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Effectiveness of Core Stability Exercise with I and Y Kinesio Taping on Pain, Functional Disability and Quality of Life in Patients with Chronic Non-Specific Low Back Pain: A Randomized Clinical Trial.

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ABSTRACT

Background: Chronic non-specific low back pain (CNSLBP) is prevalent and significantly affects function and quality of life. Core Stability Exercise (CSE) and Kinesio Taping (KT) are commonly used interventions, but evidence comparing the relative efficacy of different taping techniques (I vs. Y) in combination with CSE remains limited.

Objective: To compare the effectiveness of Core Stability Exercise combined with I-taping versus Y-taping on reducing pain (primary outcome: NPRS), disability (ODI), and improving quality of life (SF-36) in CNSLBP.

Primary Outcome: Between-group difference in change in NPRS score from baseline to 4 weeks.

Methods: A parallel-group randomized controlled trial included 62 CNSLBP patients aged 30–55 years, randomly allocated (1:1) to I-taping+CSE or Y-taping+CSE. Randomization was computer-generated with sealed-envelope allocation. NPRS, ODI, and SF-36 were assessed pre- and post-intervention. Effect sizes (mean difference with 95% CI) and exact p-values were reported.

Results: Both groups showed significant within-group improvement in NPRS and ODI over 4 weeks. Between-group NPRS change showed a mean difference of −0.42 (95% CI: −1.29 to 0.45; p = 0.31), indicating no superiority of either taping method. No serious adverse events occurred.

Conclusion: I-taping and Y-taping combined with Core Stability Exercise are similarly effective in improving pain, disability, and quality of life in CNSLBP patients. Improvements observed exceeded MCID thresholds for NPRS and ODI in both groups, suggesting clinical relevance despite non-significant between-group differences.

KEYWORDS: Chronic non-specific low back pain, Kinesio Taping, Core Stability Exercise, NPRS, Oswestry Disability Index, SF-36,

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INTRODUCTION

Chronic non-specific low back pain (CNSLBP) remains one of the most common musculoskeletal conditions globally and is a major contributor to disability in adults. According to global burden of disease estimates, the lifetime prevalence of low back pain ranges from 60–80%, while chronic non-specific forms constitute approximately 20% of all cases. CNSLBP is defined as pain persisting for more than 12 weeks without a specific underlying pathology. Contrary to outdated claims suggesting extremely high prevalence, recent epidemiological reviews highlight more accurate figures that emphasize the global health burden without overestimation [1]. Low back pain is a predominant contributor of global disability worldwide and a significant health concern affecting individuals of all ages globally[2] .The prevalence of low back pain ranges globally from 30% to 80% in the adult population and increases with age [3] .The aetiologias of low back pain can be broadly categorized into spinal and non-spinal causes, with various factors contributing to the development of pain[4] . Notably, approximately 90% of the population suffers from CNSLBP, which is a major cause of disability and a significant socioeconomic challenge [5]. CNSLBP is a common condition characterized by persistent pain lasting more than three months, without any evident tissue injury and frailty. CNSLBP can originate from disturbance in various structures, including intervertebral discs, facet joints, vertebral bodies, spinal roots, surrounding muscles, and supporting ligaments [6].

The inefficiencies of the clinical and medical system in the care and management of chronic lower back pain have led to the development of various physiotherapy techniques that have proven their efficacy in treating and even recovering from this quality

of life-affecting pain. Kinesio Taping and Core Stability Exercise are two such techniques that have been developed and applied among patients. Mostly two types of Kinesio taping techniques (I and Y) are used in physiotherapy for this pain.[6] Core stability exercises alleviate CNSLBP by enhancing spinal stability, improving neuromuscular control, and reducing shear forces on the lumbar spine, thereby reducing discomfort and impairment[7] [8]. CSE refers to the capacity to regulate the posture and movement of the body's center region.[9] CSE is an effective intervention for enhancing proprioception, balance, and muscle thickness percentage change, while diminishing functional impairment and mobility apprehension in individuals with subacute NSLBP, it also helps in alleviating muscle cramping and helps in muscle function, it enhances the strength and endurance of the entire muscle group, maintain lumbar stability, alleviate muscle spasms, promote blood circulation, improves soft tissue nutrition, facilitate inflammation absorption, and accelerate the healing of damaged soft tissues, basically reducing pain and enhancing the functionality of waist movement .[10] [11] But there is limited data available to determine which one has better efficacy when combined with Core Stability Exercise.

CNSLBP arises from multiple contributing factors including degenerative changes, impaired neuromuscular control, core muscle weakness, sedentary lifestyle, and poor movement patterns. Various physiotherapy interventions have been evaluated for management, among which Core Stability Exercise (CSE) and Kinesio Taping (KT) have gained substantial attention.

CSE aims to enhance neuromuscular control, lumbar stability, and coordination of deep trunk muscles. Evidence supports its role in reducing pain intensity, improving proprioception, and enhancing functional ability. KT, specifically I- and Y-shaped taping methods, is widely used for pain modulation, circulation enhancement, and postural support. However, available literature does not clearly indicate whether one taping method provides superior therapeutic benefit when combined with CSE.

Despite numerous studies and clinical guidelines, non-specific low back pain treatment remains controversial. Previous studies have explored KT or CSE individually, or compared taping vs. sham taping. However, no robust RCT has directly compared I-taping vs. Y-taping when combined with standardized CSE protocols. Thus, uncertainty persists regarding the optimal taping configuration to augment CSE outcomes in CNSLBP.

Study Hypothesis: This RCT was designed as an exploratory equivalence trial to evaluate whether I-taping and Y-taping combined with CSE demonstrate similar effects in reducing pain and disability among CNSLBP patients. Therefore, more clinical evidence is needed across diverse patient demographics and outcome parameters to ensure accurate and effective application in pain management. This study contributes valuable data toward identifying more efficient therapeutic strategies. In this context, the present research explores the efficacy of these interventions in managing chronic non-specific low back pain (CNSLBP).

METHODOLOGY:

2.1 Research Design: Observations based cross sectional study using Complete Randomized research design was framed to obtained the reliable Measures.[8]

A single-blind (assessor-blinded), two-arm parallel randomized controlled trial.

2.2 Area of Study and Sample size- Participants were recruited from physiotherapy outpatient departments of affiliated healthcare centers. A total of 62 adults aged 30–55 years with clinically diagnosed CNSLBP were included.

2.3 Sample Selection:

Ethical Approval:

Ethical permission was secured from the institutional healthcare research ethics committee of CSJMU (HEC Reference No: 2024-June-002).

Granted Authorization

Informed written consent was acquired from all individuals before to their inclusion in the study.

Trial Registration:

The trial was properly recorded with the Clinical Trials Registry of India (CTRI) under the ID: **CTRI/2024/08/072846.**

Eligibility Screening:

An allergy test was conducted for all medically diagnosed CNSLBP patients based on the inclusion criteria

5. a) Inclusion Criteria:

Participants who satisfied the subsequent criteria were incorporated in the study:

Identified with CNSLBP

Pain score greater than 3 on the NPRS

Aged between 30 and 55 years

Diagnosed CNSLBP >12 weeks

NPRS pain score ≥3

Age 30–55 years (chosen to represent a working-age population and reduce confounding from age-related lumbar degeneration)

5 .b)Exclusion Criteria

History of spinal surgery

Neurological deficits or radiculopathy

Systemic inflammatory diseases

Skin allergy to tape (determined via pre-test patch)

Pregnancy

Participation in other structured exercise programs

6. Participant Selection:

Patients meeting the inclusion criteria were chosen to participate in the experimental study.

2.4 Participant Recruitment and Group Allocation-

A sequential non-probability sampling technique was employed to recruit eligible participants from participating institutions. They were recruited from the Physiotherapy Department of concerned Institutes and a tertiary healthcare center. All eligible patients diagnosed with CNSLBP were randomly assigned to one of two experimental groups to ensure unbiased outcomes:

Randomization and Allocation Concealment

Randomization sequence generated using computer software (block size = 4)

Allocation concealed using opaque sealed envelopes

Independent personnel enrolled participants; another assigned intervention

Outcome assessors were blinded

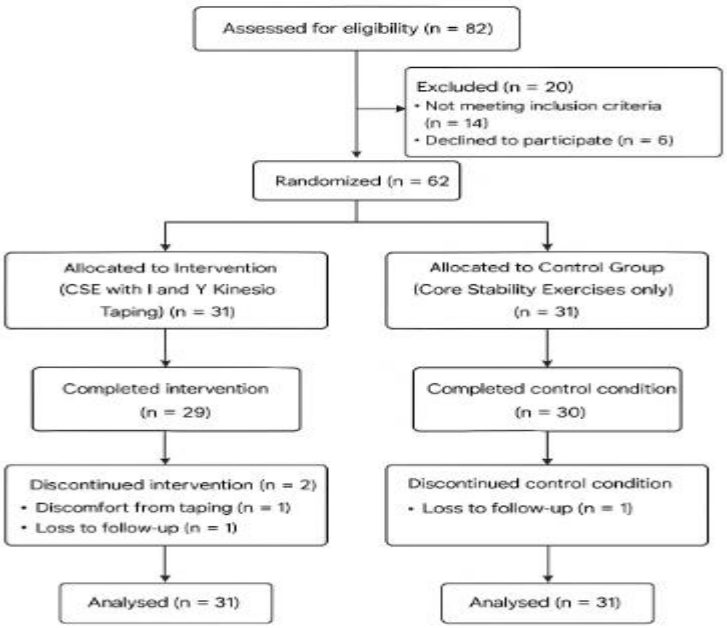
Group 1: Kinesio 'Y' taping with core stability exercises

Group 2: Kinesio 'I' taping with core stability exercises

A total of 62 participants were enrolled in the study, with 31 in each group.

Sample Size Determination:

The Sample size was calculated via G-Power software with an effect size of 0.50, $\alpha = 0.05$, and power $(1-\beta) = 0.80$.



CONSORT diagram

2.5 Tools and Techniques to Assess the Outcomes-

I. For Sociodemographic Investigation:

The biodata form collected demographic data such as age, gender, marital status, education level, employment status, and location, were assessed using a biodata form and personally interviewed to the participants.

II. For Experimental Investigation:

The experimental intervention was conducted with respondents and was implemented in three phases.

1. Phase - 1 Pre- test

2. Phase - 2 Therapies Administration

3. Phase - 3 Post test

The following standardized measures and scales were used as tools for pre-post assessment of pain intensity (PI), quality of life (QoL), and disability status among the selected patients and revealing outcomes:

SF-36: Quality of Life (Primary Outcome):

The SF-36 questionnaire was employed to evaluate health-related quality of life. It includes eight domains: The self-administered English version was used in this study. The SF-36 is a dependable tool for evaluating functional limitations and overall quality of life in patients with CNSLBP, a significant health concern in developing countries.[12]

NPRS: According to British Pain Society (January 2019), the Numerical Rating Scale (NPRS-11) is an 11-point self-report tool for pain, ranging from 0 (no pain) to 10 (worst possible pain). Commonly used, it may be divided into mild (1–3), moderate (4–6), and severe (7–10) pain. It can be used verbally or in written for.[13]

The Oswestry Disability Index: The (ODI) is a self-administered questionnaire that evaluates functional impairment. It consists of 10 sections, each with 6 statements rated 0-5. Scores are calculated as a percentage (total score/total possible score × 100%), with higher scores indicating greater disability[14].

2.6 Interventions of patients with CNSLBP for application of therapies-

All chosen patients were randomly assigned to two groups. Every group was allocated or 4 weeks on alternating days. Patients were randomized to receive either 'Y' or 'I' taping along with core stability exercises. Experimental Group 1 received 'Y' taping with core stability exercises, while Experimental Group 2 received 'I' taping with core stability exercises.

Experimental Group 1 – 'Y' Taping and Core Stability Exercises

In Experimental Group 1, 'Y' taping was applied with light tension (15–25%) or paper-off tension for about 5 cm. The tape was

released without strain as the patient returned to a neutral posture or moved into forward flexion with rotation to the opposite side. After confirming proper tape application, participants performed core stability exercises: prone plank, single-leg bridges (right and left), side plank, double bridge, and bird-dog. Sessions lasted 45 minutes and were conducted three times per week.[15]

Experimental Group 2 – 'I' Taping and Core Stability Exercises

In Experimental Group 2, participants received 'I'-shaped Kinesio taping along with core stability exercises. The Posterior Superior Iliac Spine (PSIS) and T12 vertebra were marked, and two 'I' strips were applied parallel to the spine from PSIS to T12 with a slight stretch (10–15%) on both sides while the participant flexed the spine. Core exercises included prone plank, single-leg bridges (right and left), side plank, double bridge, and bird-dog. Training lasted 30 minutes within a 45-minute session, conducted three times per week.[16]

2.7 Post-test Measurements of the patients:

All subjects were retested using the same pre-test measurements to evaluate improvement after the final session of therapy, following a four-week treatment intervention course with the selected therapies.

2.7 Data Analysis:

The obtained data were analyzed using SPSS version 26. Descriptive statistics (frequency, percentage, mean, and standard deviation) summarized participant's sociodemographic characteristics. Chi-square tests assessed associations between sociodemographic variables and primary outcomes, 't' test was applied to comparison of pre-post outcomes.

RESULTS -

This study compared the effectiveness of Kinesio 'I' taping and 'Y' taping, both combined with core stability exercises, in managing CNSLBP. Using NPRS, the Oswestry Disability Index, and the SF-36 Quality of Life questionnaire, it aimed to determine which approach offers better pain relief and functional improvement. Statistical analysis of obtained data revealed the results presenting here in following manner:

3.1 Demographic information:

The mean age of the participants was found to be 52.63 years, with females (69.35%) being significantly more affected than males by CNSLBP at a statistically significant level. The mean Body Mass Index (BMI) was 23.64 kg/m², indicating that the participants were predominantly overweight or had grade I obesity. The sociodemographic data of the respondents revealed a wide range of variations in terms of region, educational qualification, and occupation. Chi-square test assessed p-values and all p-values are < 0.05, indicating statistically significant differences in the distribution of participants across all these demographic categories as showing in table no. 1.

3.2 Pre-Post Effect on Pain Status:

As showing in Table no. 2 This table presents the results comparing the effects of two different physiotherapy interventions on pain intensity among participants with chronic non-specific low back pain. The reveals are:

Pre-test results: Both groups had similar pain intensity levels before the intervention, with most participants experiencing moderate to severe pain.

Post-test results: Both groups showed significant improvements in pain intensity after the intervention.

In Group 1, 70.96% of participants experienced mild pain, and 19.35% reported no pain.

In Group 2, 51.61% of participants experienced mild pain, and 29.03% reported no pain.

Comparison between groups: Group 2 ("I" taping with core stability exercise) seemed to have slightly better results, with more participants reporting no pain (29.03% vs 19.35%). However, Group 1 ("Y" taping with core stability exercise) had more participants experiencing mild pain (70.96% vs 51.61%).

Table no. 2: comparison on Pre Post of Selected Physiotherapy effects observed on pain intensity among the individuals with CNSLBP

*Experimental Group-1 received ‘Y' taping with core stability exercise,

**Experimental Group- 2 received 'I' taping with core stability exercises

Note: no pain = 0, mild pain = 1-3, moderate pain = 4-6, severe pain = 7-10

3.3 Pre-Post Effect on Functional Disability Status:

According to results showing in Table no 3, within-Group Comparison in calculation of the Pre-Post Oswestry Disability Questionnaire mean scores change within each group (Group 1: Mean change = 26.14 - 16.23 = 9.91 and Group 2: Mean change = 27.83 - 14.79 = 13.04), estimated p-value < 0.001 (highly significant) has indicating that the both groups showed significant improvements in Oswestry Disability Questionnaire scores after the intervention.

The t-test comparison between the two groups, assessed the pre test scores on basis of the mean difference and effect size that p-value: 0.50 (non-significant). This pre-test comparison suggests that the two groups are similar in terms of Oswestry Disability Questionnaire scores. The post-test comparison suggests that there is no significant difference between the two groups in terms of Oswestry Disability Questionnaire scores after the intervention.

Therefore, t-test comparison indicates that there is no substantial disparity between the two groups in terms of Oswestry Disability Questionnaire scores before or after the intervention. But both groups show significant improvements in Oswestry Disability Questionnaire scores after the intervention.

Table no. 3 post mean score of OD questionnaire score in Index to determine effects on the *Experimental Group-1 received ‘Y' taping with core stability exercise, **Experimental Group-2 received 'I' taping with core stability exercises

3.4 Pre-Post Effect on Quality of Life:

The SF-36 is a commonly utilized tool for evaluating quality of life in various health conditions, including chronic non-specific low back pain. provided 8 domains, and the domains are: 1. Physical functioning 2. Physical health 3. Role limitation due to emotional problems 4. Vitality 5. Mental health 6. Social functioning 7. Bodily pain 8. General health. Table no.4 indicate the intervention Comparison; there are two interventions being compared from both groups (Group 1 and 2) on Pre-test and post-test scores for each domain. The p-values are provided for each domain, indicating the significance of the difference between the two groups. As result indicated:

Most domains show non-significant differences between the two groups, with p-values ranging from 0.161 to 0.775.

Certain domains exhibit marginal enhancements in scores from pre-test to post-test, nonetheless the disparities between group lack in statistical difference.

The results suggest that both interventions may have some positive effects on quality of life in patients with CNSLBP, nevertheless but no significant differences exist in the two interventions in most domains.

*Experimental Group-1 received ‘Y' taping with core stability exercise, **Experimental Group-2 received 'I' taping with core stability exercises.

DISCUSSION:

This research evaluates the effectiveness of 'Y' taping and 'I' taping with core stability exercises (CSE) in patients with CNSLBP. The findings indicates that both treatment interventions were equally effective in improving pain and disability scores. Kinesio taping with CSE, a technique used in both interventions, has been found to benefit various conditions by improving proprioception, pain management, blood and lymph circulation, and reducing inflammation and muscle stiffness[15]

The study consisted of a four-week treatment protocol, with three sessions per week on alternate days. The results showed significant improvements in pain and quality of life scores after treatment. The mean score of pre-treatments (NPRS) was 5.37±0.96, which reduced to 1.80±0.93 after treatment.

The findings of this study correspond with prior research that suggests Kinesio taping can be an effective treatment for CNSLBP. The mechanism of Kinesio taping in pain management is thought to be due to its elastic nature, which stimulates low-threshold mechanoreceptors in the skin and fascia, leading to pain suppression [17]

POTENTIAL LIMITATIONS:

The study's intervention time was only one month, which may be inadequate to encompass long-term impact or sustainability of the treatment. Insufficient time to capture maximum benefits and effectiveness of these therapies. Because of Lack of long-term follow-up, the study may not be capable of evaluating the longevity of the therapeutic effects or recognizing any long term.

By acknowledging these limitations, researchers can better interpret their findings and identify areas for future research.

CONCLUSION

Although the comparison suggests that there is no significant difference between the two groups in terms of NPR scores, ODI Questionnaire scores and short-form 36 scores on pain, disability and quality of life respectively but slightly significant (with p value 0.52) on some domains and pain recovery among the participants of 'I' taping with core stability exercise. Overall, this study revealed that both therapies were effective decreasing pain intensity among participants with CNSLBP. However, the outcomes may indicate that "I" taping with core stability exercise could be slightly more effective in eliminating pain, while "Y" taping with core stability exercise might be more effective in reducing pain to mild levels. Both groups showed significant improvements in pain and quality of life after the intervention, with large effect sizes and estimated p-values < 0.001. This suggests that both 'Y' taping with core stability exercise and 'I' taping with core stability exercise are effective in reducing disability scores. The study suggests to adoption of this combination in treating the patients with CNSLBP.

Table no 1 Comparative Distribution on demographic status of the participants

Category	**F (n=62)**	**Percentage (%)**	**'P' value**
Age (years)			**0.0000331** **Significant**
30 - 35	06	9.67	
35 - 40	11	17.74	
40 - 45	07	11.29	
45 - 50	10	16.12	
50 - 55	28	45.16	

Total (Mean age 52.63±8.570)	**62**	**100.0**	
Gender			
Males	19	30.64	**0.0023** **Significant**
Females	43	69.35	
Body Mass Index (weight in kg / height in m2) **Mean ± SD, kg/m2**	23.64±3.25		
Region			
Urban	41		**0.0000000394** **Highly significant**
Rural	04		
Semi-urban	17		
Qualification			
None	03	4.83	**0.00000000011** **Extremely significant**
School	14	22.58	
College	45	72.58	
Occupation			
Business	15	24.19	**0.000198** **Significant**
Service	19	30.64	
Retired	26	41.93	
Unemployed	02	3.22	

Table no. 2: comparison on Pre Post of Selected Physiotherapy effects observed on pain intensity among the individuals with CNSLBP

Level of pain on NPR score	*Group 1 (N= 31)		**Group 2 (N= 31)		Total (N= 62)	
	Pre test N (%)	Post test N (%)	Pre test N (%)	Post test N (%)	Pre test N (%)	Post test N (%)
no pain (0)	0 (0.0)	09 (29.03)	0 (0.0)	06 (19.35)	0 (0.0)	15 (24.19)
Mild (1- 3)	03 (9.67)	16 (51.61)	4 (12.90)	22 (70.96)	07 (11.29)	38 (61.29)
Moderate (4–6)	19 (61.21)	06 (19.35)	17 (54.83)	03 (9.67)	36 (58.06)	09 (14.51)
Severe (7 – 10)	09 (29.03)	0 (0.0)	10 (32.25)	0 (0.0)	19 (30.64)	0 (0.0)
Mean value	5.2	1.1	5.1	2.1	4.8	1.5
SD	1.8	1.2	1.9	1.5	1.7	1.3
'P' value	< 0.001		< 0.001		< 0.001	

Table no. 3 post mean score of OD questionnaire score in Index to determine effects on the disability status

Oswestry Disability Questionnaire Scores, (mean±SD)	*Group 1 (N= 31)		**Group 2 (N= 31)		p value
	Pre test	Post test Mean score	Pre test Mean score	Post test Mean score	
	26.14± 11.48	16.23±11.34	27.83±12.68	14.79± 11.23	<0.0001

Table no. 4 comparison on pre- post response indicating effects on quality of life of participants on mean scores of Short from (SF-36) domain

Attributes of SF-36 (Quality of Life)	***Group I**		****Group II**		**P value**
	Pre test mean scores	**Post test mean scores**	**Pre test mean scores**	**Post test mean scores**	
Ist Domain (Physical functioning)	50 (30)	55 (10)	55 (10)	65 (15)	0.16
2nd Domain (physical health)	25 (50)	50 (25)	25 (15)	50 (25)	0.595
3rd domain(role limitation of emotional problem)	33.3 (0.20)	33.3 (33.3)	33.3 (1.7)	33.3 (0.0)	0.161
4th domain (vitality)	50 (5)	55 (20)	50 (0)	50 (15)	0.461
5th domain (mental health)	48 (16)	56 (19)	52 (12)	56 (12)	0.389
6th domain (social functioning)	50 (25)	62.5 (12.5)	50 (37.5)	62.5 (25)	0.775
7th domain (pre and post pain)	67.5 (32.5)	77.5 (20)	67.5 (22.5)	67.5 (20)	0.489
8th domain (general health)	40 (10)	45 (5)	40 (10)	45 (5)	0.624

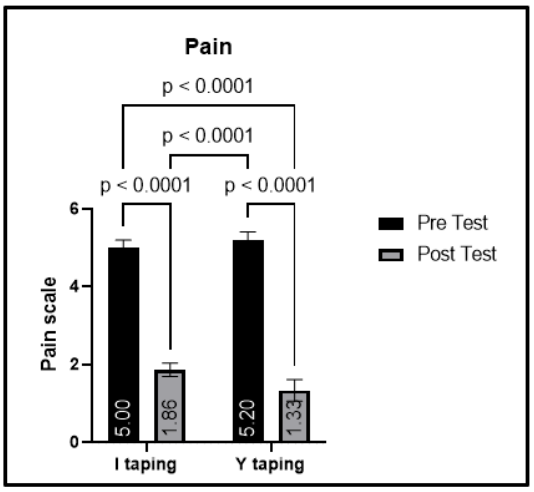


***Figure 1:* Graphical presentation of pre and post pain**

Graphical Depiction of SF-36 Health Survey Domain Scores

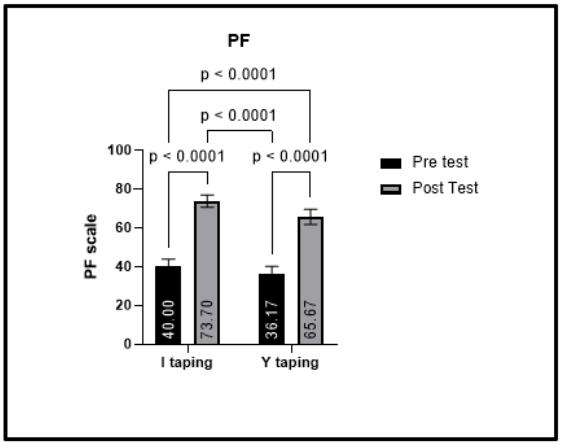


Figure 2: Graphical representation o of pre and post physical functioning

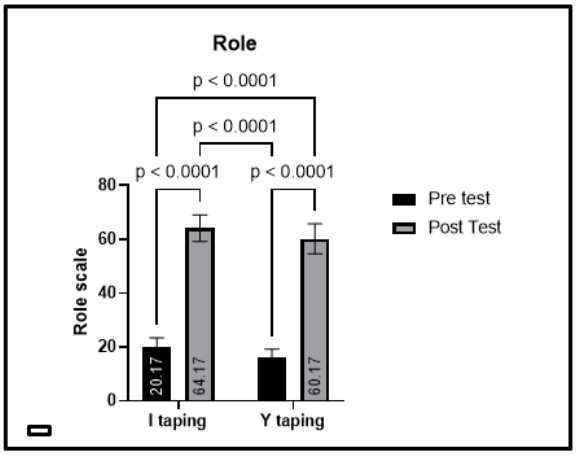


Figure 3: Graphical representation of pre and post role limitation

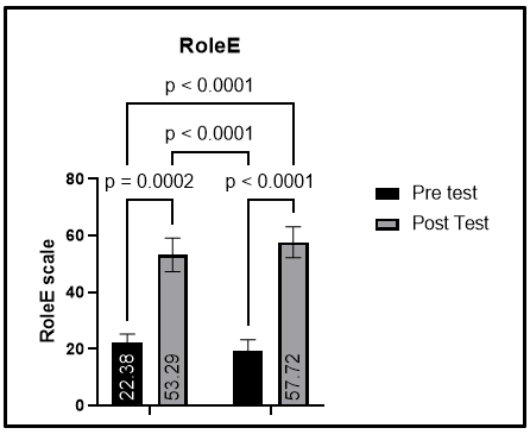


Figure 4: Graphical representation of pre and post Emotional Problems

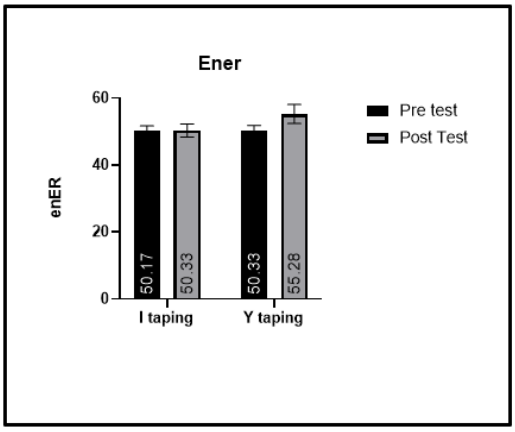


Figure 5: Graphical representation of pre and post vitality

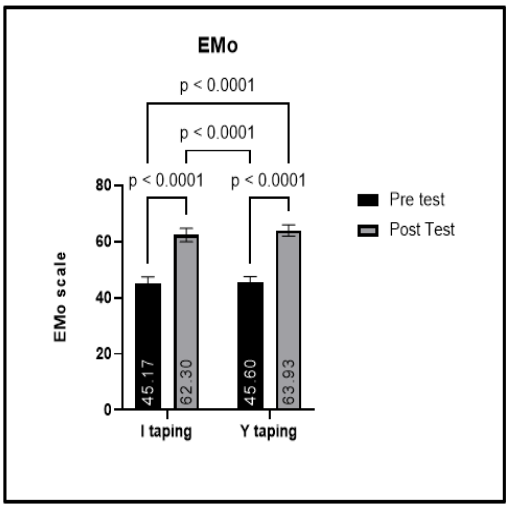


Figure 6: Graphical representation of pre and post value of emotional well-being (mental health)

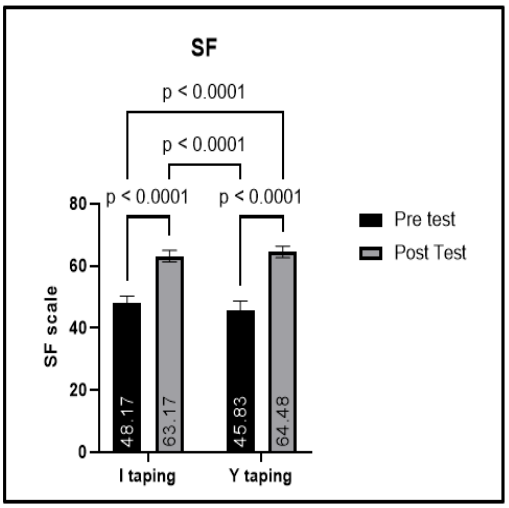


Figure 7: Graphical representation of pre and post values of social functioning

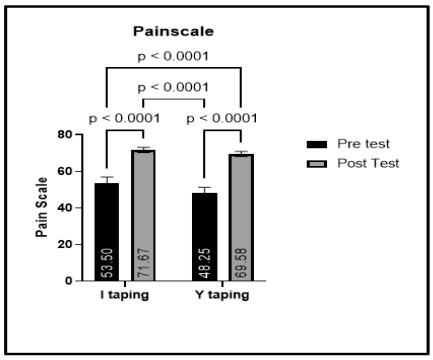


Figure 8: Graphical representation of pre and post values of bodily pain

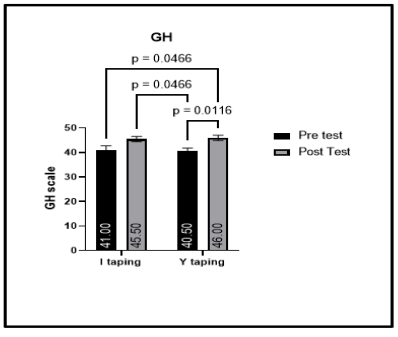


Figure 9: Graphical representation of pre and post values of general health

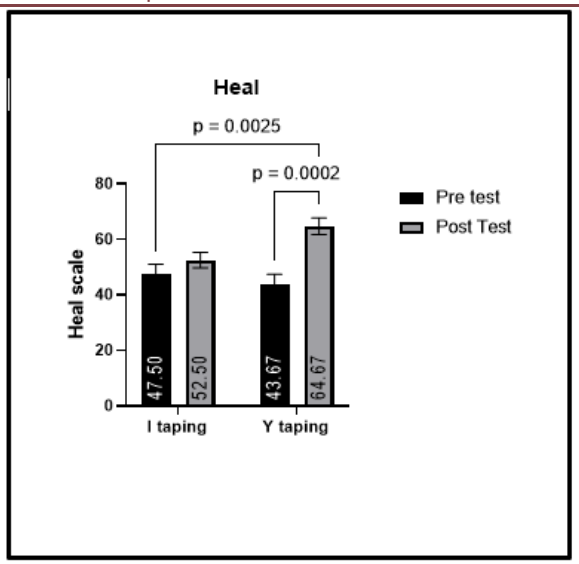


Figure 10: Graphical representation of pre and post values of healing

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