



EFFECTIVENESS OF FELDENKRAIS EXERCISES AND CORE STABILITY EXERCISES WITH CONVENTIONAL PHYSIOTHERAPY IN NON-SPECIFIC MECHANICAL LOW BACK PAIN AMONG HOME MAKERS - A RANDOMISED CONTROLLED TRIAL

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ABSTRACT

Background and Objectives:

Low back pain is a discomfort that occurs in 60-80% of general population mainly associated with deconditioning of spine and trunk due to lack of core strength and stability. Repeated exposures to the small loads or sustained loads during the activities of daily life mainly cause poor posture which is a cumulative process results in chronic pain. In India LBP prevalence ranges from 6.2 - 92% with age and female preponderance. Among females, homemakers get engaged in large number of hours of household activities involves improper postures. The aim of this study is to find the effectiveness of feldenkrais exercises and core stability exercises in combination with conventional physiotherapy. The objectives of this study are to assess the effectiveness of Feldenkrais exercises in reducing non-specific mechanical low back pain. To assess the effectiveness of core stability exercises in reducing non-specific mechanical low back pain. To

compare the effectiveness of Feldenkrais exercises and core stability exercises in reducing non-specific mechanical low back pain.

Methodology:

A total of 110 subjects between the age group of 30 to 50 years were randomised into two groups. Subjects were screened initially and those fulfilling the inclusion and exclusion criteria were included in the study. Group-A(n=55) were given with feldenkrais exercises and conventional physiotherapy while Group-B(n=55) were given with core stability exercises and conventional physiotherapy for 3 days in a week for 4 weeks. Pre and Post assessment of pain and disability were measured initially and after 4 weeks using Modified Oswestry Disability Questionnaire (MODQ).

Design: Randomised controlled trial

Results: Data has been derived using SPSS 20.0 software. Mann Whitney U Test was done to find the effectiveness of both groups and there was no statistically significant difference ($p=0.6777$) and both the groups were equally effective.

Conclusion: The study concluded that both Feldenkrais exercises and core stability exercises were equally effective in reducing pain and disability in non-specific mechanical low back pain.

Keywords: Low back pain, Feldenkrais exercises, core stability exercises, homemakers, conventional physiotherapy.

INTRODUCTION

Musculoskeletal disorders (MSD) are defined as muscular pain or injuries to the human support system that can occur after a single event or cumulative trauma, negatively impacting daily activities. MSD can range from pain in the upper limbs such as the forearm and wrist to postural muscles such as the upper and lower back, neck and shoulders as well as lower extremities such as hips, thighs, knees and ankles ⁽¹⁾

Low back pain [LBP] is a discomfort in the area of the lower part of the back and spinal column.⁽²⁾ It is susceptible to injury because it supports most of the body weight.⁽³⁾ Chronic low back pain is the pain that persists longer than the expected time period for healing, with duration of more than three months.⁽⁴⁾ It is the non-specific LBP population which often develops into a chronic fluctuating problem with intermittent flares.⁽⁵⁾ Most low back injuries are not the result of a single exposure to a high magnitude load, but instead due to cumulative trauma from sub-failure- magnitude loads like repeated small loads (e.g. bending) or a sustained load (e.g. sitting).

Mechanical low back pain is a cumulative process resulting from chronic poor posture coupled with sedentary habits that put the back under severe mechanical stress. ⁽⁶⁾ Mechanical factors such as lifting heavy loads, repetitive job, prolonged static posture and awkward posture. Non-mechanical psychosocial factors such as anxiety, depression, lack of job control and mental stress, have been also found to be associated with LBP.⁽⁷⁾ Nonspecific low back pain is the most common type of diffuse pain that does not change in response to particular movements, is localized and non-radiating.⁽⁸⁾

Housework is traditionally a labour performed by women. It involves routine and compulsory household maintenance tasks (cleaning, cooking, purchasing, etc.) and family care duties (child rearing and other caregiving responsibilities) that require substantial physical, emotional and intellectual labour. Studies have found that housework can be more energy intensive than some types of paid work and is a source of hazards comparable to other occupational settings. Homemakers engage in a large number of hours of housework, involving them in repetitive hand movements, bending, kneeling and squatting. These postures and movements were associated with MS pain and have low back pain and activity restriction due to their pain. They have significant impact of social burden on their low back pain.⁽⁹⁾

LBP prevalence has been found to range from 6.2% to 92% with increase of prevalence with age and female preponderance.⁽¹⁰⁾ Study suggest that 83% of the non-working rural housewives aged between 30-70 years have low back pain and activity restriction due to their pain.⁽¹⁰⁾

Physiotherapy is the most widely used form of treatment adopted for gaining relief from low back pain. Electrotherapy methods are widely used to decrease pain. Among them, Interferential current is medium frequency current producing low skin impedance and allowing deeper tissue penetration, thus being considered effective to immediately decrease pain.⁽¹¹⁾ Therapeutic ultrasound (US) is among the commonly used physical modalities for treating soft tissue injuries. Therapeutic US is delivered in two modes: 1) Continuous mode in which the delivery of US is non-stop throughout the treatment period; 2) Pulsed mode in which the delivery of US is intermittently interrupted.⁽¹²⁾

An art of movement learned through the self-realization method with minimal effort and maximal efficiency is referred as Feldenkrais method (FM), commonly known as “Feldenkrais.”^(13,14,15) The Feldenkrais Method (FM) was developed over a period of decades in the last century by Dr. Moshe Feldenkrais. He claimed the basis of the approach was founded in the human potential for learning how to learn. As such, he operationalized an experiential process or set of processes, whereby an individual or a group could be guided through a series of movement-and sensation-based explorations.⁽¹⁶⁾

One of the core principles of FM is to develop the people’s proprioceptive and kinaesthetic awareness through a guided session by a teacher thereby exploring an appropriate way of moving the body or correcting abnormal habitual posture.⁽¹⁷⁾ The FM includes two modes of instruction, 1) Awareness through movement [ATM] 2) Functional Integration (FI).^(13,14,18) One additional premise of the method is that a resultant improvement in neuromuscular function could have a positive influence not only on the way a person moves, but also on how that person thinks and feels.⁽¹⁹⁾

Each session of the self-awareness method is termed as ‘lesson’, which optimally could last for 35-45min. ATM lessons are taught as group lessons whereas individual lessons are termed as FI. The FM lessons are taught to inspect reduction in pain, promote balance, mobility, gait and reducing anxiety levels⁽²⁰⁾ FI involves gently guided manipulation of body parts on a one-to-one basis, where the practitioner communicates new possibilities of body organisation using non-invasive tactile guidance.⁽¹⁹⁾

Core stability exercises in LBP rehabilitation have become popular due to observed changes in abdominal muscle activation patterns in the presence of LBP⁽²¹⁾. Core stability training is to effectively recruit the trunk musculature and then learn to control the position of the lumbar spine during dynamic movements.⁽²²⁾ Core stabilization exercises facilitate co-contraction between abdominals and back extensors to maintain the spinal stability so as to transfer the loads equally to make the patient functionally active.⁽²³⁾

There are many studies stating that core stability exercises and Feldenkrais exercises can improve low back pain. But there is lack of study to know which exercise provide the good output. Hence there exist the need to compare these two exercises and their effectiveness in treating low back pain.

MATERIALS AND METHODS

Research design: Comparative randomised parallel open label study design

Source of data: Subjects were recruited from

- Out-patient department, R.V. college of Physiotherapy, Bengaluru
- Saranya springs apartment, Marathalli, Bengaluru
- Saranya Enclave, Marathalli, Bengaluru

Sampling technique: Random sampling method

Sample size:

$$n = [Z_{\alpha/2} + Z_{\beta}]^2 pq / d^2$$

$$\alpha = 5\%; \beta = 20\%; d = 0.15 ; p = 0.83; q = 0.17$$

$$n = [1.96 + 0.89]^2 0.83 \times 0.17 / (0.15)^2 = 1.14608475 / 0.0225 = 50.9$$

$$\begin{aligned} \text{Net sample size} &= \text{calculated sample size} + 10\% \text{ error} \\ &= 50 + 5 \\ &= 55 \text{ per arm} \end{aligned}$$

Sample consisted of 110 subjects, 55 in each group aged 30-50 years, fitting into inclusion and exclusion criteria and sampling was done by random sampling method using Random UX number generator application.

INCLUSION CRITERIA

- Subjects those who are willing to sign the informed consent and participate.
- Females: home makers of 30-50 years of age
- Subjects with non-specific mechanical low back pain
- Subjects with 3 months of low back pain

EXCLUSION CRITERIA

- Subjects undergone surgeries or fractures of spine in past 1 year
- Subjects with back pain of non-mechanical origin
- Pregnant and lactating women
- Subjects with any systemic illness

Materials required:

Stationery objects, Couch/Mat, Outcome measure questionnaire (MODQ), IFT, Ultrasound, Consent form.

PROCEDURE:

All the subjects fulfilling the inclusion and exclusion criteria was informed about the study and a written consent was taken. Subjects who met the eligibility criteria were assigned into two groups based on random sampling open labelling method using a Random Number application. Group A received Feldenkrais exercises with conventional physical therapy and Group B received Core stability exercises with conventional physical therapy for a period of 4 weeks.

Patient's disability and pain were assessed by using Modified Oswestry Disability Questionnaire by asking the patient to mark their ability to perform the activity in each section.

Conventional physiotherapy

Conventional physiotherapy for both Group A and Group B as follows:

- Ultrasound – continuous mode with a frequency of 1 MHz and an intensity of 1.5W/cm².
- IFT- tetrapolar form, with patient in prone position. Electrodes positioned to close pain circuit were placed at the lumbar spine on the central pain point. Carrier frequency was 4000Hz, with modulated frequency amplitude (MFA) of 20Hz and intensity according to patients' tolerance.

GROUP-A:

Feldenkrais exercises

The subjects were instructed with the following feldenkrais exercises:

Tilting legs, Pelvic tilt, Spine like a chain, On all fours and Gekko for 5 repetitions in each. All these exercises were performed along with the conventional physical therapy that included IFT for 10 minutes and ultrasound for 6 minutes (for first two weeks). All the exercises were performed two sessions a day for thrice a week for four weeks.

➤ TILTING LEGS:

Subjects were made to lie on their back, with their knees bent and soles of their feet in contact with the floor. Actively, letting their knees tilt a little bit to the left, and then smoothly move to tilt them to the right. Making the subject move their legs slowly, smoothly and comfortably and not allowing

far (consciously to AVOID a stretching sensation) for 10 repetitions. Making each repetition a little bit smoother, softer, easier, more comfortable and explaining to slow down their breathing and guiding to inhale while tilting their knees, and exhale while bringing them back to the middle.

➤ **PELVIC TILT:**

In this the subjects were made to lie on their back, with knees bent and soles of their feet in contact with the floor. The subject should notice their lordotic curvature and flattening the low back that comes toward the floor. Then the subject was made aware to roll on the back of their pelvis, along the bone called the sacrum then back will come closer to the floor, or even press into it slightly and made patient to experience how their pelvis has rolled. Rolling pelvis a bit farther in this direction so that their low back lifts up off of the floor a little bit (stretch or going to extremes is avoided). This technique was done for 10 repetitions.

➤ **ON ALL FOURS:**

Subjects were instructed to get on their hands and knees. Making sure the arms at a right angle to the floor and a right angle to legs, knees directed below their hip joints, so that the angle is as close to a right angle and is comfortable. Now the subject was asked to inhale and lift their abdomen up and exhaling while bringing down to neutral then taking down towards the floor and is done for 10 repetitions.

➤ **GEKKO:**

Subjects were instructed for prone lying by resting their arms on either side of head. The legs were maintained in flexion and instructed to abduct (move wide apart by tilting) in opposite way and avoiding the extreme range of movement. This technique was done for 10 repetitions.

GROUP-B:

CORE STABILITY EXERCISES

This was done in two phases:

Phase1 included single knee to chest and bridging exercises with 10 repetitions along with conventional physical therapy that includes IFT for 10 minutes and ultrasound for 6 minutes (for first two weeks)

Phase2 included abdominal crunches, wall squats, lumbar extensor strengthening along with knee to chest and bridging exercises for 10 repetitions each. All the exercises are performed two sessions a day for thrice a week for four weeks.

➤ **KNEE TO CHEST:**

The subjects were placed in supine lying with knees flexed and soles of feet in contact with floor. Instructing the patient to bring one knee to their chest, keeping other leg in contact with floor or in extension and maintaining each leg for 5 seconds and repeating the procedure 10 times.

➤ BRIDGING:

Subjects were in supine lying and knees flexed and soles of feet flat on floor, then subject was asked to lift their hip as high as possible and holding the pose for 5 seconds and repeating for 10 times.

➤ ABDOMINAL STRENGTHENING:

Abdominal strengthening by crunches and supine leg lifts.

ABDOMINAL CRUNCHES: The subject in crook lying was asked to place the hands behind the head and lift the trunk upwards, to reach the knees and hold the position for 5 seconds then bring back to neutral position.

➤ SUPINE LYING- LEG LIFTS: The subject in prone lying was asked to lift one leg first and hold it for 5 seconds then bring it to neutral position and repeat the same for other leg. Later made to lift both the legs simultaneously, hold them for 5 seconds, and then bring them back to neutral position.

➤ WALL SQUATS:

Subjects were made to stand against the wall and instructed to lower their body into a squat position for 5 seconds and bringing back to neutral position.

➤ LUMBAR EXTENSOR STRENGTHENING:

PRONE LYING – TRUNK LIFTS: The subject in prone lying was asked to keep the hands along the side of the body, lift the trunk off the floor and hold the position for 5 seconds, then bringing it back to neutral position.

- ❖ All the exercises were performed for 4 weeks. For the first two weeks along with the modalities exercises were performed under supervision and the next two weeks performed at home. After the 4 weeks of treatment all the subjects were reassessed using MODQ scale to compare the pre and post test scores.

STATISTICAL ANALYSIS:

Data collected for the study were analysed using appropriate statistical test and results are given in terms of tables and graphs in following pages.

Randomized controlled trial was used to compare the effectiveness of feldenkrais exercises and core stability exercises with conventional physiotherapy. A total of 110 subjects (housewives) were enrolled in this study based on inclusion criteria, of ages between 30-50 years. Pain and disability were measured for 110 subjects using MODQ scale. 7 subjects were drop outs (3 from group-A and 4 from group-B). 103 subjects were evaluated after the final (4th week) week of treatment. Mann-Whitney U test for inter group comparisons and Wilcoxon matched pairs test was applied for intra group comparisons.

RESULTS:

Table 1: Age distribution of subjects studied

AGE	GROUP A	GROUP B
30-34	13	15
35-39	15	12
40-44	14	11
45-50	13	17
TOTAL	55	55

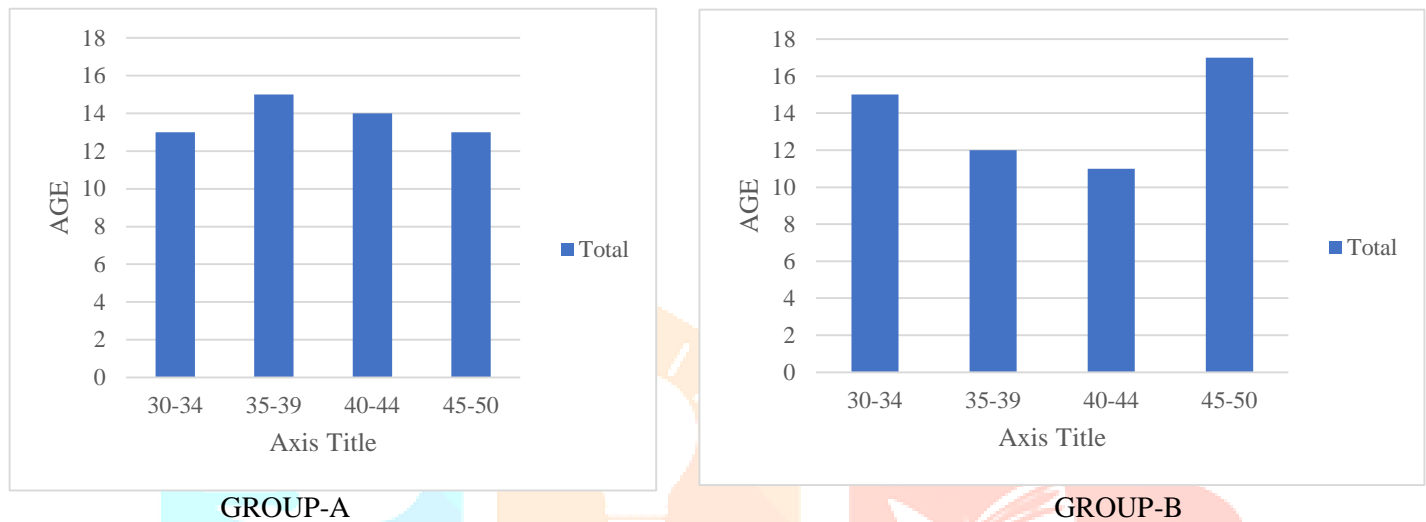


Fig 9: Age distribution of subjects

Table 2: Age distribution, Mean & SD of studied subjects

AGE	GROUP-A	GROUP-B
30-34	13	15
35-39	15	12
40-44	14	11
45-50	13	17
TOTAL	55	55
MEAN	39.78	39.87
SD	5.83	6.66

The above table and graph show the age distribution, mean and standard deviation of Group-A and Group-B.

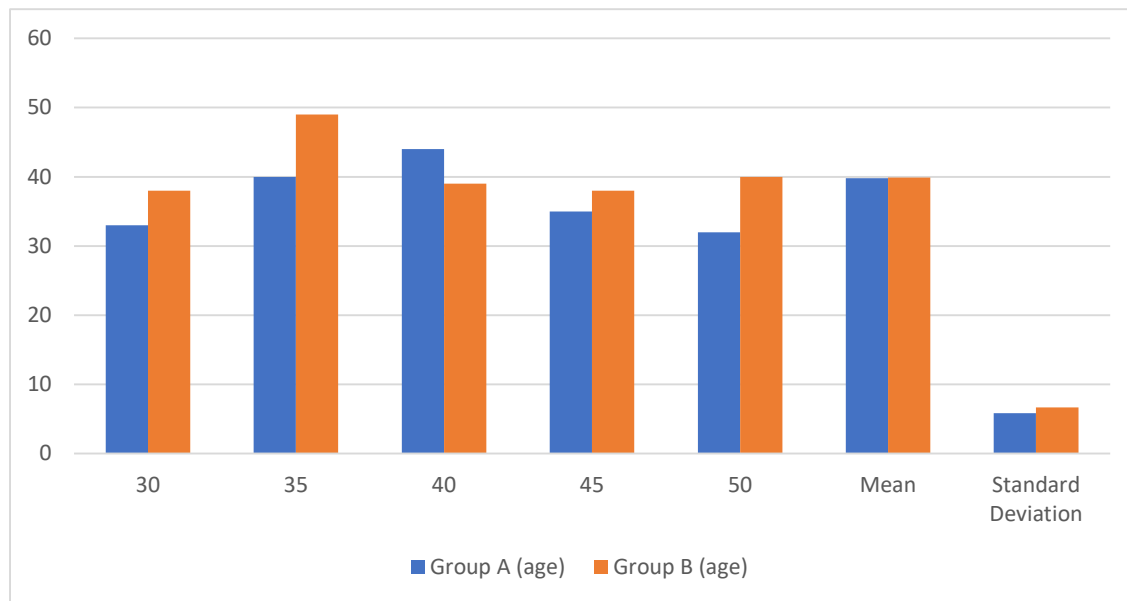


Table3: Normality of pre-test and post-test low back pain scores (%) in two groups (A and B) by Kolmogorov Smirnov test

Time points	Group A		Group B	
	Z-value	P-value	Z-value	P-value
Pretest	0.9230	0.3610	1.3460	0.0500*
Posttest	0.8610	0.4490	0.8230	0.5080
Difference	0.9370	0.3440	1.5740	0.0140*

*p<0.05 indicates skewed distribution

Note: The pre-test and difference (Pre-test-post-test) scores of low back pain in group B not follow a normal distribution. Therefore, the non-parametric tests i.e. Mann-Whitney U test for inter group comparisons and Wilcoxon matched pairs test was applied for intra group comparisons.

Table4: Summary of pretest and posttest low back pain scores (%) in two groups (A and B)

Time points	Group A (n=52)				Group B (n=51)			
	Mean	SD	Median	IQR	Mean	SD	Median	IQR
Pretest	27.92	4.67	28.00	6.00	27.53	4.71	28.00	6.00
Posttest	23.50	7.13	24.00	8.00	23.37	6.34	24.00	6.00
Difference	4.42	4.45	4.00	8.00	4.16	4.32	4.00	4.00

Table5: Comparison of two groups (A and B) with pretest and posttest low back pain scores (%) by Mann-Whitney U test

Time points	Group A			Group B			U-value	Z-value	p-level
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Pretest	27.92	4.67	53.61	27.53	4.71	50.36	1242.50	-0.5508	0.5818
Posttest	23.50	7.13	52.52	23.37	6.34	51.47	1299.00	-0.1781	0.8586
Difference	4.42	4.45	53.21	4.16	4.32	50.76	1263.00	-0.4156	0.6777

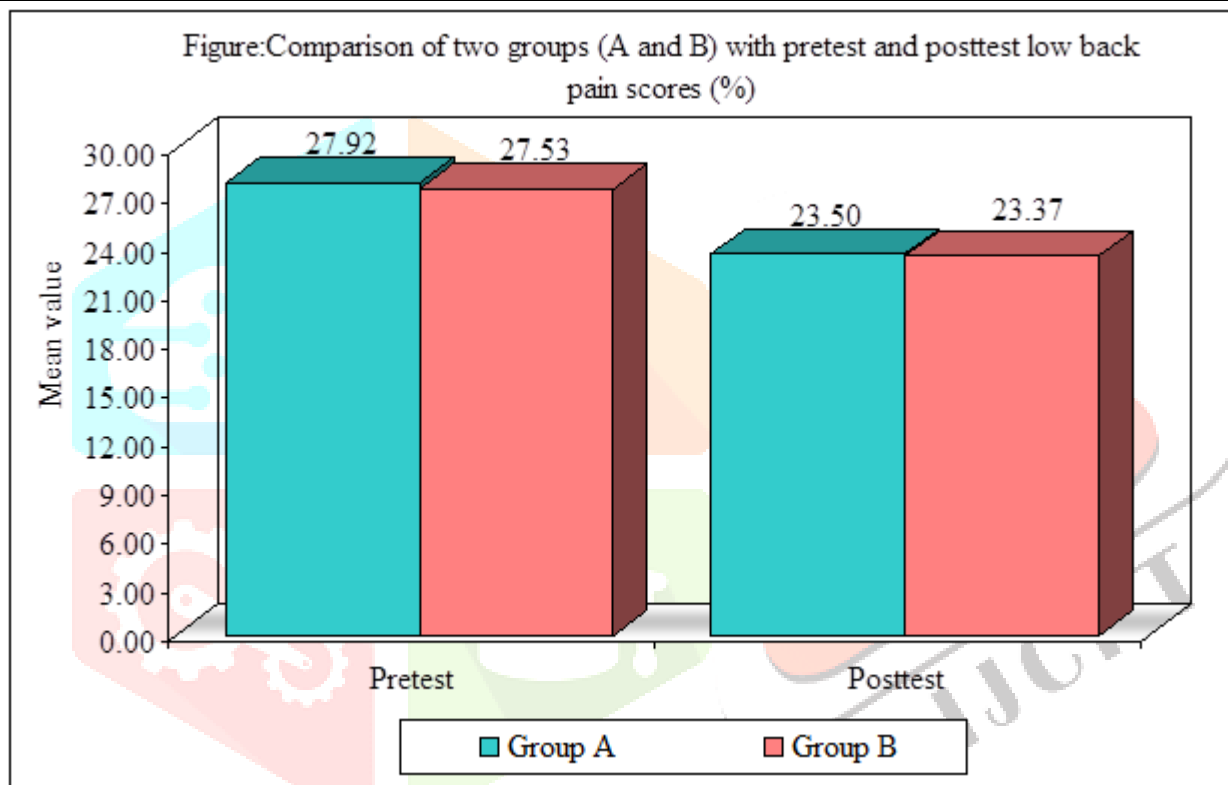


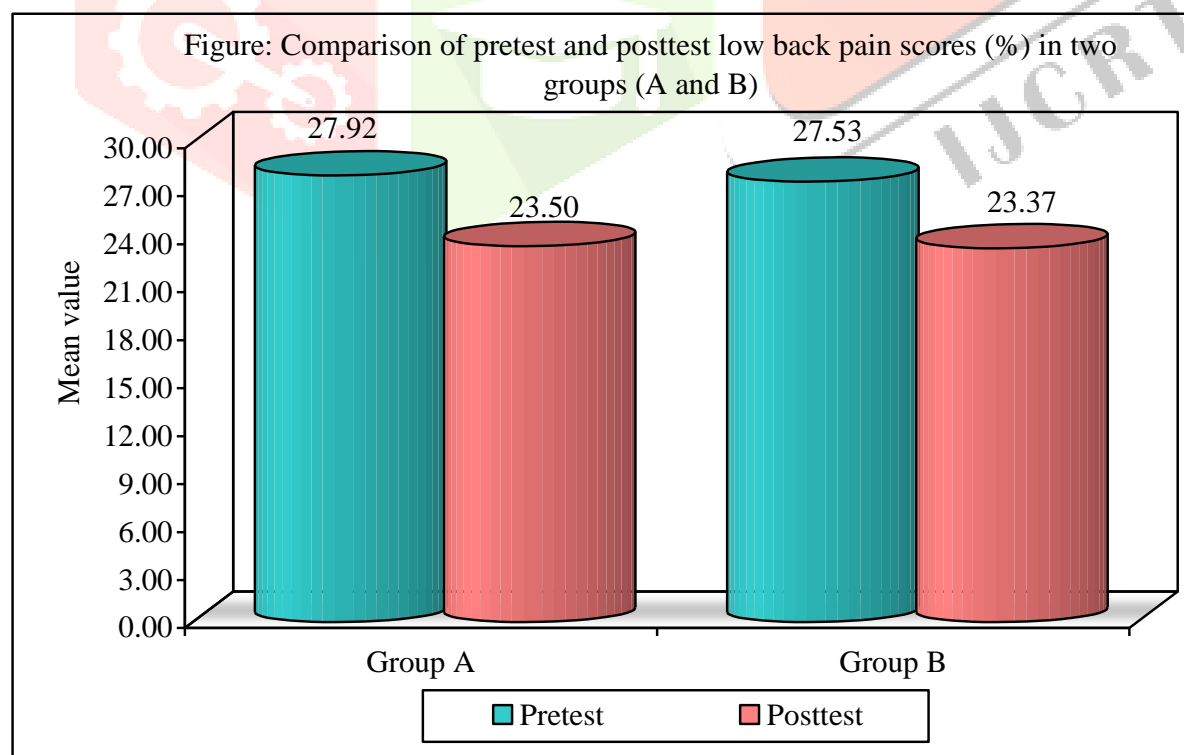
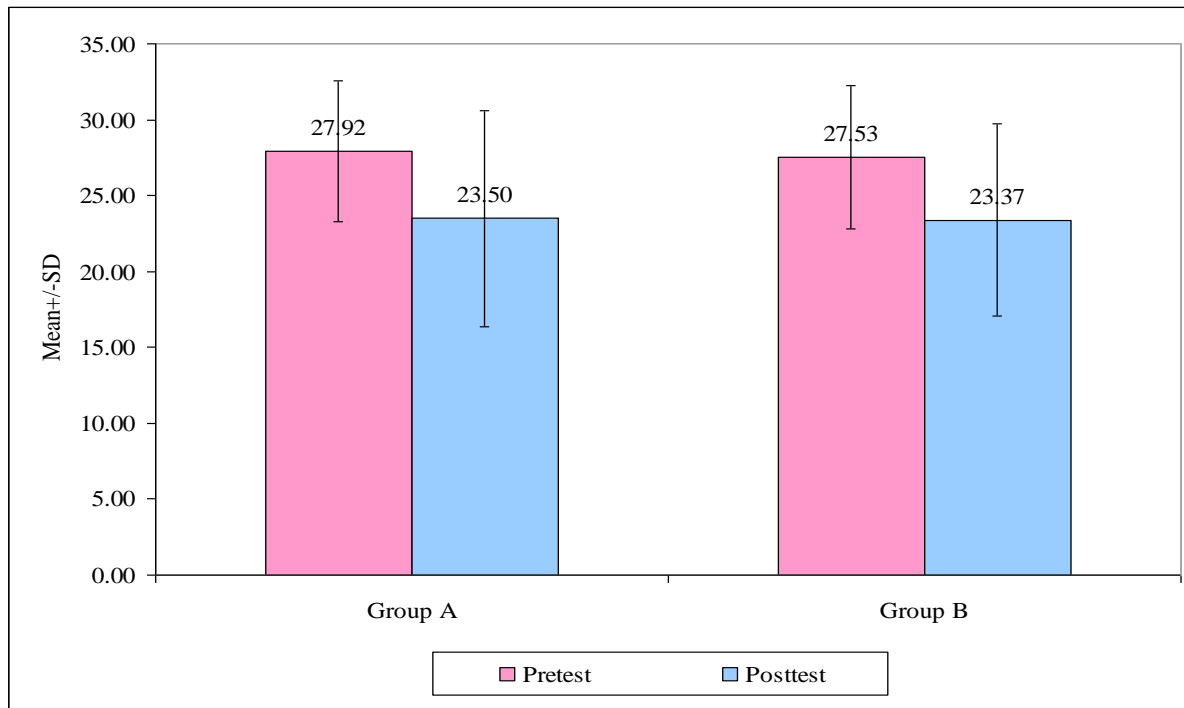
Figure10: Comparison of two groups (A and B) with pretest and posttest low back pain scores (%)

Table6: Comparison of pretest and posttest low back pain scores (%) in two groups (A and B) by Wilcoxon matched pair test

Groups	Time points	Mean	SD	Mean Diff.	SD Diff.	% of change	Z-value	P-value
Group A	Pretest	27.92	4.67	4.42	4.45	15.84	5.1757	<0.001
	Posttest	23.50	7.13					
Group B	Pretest	27.53	4.71	4.16	4.32	15.10	5.1757	<0.001
	Posttest	23.37	6.34					

A significant difference was observed between pre-test and post-test low back pain scores (%) in group A ($Z=5.1757$, $p<0.001$) at 5% level of significance. It means that, a significant of 15.84% decrease in low back pain scores was seen after treatment in group A. Similarly, a significant difference was observed between pre-test and post-test low back pain scores (%) in group B ($Z=5.1757$, $p<0.001$) at 5% level of significance. It means that, a significant of 15.10% decrease in low back pain scores was seen after treatment in group B.

Figure11: Comparison of pretest and posttest low back pain scores (%) in two groups (A and B)



No significant difference was observed between group A and group B with pre-test low back pain scores (%) ($Z=-0.5508, p=0.5818$), post-test low back pain scores (%) ($Z=-0.1781, p=0.8586$) and their change scores ($Z=-0.4156, p=0.6777$) at 5% level of significance. It means that, the two groups (A and B) have similar pre-test and post-test low back pain scores (%).

DISCUSSION:

The present study is intended to find the effectiveness of Feldenkrais exercises with conventional physiotherapy and core stability exercises with conventional physiotherapy for non-specific mechanical low back pain in housewives aged 30-50 years. The study mainly focuses on the severity of pain and the disability caused to the subjects due to low back pain. 110 subjects with non-specific mechanical low back pain were divided into two groups with 55 subjects in each group. There were 7 dropouts in the study. The mean age of group-A was 39.78 with SD of 5.83 and in group-B mean age was 39.87 with SD of 6.66. all subjects underwent for 4 weeks of treatment with 3 sessions per week to predict the variable of pain and disability through MODQ scale. Modified Oswestry disability questionnaire was used for screening the level of disability and severity of pain which has a high test-retest reliability (ICC 0.90). Using MODQ a total of 110 subjects between ages of 30-50 years who had chronic, non-specific mechanical LBP for atleast 3 months were taken randomly into two groups. After the 4 weeks of intervention the subjects were reassessed and compared to their pre-test values.

As lots of research already proven the effects of Feldenkrais method, core stability exercises and conventional physiotherapy on low back pain, the current study is intended to examine the effects of the combination of FM with conventional physiotherapy and core stability exercises with conventional physiotherapy.

The current study showed there was significant difference seen within the both groups. A significant difference was observed between pre-test and post-test low back pain scores (%) in group A ($Z=5.1757, p<0.001$) at 5% level of significance. Teresa Paolucci, Federico Zangrando et al., found that Feldenkrais method was significantly effective by exploring new movement sequences, attention is directed to the body parts that the subject might not be aware of or might have excluded from his functioning in improving interoceptive awareness and reducing pain ($p<0.001$) and disability ($p<0.001$) in chronic low back pain patients⁽²⁴⁾.

Alison L. Smith et al., evaluated the effects of feldenkrais method on pain and state of anxiety in chronic low back pain that there was significant decrease in affective pain⁽¹⁹⁾.

A significant difference was observed between pre-test and post-test low back pain scores (%) in group B ($Z=5.1757, p<0.001$) at 5% level of significance. Dr. Venkata Naga Prahalada Karnati et al., stated core stabilization exercises are proved to be effective in chronic mechanical low back pain and specific exercise training of the "stability" muscles of the trunk is effective in reducing pain and functional disability in patients with chronically symptomatic low back pain⁽²⁵⁾.

Shivalika, Apoorv Narain et al., found that skilled activation of the deep muscles and training the integration of the deep and superficial systems by the combination of core stabilization exercises and conventional physiotherapy was effective in treating low back pain⁽²⁶⁾.

Marcelo Baptista Dohnert et al., has shown significant pain improvement by the visual analog scale and functionality improvement by Oswestry and Roland Morris Disability Questionnaires for CLBP decrease with the use of the interferential therapy ⁽¹¹⁾.

The two approaches mainly aimed to reduce the pain and disability of the subjects. The results of the two approaches i.e., feldenkrais exercises and core stability exercises along with conventional physiotherapy, in the present study clearly showed same level of significant difference between Group A and Group B with pre-test and post-test low back pain scores with 0.74% of change and showed statistically insignificant ($p=0.5818$) after the 4th week of treatment, the results clearly state no significant difference between the two approaches.

LIMITATIONS:

Study did not measure the most affected and less affected age among the study subjects.

Specific and localized muscle strength improvement was not verified.

SCOPE OF RESEARCH:

Present study can be a better predictor for assessing the effects of feldenkrais in working women.

Feldenkrais along with other techniques can be carried out for further research.

State of anxiety and sensory evaluation can also be predicted.

Further studies can include intermediate follow-ups.

Effects of Feldenkrais can be found using different measuring tools or standard outcome measures.

CONCLUSION:

The current study was intended to find the effectiveness of feldenkrais exercises and core stability exercises in combination with conventional physiotherapy in non-specific mechanical low back pain among homemakers. Awareness of the body functions and controlled movements during household activities can reduce the recurrence of low back pain. The results of this study showed that there is significant difference within the both groups A&B ($p<0.001$) but there is no significant difference between the groups ($p=0.8586$). Study concludes that both the treatments were equally effective in reducing pain and disability in non-specific mechanical low back pain.

ACKNOWLEDGMENT:

First of all I would like to thank my college for providing me an opportunity for conducting my research study. I would like to thank my guide, family, friends, and all those who have helped me during my research work. Also, I would like to thank all the subjects who volunteered to be a part of my research work.

SUMMARY:

The aim of this study was to assess the effectiveness of Feldenkrais Exercises and Core stability exercises with conventional physical therapy in treating non-specific mechanical low back pain among home makers. Pain and disability were taken as parameters.

The investigator screened the subjects as per the inclusion and exclusion criteria and a total of 110 subjects were included and randomly divided into two groups. Permission from the institutional authorities was taken and subjects who were willing to participate and sign the informed consent form were recruited. The study subjects were explained clearly about the test procedures. Pain and disability were taken using MODQ scale. Group- A was treated with Feldenkrais exercises with conventional physiotherapy whereas Group-B was treated with core stability exercises with conventional physiotherapy.

The intervention was given for 3 days a week for 4 weeks. After the 4 weeks of intervention the results analysed using Mann- Whitney U test showed that no significant difference between the groups with $p=0.6777$. Hence the study summarizes that both feldenkrais and core stability exercises are effective in reducing pain and disability in non-specific mechanical LBP among homemakers.

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