

Comparison of The Resistance Band Exercise Versus Yoga With Electrical Modality [Tens] In Working Women With Non-Specific Chronic Low Back Pain: A Randomized Clinical Trial

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Abstract:

Background: Low back pain is an extremely common problem that most people experience at some point in their life. Worldwide, 65-80% of the population experience low back pain at some stage of their lives. Non-specific low back pain is the one that is not because of a recognizable, known pathology. The purpose of the present study is to evaluate the two techniques and its effect on non-specific chronic low back pain in working woman.

Materials and Methods: A 30 working woman with non-specific low back pain were recruited based on the inclusion and exclusion criteria. In this present experimental study, the participants were randomly assigned into an Experimental group (resistance band with electrical modality (TENS)) and a Control group (yoga therapy with electrical modality (TENS)). Pre and post NPRS for pain and MODI for function were taken as an outcome measures and analysis were performed by use of Microsoft excel and SPSS.

Results: The study showed within group analysis for different outcome measures in an experimental and control group were statistically significant ($p < 0.05$). Furthermore, between group analysis for different outcome measures in an experimental and control group were also suggested statistically significant ($p < 0.05$).

Conclusion: The present study concluded a resistance band exercises and TENS approach was suggesting better improvement in pain and function compare to yoga therapy with TENS in working woman with non-specific chronic low back pain.

Key Word: Thera-band exercises, back pain, pain management, Yoga..

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I. Introduction

Low back pain is one of the common symptoms in people with all age groups. In 2017, the prevalence rate for low back pain was 7.83%. Mechanical low back pain and non-specific low back pain were the two most frequent types of low back pain. The significant improvement in low back pain is seen within 6 weeks. Hence the prognosis of the symptom is good.¹ Low back pain that is not caused by an identifiable, well-known disease such as infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorders, radicular syndrome, or cauda equine syndrome is referred to as non-specific low back pain.²

The estimated prevalence rate for chronic low-back pain was 23%. The total estimated prevalence rate for low back pain is about 84%. On the basis of duration of episode, the low back is categorized into acute, sub-acute and chronic. The cutoff duration for the acute phase of low back pain lasts less than six weeks, the sub-acute phase lasts six to twelve weeks, and the chronic phase lasts longer than twelve weeks. Acute low back pain might progress to chronic low back pain in 10% to 15% cases.²

The spine consisted a different pattern of movements which includes flexion, extension, side-flexion and rotation. It is difficult to measure a single vertebrae range of motion thus clinically a whole spine segment has been preferred for the analyzing a spine movement.³ The movement a spine and position is depending upon a static stability of spine is provided by its anatomical bony congruence and dynamic stability is provided by surrounding soft tissues. Anterior dynamic stability is provided by the abdominals, iliopsoas, piriformis and rectus femoris. Posterior dynamic stability is provided by the erector spinae, multifidus, latusmus dorsi, and quadratus lumborum. Medial dynamic stability is provided by adductor group of muscles and lateral stability is provided by gluteus group and tensor fascia lata, all muscles together helps to stabilize the spine and pelvis during kinetic functional movement. All muscles together form a muscular box which term as "CORE".⁴

Weakness of the core muscle lead to inappropriate posture and curvature of the spine. Multifidus and transvers abdominus are found to be as affected in compare with normal groups. Various exercises and approaches were used for a management of the conditions. Strengthening of the core muscles, stretching of the muscles, pain reducing modalities such as TENS, hot pack, IFT and so on.⁵

A strengthening is one of the classical method for a providing strength to a local and global muscles of the back. Resistance can be provided by a manual method, by Thera-band, sand-bags and so on. Use of a Thera-band or Elastic resistance band is one of the most common method and reliable for the strengthening of the upper limb and scapular muscles strength.⁵Resistance band or tube consisted a concentric and eccentric muscle contraction. Depending upon a choice of preference or strength of the condition Thera-band was selected.⁵Progressive resistance training is often done using resistance training machines and free weights, but such equipment is expensive, takes up a lot of room, and isn't readily available for many patients. Training using elastic resistance bands is a feasible option that may simply be incorporated in home-based programmes (ERB). Elastic resistance bands have been shown in studies to produce equivalent muscular activation to resistance training equipment or free weights.⁶

Because yoga combines physical activity with mental attention, and patients are taught proper posture, self-awareness, and self-care in addition to re- laxation, the effects of yoga may be higher than those of exercise alone.^{6,7}

- Asanas
- Pranayama is a breathing exercise that focuses on control and experience.
- • Yoga Nidra: A strategy for purposefully inducing physical, mental, and emotional relaxation, as well as
- Vipassana: A mindfulness meditation from the Buddhist tradition.

Hatha yoga, as it is often performed in the United States, is merely one component of a non-sectarian philosophical philosophy of yoga that sprang from Indian civilization some 4,000 years ago. Hatha yoga is made up of three parts: asanas (physical postures), pranayama (breathing exercises), and meditation (relaxation). The postures are intended to enhance balance while increasing flexibility and strengthening the body in a regulated manner. Forward bends, backward bends, twists, and balance are all possible in these poses, which may be done standing, sitting, reclining, or inverted. Breathing exercises help the mind focus and connect the postures.⁸TENS (transcutaneous electrical nerve stimulation) is a type of pain management that can be used in rehabilitation. The evidence for TENS' effectiveness as a stand-alone treatment for persistent low back pain is mixed.⁹

Patients are prompted to pick a number (from 0 to 10) to indicate their pain severity on the NPRS, which is often used to quantify pain intensity.¹⁰ reliability for NPRS is 0.94.¹¹ Modified Oswestry Disability Index (MODI) is one of the self-reported questionnaire for measure the low back pain. Different 10 specific points were included in the scale which scored from 0 to5.¹² The ICC value for the MODI is $r= 0.89$.¹³

The resistance band exercises with TENS and Yoga approach with TENS was still a questionable view for low back pain. Hence, to provide a more evidence for the effectiveness of specific program the current study was designed.

II. Material And Methods

This experimental study was conducted at Sainath Hospital, Bopal , Ahmedabad at January 2021. A total 30 subjects (females) of aged18-30 year, were in this study.

Study Design:An Comparative Study.

Study Location:Bopal, Ghuma, Ahmedabad.

Study Duration:6 days/ week for 3 weeks.

Sample size:30 Working Women with non-specific chronic low back pain.

Sample size calculation:We assumed that the confidence interval of 5% and confidencelevel of 95%. After calculation of sample size from the pilot study a total 27 subjects were included for the study. Henceforth, to reduce the drop out effect we inflate the sample size and it was 30 subjects.

Inclusion criteria:

1. Age group 18 to 30 years.
2. Working women those who had non-specific persistent low back pain were chosen.
3. Numeric Pain Rating Scale more than 3 points.
4. Modified Oswestry disability is more than 20%.

Exclusion criteria:

1. Pregnancy
2. Previous spinal surgery

3. Malignancy
4. Trauma
5. Congenital abnormalities
6. Patients with neurological problems
7. Patients unable to comprehend commands
8. spinal abnormalities such as acute disc pain, spondylosis, spondylolysis, spondylolisthesis.

Procedure methodology

In this present study working women aged 18 to 30 years old with non-specific persistent low back pain were included. based on criteria for inclusion and removal. 30 participants were selected and divided into two group of 15 participants in each groups. Group A was experimental group (EG) which consisted 15 participants and Group B was control group (CG) which consisted 15 participants. Participants distribution were performed by simple randomization technique. Prior consent was taken from participants in written format. Explanation about whole treatment program were given to the participants. Treatment was given 6 times per week for 3 weeks. The participants were familiarised with the activities and had one practise session prior to the training method. Prior to the training session the participants were subjected for pre-test evaluation of pain by NPRS and Disability by MODI. After completing the whole procedure at 3 weeks post assessment were taken to evaluate the improvement in pain and level of disability by the same test.

GROUP A: EXPERIMENTAL GROUP- 15 working women with chronic non-specific low back pain.

Resisted band exercise

Position	Exercises	Repetitions	Dosage
Supine	Abdominal Crunch	10 rep/ 10 sec	6 days a week for 3 weeks
Supine	Abdominal Oblique Crunch	10 rep/ 10 sec	
Sitting	Trunk Rotation	10 rep/ 10 sec	
Standing	Trunk side-bending	10 rep/ 10 sec	

TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS):

Participant were in prone lying position. Electrodes were placed 2 cm away from the spinous process of the lumbar spine, forming a square. The dosages were as followed:

Frequency: 30- 50 Hz.

Pulse Duration: 200 microseconds.

Mode: Continuous.

Intensity: Depending on tolerance. Time: 20 minutes.

GROUP B: CONTROL GROUP- 15 working women with chronic non-specific low back pain.

YOGA THERAPY

Position	Exercises	Repetitions	Dosage
Prone	Bhujangasana	10 rep/ 10 sec	6 days a week for 3 weeks
Supine	Setubandhasana	10 rep/ 10 sec	
Supine	Pavanmuktasana	10 rep/ 10 sec	
Standing	Virbhadrasana	10 rep/ 10 sec	

TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION (TENS):

Participant were in prone lying position. Electrodes were placed 2 cm away from the spinous process of the lumbar spine, forming a square. The dosages were as followed:

Frequency: 30- 50 Hz.

Pulse Duration: 200 microseconds.

Mode: Continuous.

Intensity: Depending on tolerance.

Time: 20 minutes.

Post-intervention analyses of the data were carried out by the SPSS and Microsoft excel.

Statistical analysis

The SPSS version 26 was used for the examine the data. The distribution of data was checked by Shapiro-Wilk test. All 30 subjects were evaluated by NPRS and MODI. Pre data were collected before the beginning of the procedure and post analyses of data were collected.

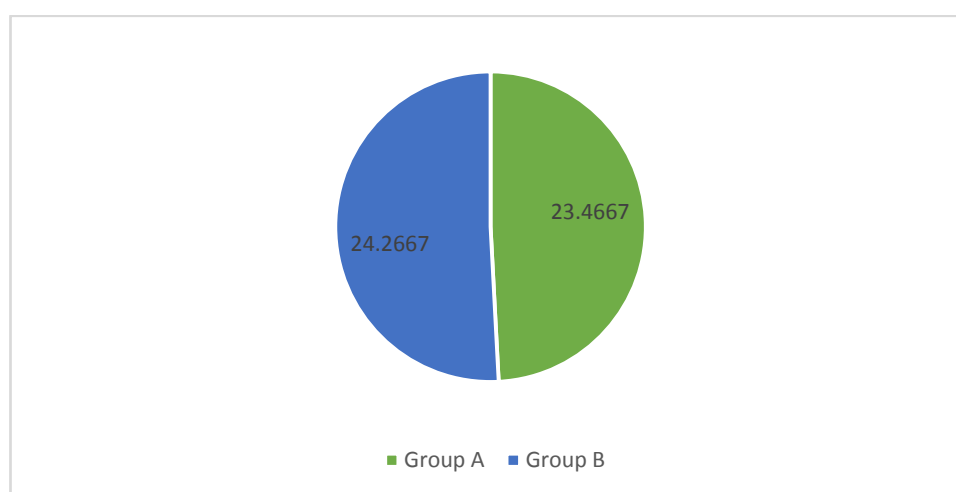
Within group and between group comparison of mean and standard deviation were analysed by student t-test. The Confidence Interval for the study was kept at 95%. Significance level was kept <0.05.

III. Result

An experimental study on Thirty working women with non-specific low back pain. The study's goal was to see how resistance band training and yoga combined with an electrical modality [TENS] affected working women with non-specific persistent low back pain. The participants were divided into two groups: experimental and control. There were 15 working ladies in the experimental group, which had resistant band exercises with TENS for 6 days in a week for 3 weeks. The control group were received Yoga with TENS. Before and after analyses of data were calculated via SPSS with T-test (Paired and Unpaired).

Table 1: Table for mean of age and gender distribution in Resistance band exercises with TENS group and Yoga with TENS group

Groups	MEAN	SD	GENDER (F)
Resistance band with TENS Group	23.4667	3.1137	15
Yoga with TENS Group	24.2667	3.0814	15



Graph 1: Mean of age distribution in Resistance band exercises with TENS group and Yoga with TENS group

Table 2: Before and after comparison of Resistance band with TENS for the different outcome measures

OUTCOME		MEAN	SD	T	P
NPRS	PRE	5.8000	1.2649	7.179	<0.001
	POST	3.5333	0.9904		
MODI	PRE	45.2000	9.4430	9.042	<0.001
	POST	24.0000	9.2736		

Comparison of the variables in Resistance band with TENS was performed by paired t-test. The analyses of the data were suggested statistically significant result for the all outcome measures before and after intervention.

Graph 2: Before and after comparison of Resistance band with TENS for the different outcome measures

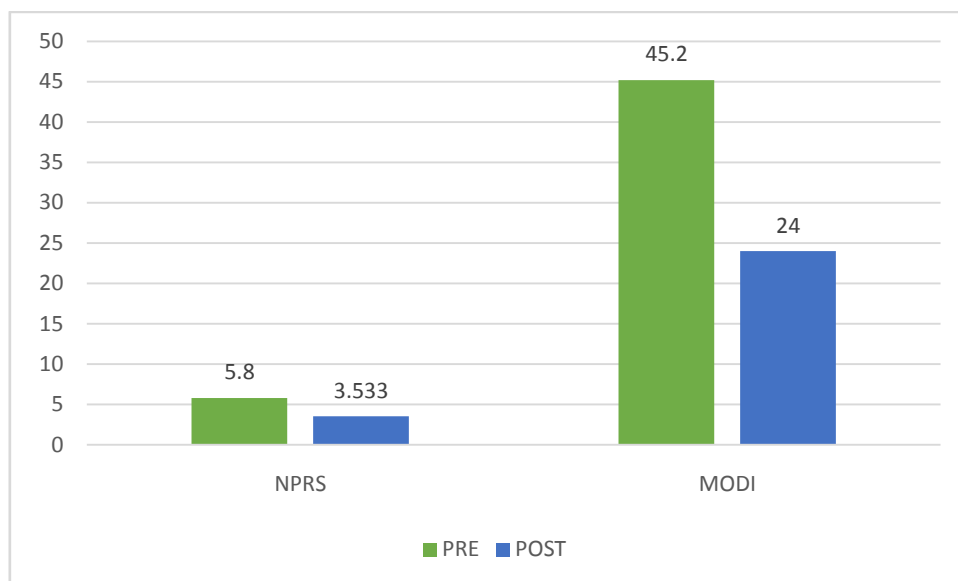


Table 3: Before and after comparison of Yoga with TENS for the different outcome measures

OUTCOME		MEAN	SD	T	P
NPRS	PRE	6.2000	1.0823	21.399	<0.001
	POST	1.0000	0.7559		
MODI	PRE	43.7333	10.4435	13.166	<0.001
	POST	13.3333	5.2463		

Comparison of the variables in Yoga with TENS was performed by paired t-test. The analyses of the data were suggested statistically significant result for the all outcome measures before and after intervention.

Graph 3: Before and after comparison of Yoga with TENS for the different outcome measures

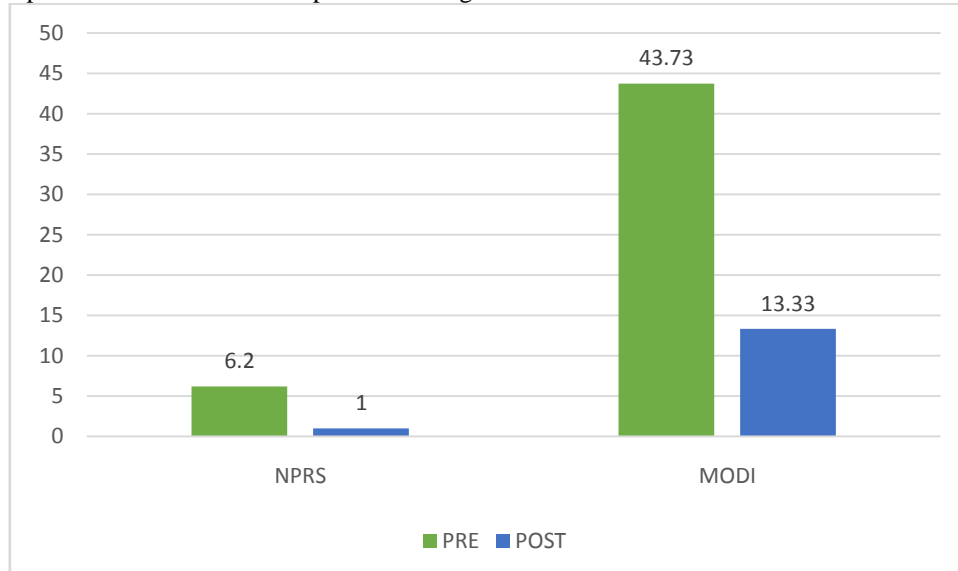
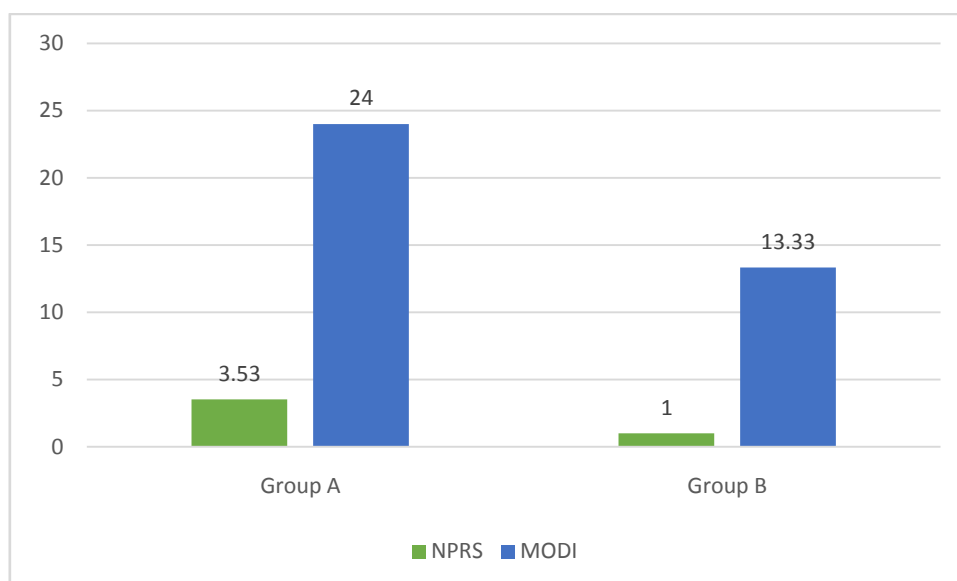


Table 4: Comparison of different variables in Resistance band with TENS group and Yoga with TENS group

Variables	Resistance band with TENS group		Yoga with TENS Group		T value	P value
	Mean	SD	Mean	SD		
NPRS	3.5333	0.9904	1.0000	0.7559	7.875	<0.01
MODI	24.0000	9.2736	13.3333	5.2463	3.877	0.001

Comparison of the variables between the Resistance band with TENS group and Yoga with TENS group was performed by unpaired t-test. The analyses of the data were suggested statistically significant result for the all outcome measures post-intervention.



Graph 4: Comparison of different variables in Resistance band with TENS group and Yoga with TENS group

IV. Discussion

The goal of this study was to compare the effects of resistance band exercises with electrical modality (TENS) and Yoga therapy with electrical modality (TENS) on pain and function in working women with non-specific chronic low back pain. The intervention was implemented over a period of three weeks, six days per week. Following objectives for evaluating pain and function were analysed.

Numeric pain rating scale and modified Oswestry Disability Index were evaluated. After three-week assessment of all outcome measures were carried out. In resistance band exercises with TENS group following exercises were advised: Abdominal crunch, abdominal oblique crunch, trunk rotation, trunk side-bending with TENS were given, meanwhile in Yoga with TENS group following exercises were advised: Bhujangasana, Setubandhasana, Pavanmuktasana, Virbhadrasana and TENS were given.

Pain was assessed by using a standard measurement tool which was Numeric pain rating scale (NPRS), the functions were measured by Modified Oswestry Disability Index (MODI). All outcome measures such as age, NPRS and MODI were taken before the intervention and the baseline data comparison of both the two groups were screened. The baseline analyses found that both groups were equally distributed on all aspects which indicated that any change in the statistical values of outcome measures in both groups after the interventions can be attributed solely to the given intervention. The statistical analysis of the present study showed statistically significant improvements in terms of NPRS and MODI post intervention of 18th sessions.

The present study was indicated that, both the groups were showing statistically significant ($p < 0.05$) effect by the exercises and TENS which had been provided to them. Within group comparison of an outcome measures for a resistance band group with TENS were found that, NPRS ($3.5333 + 0.9904$) and MODI ($24.000 + 9.2736$) were shown statistically significant effect. Within group comparison of an outcome measures for a Yoga therapy with TENS were found that, NPRS ($1.000 + 0.7559$) and MODI ($13.333 + 5.2463$) were shown statistically significant effect.

The resistance band exercises provide strength to the muscle. It is used for the strengthening purpose of the static and dynamic stabilizers of the joint. The resistance offered by a tube is directly related to the stretching of the resistance band. Therefore, higher the stretch of the band higher the resistance provided by the band. A right angle and specific elastic recoil properties are correlated with the human strength duration curve hence increasing range of motion causes elicits more motor fibres to improve the strength of the muscle. (16) Peeyoosha V Nitsure et al. narrated that the resistance band exercises does not depend on gravity, it also provide a Constance muscle tension during the exercise. Which help to enhance muscle fibre requirement and range of motion. Increase fibre activation and recruitment enhances strength of muscle which breaks the vicious cycle of the pain. (5) The similar finding were proposed by the V. M. Iversen et al for Resistance band exercise has been shown to reduce pain and enhance function. (6)

The findings of this study revealed that women with persistent non-specific low back pain might have considerable improvements in pain and function. The finding were correlated with the finding of Peeyoosha V Nitsure et al and V. M. Iversen et al. Hence it can be hypothesized that the probable mechanism of enhancing muscle activation and recruitment works similar for the present study.

L. Resende et al. conducted a meta-analyses of the TENS relief of spinal pain. The study proposed that low back pain had central sensitization. TENS produces and releases endogenous opioids and reduce central

excitability by inhabitation of pain. However, increases the pain modulation by increasing a pain threshold. The ultimate mechanism for the reduction in pain via alter the central sensitization and inhibition. (21) The finding were consistence with a study proposed by Corey B. Simon et al. (18) and Nikolaos D. Kofotolis et al. (9) The finding of the present study was suggested significant improvement in pain in women with chronic non-specific low back pain, the mechanism for that was similar which is presented by L. Resende et al. (21)

A study conducted by Padmini Tekur et al. proposed Yoga therapy helps to enhance the relaxation of the body by body movement and mindful awareness which alleviate the pain and improve the flexibility. Various yoga positions targets the different region of the body such as performing a Pavanmuktasana stretches the spine from the back which provide similar effect alike intermittent traction. Stretching a back muscle reducing a spasm and also inhibits the pain sensation by increasing range of motion. Bhujangasana, setubandhasana provides a similar effect as Pavanmuktasana. (22)

Goran Kuvacic et al conducted a randomised controlled study on In persons with persistent low back pain, On disability, anxiety, depression, and pain, the benefits of yoga and educational intervention were investigated. The author narrated improvement in all outcome measure with yoga intervention. (7) The finding of the Goran Kuvacic are consisted with Arndt Bussing et al. (17)

The findings of this study revealed that women with persistent non-specific low back pain might have considerable improvements in pain and function, the probable mechanism for that was similar which is presented by Padmini Tekur et al. (22) Comparison of the between the group mean and SD showed a statistical significant difference in NPRS ($p < 0.05$). NPRS (p value: 0.001) and MODI (p value: 0.001) were shown statistically significant effect. The improvement in pain and function between the groups could be attributed to the mechanism explained above by Peeyoosha V Nitsure et al., L. Resende et al., Padmini Tekur et al. (5, 21, 22)

For women with non-specific chronic low back pain, both groups showed signs of improvement in pain and function both within across groups. However, the mean difference of post intervention for the different outcome measures in Resistance band exercises with TENS was showing more improvement compared to the Yoga therapy with TENS.

V. Conclusion

The analysis of the data concluded that both the groups were individually effective for showing the improvement in pain and function. In working women with chronic non-specific low back pain, resistance band exercises with TENS showed a greater improvement in pain and function than Yoga with TENS.

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