)
95% CI	-0.14: 4.81	14.06: 19.01	11.93: 16.87
	<i>p</i> = 0.06	<i>p</i> = 0.001	<i>p</i> = 0.001

NOTE: SD, Standard deviation; MD, Mean difference; CI, Confidence interval; *p* value, Probability value

**Figure 3.** Mean VAS pre- and post-treatment of control, manual therapy, and Kinesio taping groups

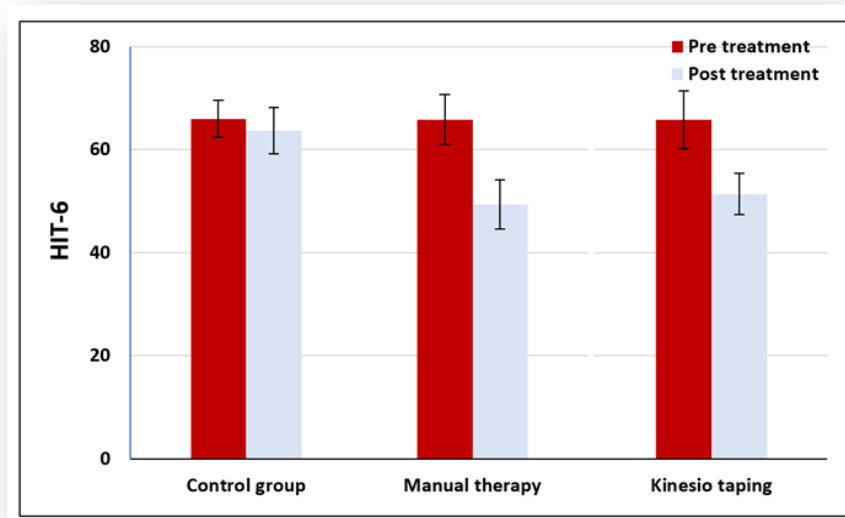


Figure 4. Mean HIT-6 pre- and post-treatment of control, manual therapy, and Kinesio taping groups

3.3. Between Group Comparisons

There was a significant decrease in VAS and HIT-6 of manual therapy and Kinesio taping groups compared with that of control group post-treatment ($p < 0.001$). There was a significant decrease in VAS of manual therapy compared with that of Kinesio taping group ($p < 0.05$), while there was no significant difference in HIT-6 between manual therapy and Kinesio taping groups post-treatment ($p > 0.05$) (Table 3).

Table 3. Comparison of VAS and HIT-6 between control, manual therapy, and Kinesio taping groups post-treatment

Outcome	Control vs manual therapy		Control vs Kinesio taping		Kinesio taping vs manual therapy		η^2
	MD (95% CI)	p	MD (95% CI)	p	MD (95% CI)	p	
VAS	5 (4.12: 5.88)	0.001	4.06 (3.18: 4.95)	0.001	0.94 (0.05: 1.82)	0.03	0.83
HIT-6	14.34 (10.42: 18.24)	0.001	12.27 (8.36: 16.18)	0.001	2.07 (-1.84: 5.98)	0.41	0.69

NOTE: MD, Mean difference; CI, Confidence interval; p value, Probability value; η^2 , Partial Eta Square

4. DISCUSSION

One of the most frequent complaints that family practitioners see is tension-type headaches (TTH). TTH is defined by dull, tight, or pressing headaches that range in intensity from mild to moderate. Additionally, they are usually non-pulsatile, bilateral, diffuse, tightening in nature, and unaffected by physical exertion. Phonophobia and photophobia may be related symptoms (Onan et al., 2023). They can significantly affect a person's quality of life, cause disruptions to everyday activities, and occasionally result in disabilities that impose a financial burden at work or education. Despite their widespread prevalence, the precise etiology and pathophysiology of TTH remain unknown, and there is no consensus regarding available treatments (Ashina et al., 2021b).

The purpose of this study was to compare the impact of manual therapy and Kinesio taping on Jouf University female students suffering from TTH. Our findings revealed that there was a substantial decrease in the VAS within the three groups after therapy. After treatment, the Kinesio taping and manual therapy group's HIT-6 dramatically dropped from its pre-treatment level, while the control group's HIT-6 remained unchanged. The post-treatment comparison revealed that the VAS of manual therapy was considerably lower than that of the Kinesio taping group. However, the HIT-6 did not substantially differ between the Kinesio taping and manual therapy groups after treatment.

These findings align with those of Álvarez-Melcón et al. (2018), who reported in their study that the relaxation exercises (control) group showed significantly decreased pain parameters. Berggreen et al. (2012) also agreed with our work that treating the trigger points of the cervical muscles vastly reduces the intensity of morning headaches in people who suffer from persistent tension-type headaches (CTTH). Additionally, Moraska et al. (2015) demonstrated that one month following the intervention, the prevalence of headache occurrence was considerably reduced by massage therapy and trigger point treatment.

Additionally, a systematic review done by Cumplido-Trasmonte et al. (2021) showed that in individuals suffering from TTH, manual therapy-based physiotherapy improves pain severity and frequency, craniocervical range of motion, headache impact, disability, and quality of life. Consistent with Esin et al. (2019), the Kinesio taping group showed statistically significant positive results for all indicators compared to the placebo taping group after treatment. Major benefits of Kinesio taping (KT) include pain reduction, muscle relaxation, improved proprioception, and edema reduction through localized blood and lymphatic fluid drainage. By creating space under the skin, elevating it improves fascial flow and gets rid of inflammatory products. KT has been widely utilized to treat

people with myofascial pain syndrome, although the precise mechanism of action of KT is still unknown.

On the other hand, our results are inconsistent with Bini et al. (2022), who demonstrated in their study that manual treatment had minor benefits in lowering headache frequency, intensity, and disability over the short and long term, according to a sensitivity meta-analysis of low-RoB trials, and disagreed with the work done by Esin et al. (2018), who investigated patients with myogenic trigger zones (MTZ) in the neck muscles, which results in cervicogenic headache (CHA). When comparing the Kinesio taping group to Eval-1, there were positive dynamics that are statistically significant. All indicators were statistically significantly in favor of the results of groups B (Placebo Kinesio group) and C (Physical exercise group). The better outcomes of the Kinesio taping group compared to the manual therapy group in Esin's study may be a result of the limitation of the manual therapy to only one 20-minute master class for parents and teenagers focused on developing proper locomotor patterns, or motor stereotypes. The positive results of manual therapy over the Kinesio taping in alleviating the pain intensity as evidenced by VAS results in our study may be due to the ability of the manual therapy in terms of muscular aspects to decrease radiating pain and sensitivity, the most common indicator is heightened sensitivity to pain associated with elevated tension in the head and neck muscles which is one of the important predisposing factors for TTH. When pain is referred to active myofascial trigger points in the head and neck, different pain-producing chemicals are released, which irritate peripheral pain receptors and cause radiating head pain. Certain factors trigger and encourage myofascial trigger point activity. These factors consist of prolonged poor postures, which can lead to dysfunction in the neck muscles, decreased neck mobility, and excessive strain on the vertebrae (Cigarán-Méndez et al., 2019).

The study was constrained by the sample size of 45 participants, while calculated to be statistically adequate, is relatively small, limited to only female students, and recruitment from only one university potentially constrained the generalizability of the findings to a larger population of university students with TTH, the study was additionally constrained by the inability to obtain a headache diary from the students regularly, resulting in its exclusion from the evaluation measures employed in this study.

One intriguing potential research direction is assessing the degree to which the benefits are sustained over a longer time frame, like six months or a year after therapy. Also, comparing other physical therapy methods implicated in TTH research would be of great value.

5. CONCLUSIONS

Both manual therapy and Kinesio taping are effective physical therapy modalities for treating tension headaches. However, manual therapy is more effective at reducing pain severity. We considered adding both manual therapy and Kinesio taping to the physical therapy rehabilitation program of patients with tension headaches would be beneficial.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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