EFFECTIVENESS OF RHYTHMIC STABILIZATION EXERCISE VERSUS MOTOR CONTROL EXERCISES ON PAIN AND FUNCTION IN SUBJECTS WITH NON-SPECIFIC LOW BACK PAIN

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Abstract-

Background and Objective: Low back pain is a major disability worldwide, caused by sedentary jobs, obesity, and low socioeconomic conditions. Nonspecific Low Back Pain is a condition with no known cause. Low back pain is caused by poor posture, prolonged sitting, and improper postures, which weaken abdominal muscles and reduce back endurance, increasing the risk of injury. Rhythmic Stabilization and Motor Control Exercises can help improve trunk stability, accuracy, and controlled movement needs to be studied. Hence the study.

Methods: This study included 128 subjects with a clinical diagnosis of nonspecific low back pain, divided into two groups randomly. Intervention was given twice a week for 6 weeks and outcome measures were measured in terms of Visual Analogue Scale, Modified Oswestry Low Back Pain Disability Index, and Function.

Results: The independent 't' and paired 't' tests were used to compare the mean significance difference between continuous variables and pre- and post-test scores respectively. Statistical analysis of the data revealed that in the group comparison, both groups showed significant results in both parameters, whereas in the between-groups comparison, Motor Control Exercise showed better improvement compared to Rhythmic Stabilization.

Conclusion: The study concluded that both Rhythmic Stabilization exercise and motor control exercises are effective in decreasing pain and improving function. However, motor control exercises are more effective when compared to Rhythmic Stabilization exercise in subjects with Nonspecific Low Back Pain.

Key words: **Nonspecific Low Back Pain, Rhythmic Stabilization, Motor Control Exercises, Modified Oswestry Low Back Pain Disability Index, Visual Analogue Scale.**

INTRODUCTION:

Low back pain (LBP) is an extremely common problem that most people experience at some point in their life.[1] Low back pain is defined as pain below the costal margin and above the inferior gluteal folds, with or without leg pain.[2] LBP is classified as specific (pain that is caused by specific pathophysiology of spinal or nonspinal origin) or nonspecific (pain, with or without leg pain, without specific cause).[3]

Specific low back pain of spinal origin includes spinal fractures, herniated discs, spinal stenosis, spondyloarthritis, tumours, infection. Nonspinal origin includes hip conditions, diseases of pelvic organs (endometriosis, prostatitis) and vascular (aortic aneurysm) and systemic disorders.[4] As low back pain is caused by specific causes, nonspecific low back pain can possibly develop from the interaction of biologic, psychological, and social factors.[3] According to its duration, LBP may be acute (sudden onset and lasting less than six weeks), sub-acute (lasting six to twelve weeks), chronic (lasting longer than twelve weeks) or recurrent.[5] It is estimated that 85% of LBP patients in primary care are without a specific medical diagnosis, they are classified as nonspecific LBP.[6] Based on a systematic review of the global prevalence of low back pain that included 165 studies from 54 countries, the mean prevalence of low back pain in the general adult population was approximately 12%. In persons with 40 years of age or older and women have a higher prevalence. The mean lifetime prevalence of low back pain was approximately 40%. [7] The incidence of low back pain in first - ever episodes ranges between 6.3% and 15.4%. And any episode of low back pain ranged from 1.5% to 36%. [1] In a study conducted among rural women in Puducherry, India, the occurrence of low back pain in India is alarming, with nearly 60% of the people in India having suffered from low back pain. [8]

The main causative factors that can cause low back pain are poor posture while sitting or standing, heavy manual lifting, sustained postures, and prolonged trunk flexion. [9,10] Some studies have concluded that having bad habits with prolonged sitting contributes to prolonged uncomfortable pain caused by high static muscle load. Prolonged sitting leads to increased body discomfort in the neck, shoulder, upper back, low back, and buttocks, while prolonged slumped sitting may be related to internal oblique or transverse abdominis muscle fatigue, compromising the stability of the spine and making it vulnerable to injury.[11]

Diagnosis of nonspecific low back pain is done only after ruling out specific causes of spinal and nonspinal origin. Detailed history taking and physical examination can exclude specific disorders of spinal conditions and nonspinal conditions. Attention to red flags should be considered in history taking, like history of cancer, infection, fever, unexplained weight loss, and long-term glucocorticoid use.[12] History taking should determine whether pain is limited to the lower back or is more widespread.[13] In the case of LBP with radiculopathy, a neurological examination should be done to rule out limb weakness, loss of sensation, and decreased reflexes. Maneuvers on physical examination to identify other sources of low back pain (i.e., facet joints, sacroiliac joints, disks) have low diagnostic accuracy. [14,15]

Regular imaging is not recommended in patients with nonspecific low back pain.[13] Imaging may be performed when a patient presents with severe or progressive neurologic deficits or when any highly suspected red flags are present. In LBP, weightbearing radiographs of the lumbar spine in AP and lateral view are preferred.[16] Advanced imaging, computed tomography (CT), or magnetic resonance imaging (MRI) is performed if radiographs are not helpful in finding the cause or there is clinical suspicion for red flag signs.[17] There is evidence that in acute and chronic low backpain patients, ipsilateral atrophy of multifidus muscles is seen and confirmed by ultrasound and computed tomography (CT).[18]

In the initial stages of nonspecific low back pain, management includes educating patients and advising posture corrections in normal daily activities, avoiding bed rest, usage of non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxants, and weak opioids for a short time period. Use of NSAIDs in conjunction with antidepressants for chronic lower back pain.[19] Physical therapy includes strengthening exercises, spinal mobilization, soft tissue mobilization, and electrophysiological agents like heat are used.[10] Patients with low back pain frequently present with trunk muscle imbalances and movement dysfunctions. Adapting to the changes in the proper muscle coordination patterns could develop and increase the risk of re-injury to the spine. The focus of exercise training should be on specific muscle groups which have a primary role in dynamic stability and segmental control of the spine, i.e., transverse abdominus, and multifidus.[20]

Proprioceptive neuromuscular facilitation (PNF) exercises are designed to enhance the response of neuromuscular mechanisms by stimulating proprioceptors. The primary goal of proprioceptive neuromuscular facilitation treatment is to help patients achieve their highest level of function**.** Rhythmic stabilization is one of the proprioceptive neuromuscular facilitation techniques. Indications for rhythmic stabilisation include limited range of motion and pain, particularly when motion is attempted. The rhythmic stabilization technique uses alternating isometric contractions against resistance; no motion is intended.[9] PNF has been recommended for sensory-motor control training as well as for stimulating lumbar muscle proprioception.[11]

Motor control exercises target the deep spinal muscles (transverse abdominis, multifidus) [5]. Motor control exercises were developed based on the principles of motor learning theory. The motor learning approach is to retrain the control trunk muscles, posture, movement pattern, and co-ordination of the spine. This approach involves the training of pre-activation of deep trunk muscles, with progression toward more complex static, dynamic, and functional tasks that activate deep and global trunk muscles. [10,21]

Thus, the aim of the study was to assess the effectiveness of rhythmic stabilization exercise versus motor control exercises on pain and function in subjects with non-specific low back pain.

MATERIALS AND METHODS:

Study Design: Quasi- experimental study design

Ethical Clearance and Informed Consent: The study protocol was approved by the Ethical Committee of GSL Medical College & General Hospital, the investigator explained the purpose of the study and given the patient information sheet.The participants were requested to provide their consent to participate in the study. All the participants signed the informed consent and the rights of the included participants have been secured.

Study Population: Subjects clinically diagnosed as non-specific low back pain by an orthopaedician.

Study Setting: The study was conducted at Department of Physiotherapy, GSL general hospital, Rajamahendravaram, Andhra Pradesh, India.

Study Duration: The study was conducted during the period of one year.

Intervention Duration: 30 minutes per session, 2 sessions per week for 6 weeks.

Study Sampling Method: Systematic random sampling method

Sample Size: A total of 450 subjects with non specific low back pain were screened for eligibility. Out of these, 128 subjects, both men and women who were willing to participate in the study were included in this study, all the recruited participants were given information about the study. After obtaining informed consent form and meeting the criteria, a total of 128 subjects were evenly allocated into two groups by systematic random sampling method.

Group A - Rhythmic stabilization exercise (64 subjects)

Group B - Motor control exercises (64 subjects)

MATERIALS USED :

- Arm rest chair
- Stool

- Examination Couch
- Pillows
- Stopwatch
- Modified Oswestry Low Back Pain Disability Questionnaire,
- VAS score sheet.

CRITERIA FOR SAMPLE SELECTION

INCLUSION CRITERIA

- Subjects with Non specific low back pain who are clinically diagnosed and referred by Orthopaedician.
- Subjects over 20 years of age.
- Both male and female patients are included.
- Subjects who have back pain for more than 3 months.

EXCLUSION CRITERIA

- Spinal fractures, disc herniation
- Sign of nerve root pain
- Subjects with spondylosis, spondylolisthesis
- Tumours and Tuberculosis of spine
- Joint disorders (e.g., rheumatoid arthritis)
- Subjects with spinal deformities
- Unstable and severe cardiovascular and pulmonary diseases
- Pregnancy, Post-surgical patients

STUDY TOOLS AND OUTCOME MEASURES

1. **Visual Analogue scale (VAS)** [37]**:** was used to measure pain severity at baseline (pre-test) and at the end of the 6th week (post-test).

2. **Modified Oswestry Low Back Pain Disability Questionnaire (Modified OSW)** [38]**:** was used to measure the functional ability at baseline (pre-test) and at the end of the 6th week (post- test).

INTERVENTIONS:

GROUP A

RHYTHMIC STABILIZATION [9]

Subjects in this group received Rhythmic stabilization (RS) exercise. The RS exercise consisted of alternating trunk flexion and extension (isometric contractions) against resistance for 8 seconds with no motion intended.

POSITION OF SUBJECT: Sitting position.

Procedure

Subjects will be in a sitting position with their spine straight, and the therapist standing in front of the subject. Initially, to contract the subject's trunk extensor muscles, the therapist places his/her hands behind the subject's shoulder on either side. As the therapist applies resistance towards the front, instruct the subject to "stay still, match the resistance by trying to move back", hold it for 8 seconds, and shift all the resistance to the right hand and move the left hand to the front of the subject's shoulder to contract trunk flexor muscles. Then instruct the subject to "stay still and match the resistance at front and hold it", slowly move the right hand to front of the shoulder and resist the trunk flexion, hold it for 8 seconds. Again, shift the resistance back to the trunk extensors and ask the subject to match the resistance.

For both lumbar flexors and extensors, the subjects did 3 sets of 15 repetitions of their maximum resistance while holding the position for 8 seconds. Between sets, there was a minute (1 min) of pause and there were 30 second rest period between repetitions. After two weeks, rhythmic stabilization exercise is progressed by adding an extra set and lengthening the hold by two more seconds (4 sets, 15 reps, 10 sec hold). In fifth and sixth week, a further set with a two second hold was added (5 sets, 15 reps, 12 sec hold).

1st and 2nd Weeks	3rd and 4th weeks	5th and 6th Weeks
3 sets of 15 repetition with 8 second hold	4 sets of 15 repetition with 10 second hold	5 sets of 15 repetition with 12 second hold

FIG 1:
Therapist applying resistance to contract trunk extensor muscle

FIG 2:
Therapist changing the hand placement to contract trunk flexor muscles

FIG 3: Therapist applying resistance to contract trunk flexor muscles

GROUP B

MOTOR CONTROL EXERCISES [27,35,36]

Subjects in this group received Motor Control Exercises (MCE). The Motor control exercise protocol applied in this study was identical to that published in earlier studies. It is a 6-week program, these exercises are performed after warm up as three stages. In this Motor control exercise protocol, Abdominal Drawing In Manoeuvre (ADIM) is performed along with exercises.

First stage (1 -2 weeks) – Exercises begins with Abdominal Drawing In Manoeuvre (ADIM), which is an isometric contraction of local stability muscles (such as lumbar multifidus and transversus abdominis) performed in minimally loading positions (such as supine lying, quadruped, sitting, and standing) while maintaining a neutral spine and regular breathing.

Individualized instruction was given to each subject on how to activate the local stability muscles from the global muscles.

Second stage (2-4 weeks) – Exercises which began after the subjects had mastered ADIM, additional loads were applied to the spine through different movements of upper and lower extremities and the trunk in an attempt to activate a variety of trunk muscles.

Third stage (4 -6 weeks) – Programme included functional movement patterns while subjects performing an ADIM and keeping the lumbar spine in a neutral position.[10]

Procedure

The therapist evaluated and made corrections to the patient's posture, movement pattern, breathing, and trunk muscle recruitment at each level of the MCE programme. Exercises were progressed according to the patient's level of exhaustion, pain tolerance, or observable movement control. 20 to 30 minutes were spent on each session of the MCE programme.

The subjects involved in active static stretching of muscles and connective tissue surrounding the lumbopelvic- hip region and leg in an aim to boost mobility and flexibility, two factors that are typically seen as crucial in low back pain. Initially, some warm up stretches were given to the subjects before initiating the MCE programme. That includes Double knee to chest, erector spinae stretch, prone on elbow, trunk rotation stretch, trunk extension stretch, each stretch holds for 5 seconds.

While performing the following exercise protocol, instruct the subject to draw the waistline inwards (ADIM).

Motor Control Exercise protocol

Stage/progression	**Exercise**	**Intensity**
Stage one (1-2 week)	1. ADIM in supine 2. ADIM in quadruped 3. ADIM in sitting 4. ADIM in standing	7s hold,10 reps 7s hold,10 reps 7s hold,10 reps 7s hold,10 reps
Stage two (2-4 week)	5. ADIM in supine with leg lift (each leg) 6. ADIM in supine with bridging (both legs) 7. ADIM in supine with single leg bridge 8. Supine ADIM with curl ups (elbows on table) 9. Supine ADIM with curl ups (hands on forehead) 10. ADIM in horizontal side support with knee bent. 11. ADIM in horizontal side support with knee straight 12. Side lying horizontal side support with ADIM 13. ADIM in quadruped with arm raise 14. ADIM in quadruped with leg raise 15. ADIM in quadruped with alternate arm and leg raise	7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps 7 s hold,10 reps
Stage three (4-6 week)	16. Rolling from side to side with ADIM 17. Sit to stand transfer with ADIM 18. Wall squatting with ADIM 19. Walking with ADIM 10 minute	7 s hold,10 reps 7 s hold 10 reps 7 s hold,10 reps 7s hold, 10 reps

FIG 4: ADIM in supine

FIG 5: ADIM in quadruped

FIG 6: ADIM in sitting

FIG 7: ADIM in standing

FIG 8: ADIM in supine with leg lift

FIG 9: ADIM in supine with bridging

FIG 10: ADIM in supine with single leg bridge

FIG 11: supine ADIM with curl ups (elbow on table)

FIG 12: supine ADIM with curl ups (hands on forehead)

FIG 13: ADIM in horizontal side support with knee bent

FIG 14: ADIM in horizontal side support with knee straight

FIG 15: Sidelying horizontal side support with ADIM

FIG 16: ADIM in quadruped with arm raise

FIG 17: ADIM in quadruped with leg raise

FIG 18: ADIM in quadruped with alternate arm and leg raise

FIG 19: Rolling from side to side with ADIM

FIG 20: Sit to stand transfer with ADIM

FIG 21: Wall squatting with ADIM

FIG 22: Walking with ADIM

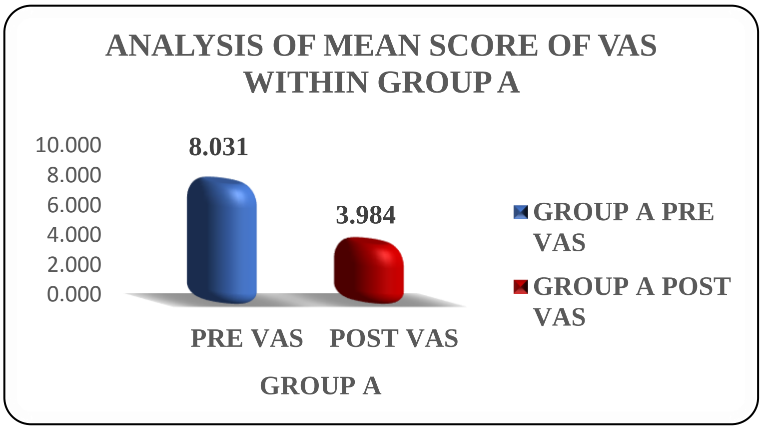
STATISTICAL ANALYSIS:
All Statistical analysis was done by using SPSS software version 21.0 and Microsoft excel-2007. Descriptive data was presented in the form of mean +/- standard deviation and mean difference percentages were calculated and presented.
Within the groups: Paired student "t" test was performed to assess the statistical difference within the groups for pain, and function (Modified OSW) from pre-test and post-test values.
Between the groups: Independent student "t" test was performed to assess the statistically significant difference in mean value between the groups for visual Analogue Scale for Pain, Modified Oswestry Low Back Pain Disability Questionnaire for Function.
For all statistical analysis, $p \leq 0.05$ will be considered as statistically significant.

RESULTS:
The results of this study were analysed in terms of reduction of pain on Visual Analogue Scale and improved function on Modified Oswestry Low Back Pain Disability Questionnaire. Total 450 subjects with nonspecific low back pain were screened for eligibility, amongst 128 subjects were included in the study trail. All the 128 subjects who met inclusion criteria have undergone baseline assessment and included subjects were randomized into two equal groups consisting 64 in each group. Comparison was done both within the group as well as in between the two groups. So as to evaluate the intra group and inter group effectiveness of Rhythmic Stabilization and Motor Control Exercise which are under considerations in the present study.

ANALYSIS OF MEAN SCORE OF VAS WITHIN GROUP A

GROUP A		MEAN	SD	P VALUE	INFERENCE
VAS	PRE	8.031	.8159	0.0001	Highly Significant
	POST	3.984	.8996		

TABLE -1

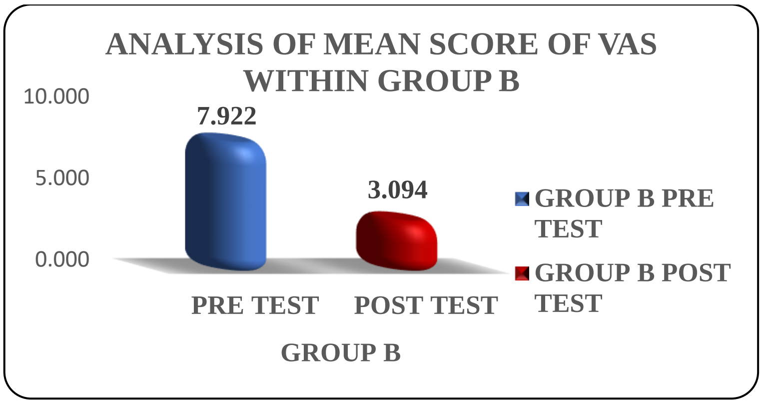


GRAPH – 1

ANALYSIS OF MEAN SCORE OF VAS WITHIN GROUP B

GROUP B		MEAN	SD	P VALUE	INFERENCE
VAS	PRE	7.922	.7828	0.0001	Highly Significant
	POST	3.094	1.0943		

TABLE – 2

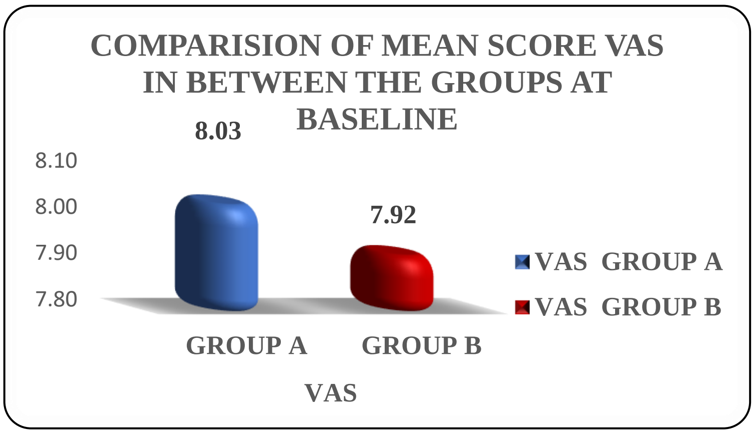


GRAPH – 2

COMPARISION OF MEAN SCORE OF VAS IN BETWEEN THE GROUPS AT BASELINE (PRE-TEST)

VAS		MEAN	SD	P VALUE	INFERENCE
PRE-TEST	GROUP A	8.031	.8159	0.44	Insignificant
	GROUP B	7.922	.7828		

TABLE – 3

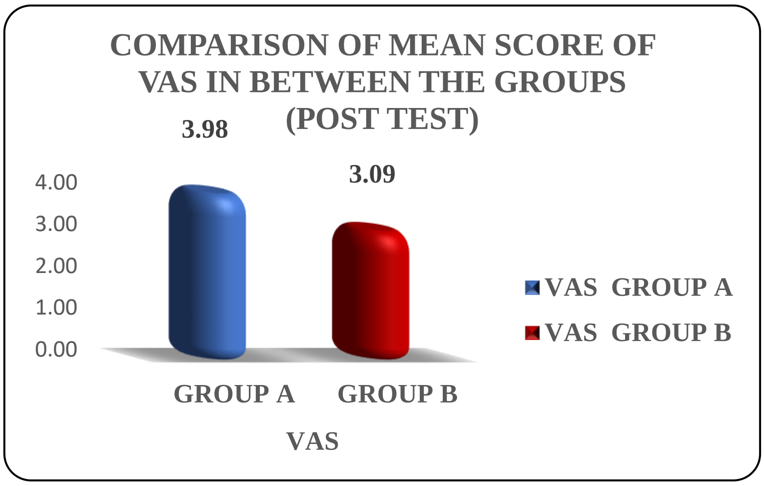


GRAPH – 3

COMPARISION OF MEAN SCORE OF VAS IN BETWEEN THE GROUPS (POST-TEST)

VAS		MEAN	SD	P VALUE	INFERENCE
POST-TEST	GROUP A	3.984	.8996	0.0001	Highly Significant
	GROUP B	3.094	1.0943		

TABLE – 4

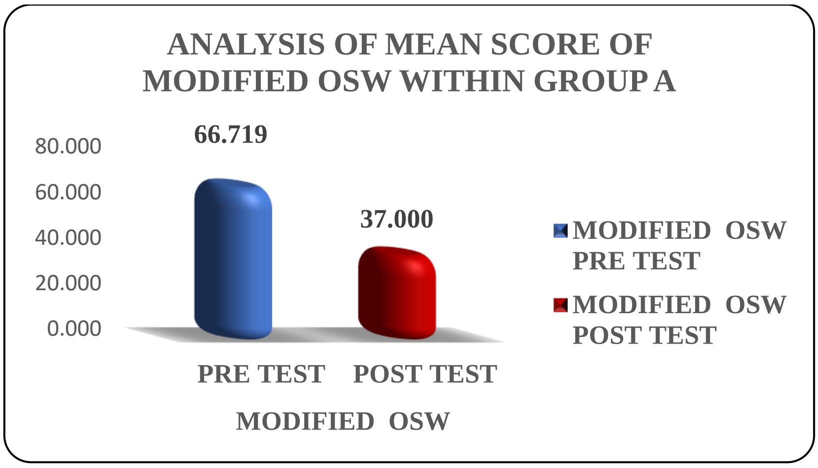


GRAPH – 4

ANALYSIS OF MEAN SCORE OF MODIFIED OSW WITHIN GROUP A

GROUP A		MEAN	SD	P VALUE	INFERENCE
MODIFIED OSW	PRE	66.719	6.2169	0.001	Significant
	POST	37.000	4.2910		

TABLE – 5

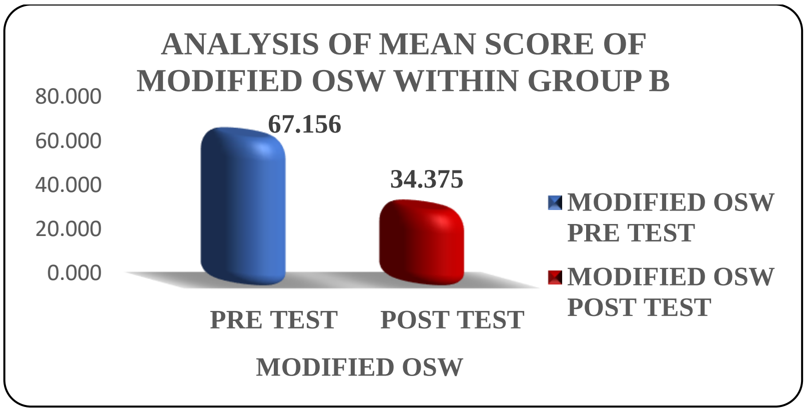


GRAPH – 5

ANALYSIS OF MEAN SCORE OF MODIFIED OSW WITHIN GROUP B

GROUP B		MEAN	SD	P VALUE	INFERENCE
MODIFIED OSW	PRE	67.156	5.6994	0.0001	Highly Significant
	POST	34.375	4.7526		

TABLE – 6

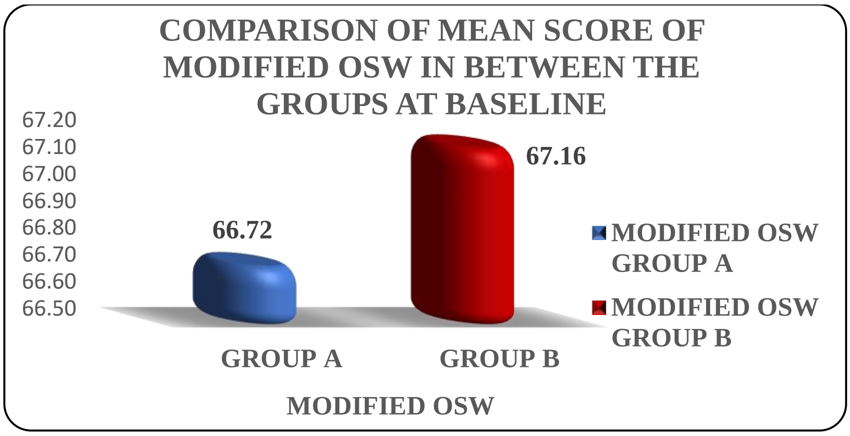


GRAPH – 6

COMPARISION OF MEAN SCORE OF MODIFIED OSW IN BETWEEN THE GROUPS AT BASELINE

MODIFIED OSW		MEAN	SD	P VALUE	INFERENCE
PRE-TEST	GROUP A	66.719	6.2169	0.679	Insignificant
	GROUP B	67.156	5.6994		

TABLE – 7

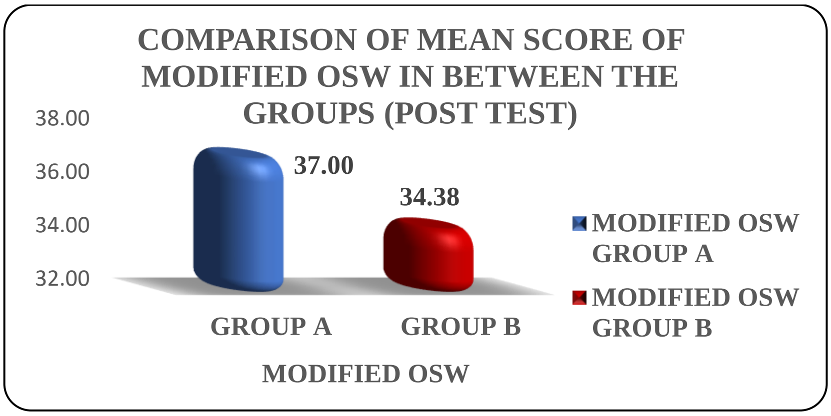


GRAPH -7

COMPARISION OF MEAN SCORE OF MODIFIED OSW IN BETWEEN THE GROUPS (POST-TEST)

MODIFIED OSW		MEAN	SD	P VALUE	INFERENCE
POST-TEST	GROUP A	37.000	4.2910	0.0001	Highly Significant
	GROUP B	34.375	4.7526		

TABLE – 8



GRAPH – 8

DISCUSSION

The aim of our present study was to evaluate the effectiveness of Rhythmic stabilization exercise and motor control exercises on pain and function in subjects with nonspecific low back pain. In this study, subjects were assessed for pain and function. The following outcome measures Visual Analogue Scale (VAS), and Modified Oswestry Low Back Pain Disability Questionnaire (Modified OSW) were used to measure the intensity of pain and function.

The results showed significant improvement in both outcome measures, VAS and Modified OSW questionnaire, in both the techniques. The two techniques were similarly effective in decreasing pain and improving function in subjects with nonspecific low back pain.

Both the Rhythmic stabilization group and the Motor control exercise group showed statistically significant differences, but the Motor control exercise group (VAS mean – 3.094, MODIFIED OSW mean – 34.37) showed clinically effective slightly when compared to the Rhythmic stabilization group (VAS mean – 3.984, MODIFIED OSW mean – 37.000).

This study supports the previous study of Sanjeev Kumar Singh, Naushin khan, Ronika Agarwal (2019) "Effect of Rhythmic stabilization exercise versus conventional physiotherapy on pain and disability with patients with chronic mechanical low back pain." The study done for 4 weeks. To see the long-term effects of Rhythmic stabilization with a large number of samples, along with 4 weeks, another 2 weeks were added in our present study.

Low back pain may be developed by some factors which increase lumbar lordosis, reduce abdominal muscle length and strength, and reduce back extensor muscle endurance, back extensor muscle flexibility, length of iliopsoas, hamstring muscle flexibility, body composition, and others.[11] Ten years of research on nonspecific low back pain trajectories has identified different patterns of pain trajectories, there are three main pain trajectory sub groups: a recovery trajectory in which pain improves rapidly; an ongoing trajectory in which pain is moderate or fluctuating; and a persistent trajectory in which the pain is constant and severe.[22]

In a magnetic resonance imaging (MRI) study, it showed that the cross-sectional area of the multifidus muscle was reduced on the symptomatic side and specified to one vertebral level in most of the cases. The localised muscle wasting could be due to inhibition of perceived pain via a long loop reflex, preventing movement to protect structures at the level of pathology [18]. In the lumbar multifidus [MF], which is a key stabilizing muscle, in the case of nonspecific low back pain, there is decreased stability due to recognised myocellular lipid infiltration and wasting.[23] Contraction of transversus abdominis was delayed in patients with low back pain, it states that a deficit of motor results in improper muscular stabilization of the spine.[24]

PNF considerably increases muscle endurance, according to Kofotolis and Kellis' study (2006). They observed that the trunk static endurance was obtained by the rhythmical stabilisation (RS) exercise.[39] The fibres that make up muscles are capable of both stretching and contracting to perform an action. Myostatic stretch reflexes cause muscles to constrict when they are being overextended. A golgi tendon organ informs the muscles to relax when the tendons are overreached. When PNF exercises are performed properly, the patient will adopt them into their everyday activities, eliminating incorrect postures and practices which lead to chronic muscle strain and stress. Exercises for rhythmic stabilization rely on the co-contraction of opposing muscle groups to keep the trunk and the entire body in position. We can believe that this strategy greatly enhances the related musculature's static strength and perhaps muscular coordination. Trunk stabilization is a need for carrying out a number of daily activities, including getting out of a chair, or carrying anything. To maintain trunk integrity during these activities, the trunk muscles almost function isometrically.[11]

Motor control exercise (MCE) is also known as specific stabilization exercise. When a team of researchers from The University of Queensland in Australia published the first publication on this subject in 1996, thereafter more research has been done on this subject and it has become more well liked and used in clinical settings. [21,24,25,26] The biological justification for the MCE is based on the idea that individuals with low back pain have impaired spinal stability and control. Therefore, the programme was created to improve the movement and posture control, as well as the performance of specific lumbopelvic muscles.[27] When patients are instructed to manage their trunk muscles while engaging in functional activities, improvements in activity, activity limitation, and overall recovery perception may be justified. [18,28]

Some research suggests that this training can alter the way trunk muscles behave when doing functional tasks. [29,30]

Many different explanations have been put forth to explain how motor control training affects pain. These mechanisms include decreased load and enhanced movement quality as a result of increased trunk muscle coordination.[31] The motor cortex or other parts of the motor system may undergo plastic alterations that would facilitate such changes in control.[32]

Motor learning occurs in three main phases: cognitive, associative, and autonomous.[33] In the first phase, the aim of motor relearning for LBP is to contract the deep muscles cognitively to increase the precision and skill of the contraction of local muscles. An isometric co-contraction of deep abdominal muscles and multifidus muscles with minimal co-activation of global muscles should be obtained. Contraction of the pelvic floor muscles will help to inhibit global muscle substitution. It is critical to provide accurate feedback on contraction quality. This may include any senses like tactile(palpation), visual (ultrasound imaging). The second phase involves the performance of tasks in challenging positions like sitting, standing. The final stage of motor learning is achieved after considerable practise and experience. The task becomes habitual and the requirement for conscious intervention is reduced.[20] Abdominal drawing-In manoeuvre (ADIM) is the main for the strengthening of the deep muscles such as Transversus abdominis, Internal Oblique, and External Oblique. ADIM is an exercise method that increases abdominal pressure by pulling the abdominal walls inward, contracting the transversus abdominis and oblique abdominals. Because of increased abdominal pressure, lumbar trunk stability is effectively accomplished. It also causes muscle contraction, which reduces excessive lordosis and pelvic tilts, which is effective for low back pain.[34]

By the end of the 6 weeks of intervention program, the subjects in Group A (Rhythmic stabilization) had significantly improved VAS ($p = 0.0001$), MODIFIED OSW ($p = 0.001$). The average age of the patients in this group was 40.45 ± 1.639 years.

After 6 weeks of intervention program, there was a significant difference in subjects of Group B (Motor control exercise) for reducing pain VAS ($P = 0.0001$) and disability MODIFIED OSW ($P = 0.0001$). The subjects in this group had an average age

of 40.39 ± 1.637 years. The mean pre and post test scores showed that both the rhythmic stabilization and motor control exercise groups were individually beneficial in reducing pain and improving function.
In terms of comparing the two groups, rhythmic stabilization and motor control exercise showed statistically significant in post-test results for reduction in pain and improvement in function. When post-treatment values of the rhythmic stabilization and motor control exercise groups were compared, there was no statistically significant difference in the outcome measures, indicating that both treatments were roughly equally effective in reducing pain and disability.
According to the findings of the current study, six weeks of rhythmic stabilization and motor control exercise interventions significantly improved function and pain reduction. However, comparisons between the group's data indicate that both therapies are equally successful. But motor control exercise protocol displays marginally superior outcomes.
The current study's findings point to the rhythmic stabilization and motor control exercise protocol as a potential therapy option for low back pain, as it helped subjects with nonspecific low back pain feel less pain and perform better.

LIMITATIONS:

- Less treatment sessions per week.
- No blinding of evaluators.
- No follow up.
- No control group.

RECOMMENDATIONS FOR FURTHER RESEARCH:

- The length of the study can be extended by either 8 or 12 weeks.
- The intervention protocol was given to the subjects with non specific low back pain in this study. For further research, the protocol can be given to specific low back pain conditions and mechanical low back pain.

CONCLUSION

The findings of this study concluded that, a 6-week intervention of both Rhythmic Stabilization Exercise and Motor Control Exercises were shown to be statistically significant in reducing pain and improving function in subjects with non specific low back pain. However, Motor Control Exercises group is more effective when compared to Rhythmic Stabilization Exercise.

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