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TO STUY THE EFFECT OF CORE STRENGTHENING BASED THERAPEUTIC EXERCISES ON PATIENTS WITH CHRONIC LOW BACK PAIN

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ABSTRACT

The present study was to determining the effect of core Strengthening based therapeutic exercises on patients with chronic low back pain. A total number of 40 subjects with chronic low back pain were randomly selected and assigned to the following two groups of equal numbers, Group-A experimental (Core strengthening) group and control group-B. Experimental group-A underwent Core strengthening based therapeutic Exercises and Control group B underwent only routine exercise for 6 weeks. Sessions lasted for 60 minutes included 20 minutes warmup and cool down (10 minutes each) and 40 minutes of Core strengthening based therapeutic exercises. The exercises had been performed three times per week and were increased gradually from 2 to 5 repetitions in first three weeks and 6 repetitions in 4-6 weeks. Control group continued with their routine exercise training. All the subjects were tested for their lumbo-pelvic stability, oswestry low back pain disability questionnaire and TrA activity before and after the study period. Results showed that Core strengthening exercises group had a significant effect on the subject's lumbo-pelvic stability ($p < 0.000$), TrA activity ($p < 0.001$) and oswestry low back pain disability questionnaire ($p < 0.0000$), were observed from pre to post value at the 0.05 probability level and improved their performance. Based on the results obtained from this study, Core strengthening group showed better results and statistically significant from pre-test to post-test than control group in improving lumbo-pelvic stability and improving low back pain and disability.

INTRODUCTION:

Core training has become the norm in many training programs throughout the world during the past decade. Equipment such as the therapy ball, BOSUTM ball and the abdominal roller used as quick and easy fitness solutions for our exercise. The mantra of "core training" makes peoples believe that enhanced core stability will improve their performance on daily activities. The importance of core stabilization system in creating stability and power system during daily activities has an important consideration. Core stabilization system monitors the movement of the trunk on the pelvis and cause of the generation, transmission and control of force and motions to the lower extremity in activities. Core stabilization is denned as the ability of set or lumbar, pelvic, femoral flexion to avoid bend and return of balance after instability. Vertical pressure, resulting in muscle contraction can increase core stability (30).

Low back pain (LBP) represents the most common cause of disability in persons under 45 years of age. Spinal disorders represent at least 40% of the compensated disorders treated by physiotherapists, and 70% of these spinal disorders involve the lumbar spine (32). The effectiveness of therapeutic exercise in the treatment of chronic LBP is currently under review (20). Back pain is one of the most widely experienced health-related problems in the western world. Low back pain (LBP) affects virtually everyone at some time during their life; studies indicate that there is an annual prevalence of symptoms in 50% of working age adults (34). One of the reasons reported for this is that Introduction the ligamentous spine has been described as unstable at loads far less than that of body weight. This leads to the potential for trauma at the relatively low loads of the activities of daily living. It has been suggested that the neuro-muscular system must fulfil a supplementary and adaptive role to maintain postural stability while controlling and initiating movement (57). The neuromuscular system acts to maintain postural stability and reduce the impact of deleterious loads on the passive restraints of the spine (44). The therapeutic application of exercise of the abdominal muscles therefore, has become widely used in the management of LBP in order to provide this supplement to spinal stability. However, general exercise regimes have not succeeded in reducing LBP, and their physiological and practical foundations have been questioned (8). Recently, the focus of research attention has been on the Transversus Abdominis muscle (TrA). This is the deepest of the abdominal muscles and it has been proposed that this component of the abdominal muscle group provides a specific contribution to spinal stability (49). The dysfunction of TrA may be related to a lack of spinal stability, and hence the incidence of LBP (8, 57). Some evidence supports this, TrA activation has been shown to be significantly delayed in LBP patients and fails to occur in the preparatory period prior to movement in all directions (8, 49). These authors concluded that a change in TrA activation is not simply a Introduction delay, but is in fact a dysfunction in its motor control. TrA is often difficult to activate and may weaken in both sedentary individuals and those with chronic LBP (14). Evidence exists suggesting that the internal oblique and TrA muscles may not be optimally recruited, or may fatigue in their stabilizing role, even in normal, currently asymptomatic individuals (56).

These asymptomatic individuals with dysfunctional TrA action may be in a 'at risk' group of developing LBP symptoms, because of their failure to fully activate their dynamic spinal support system. General conditioning programs to train strength and endurance of the spine musculature have been shown to reduce pain intensity and disability (50), and to be useful in the treatment of nonspecific chronic LBP (53), and "activity-related spinal disorders" (17). Much of the literature examining chronic LBP and exercise interventions study a population whose pain and disability manifest in "deconditioning syndrome," as described by Mayer (18). It follows that exercise-training programs directed generally at muscle strength, endurance, and reconditioning are appropriate. However, physical deconditioning may not be

the limiting factor to recovery for many patients seeking treatment for chronic low back disorders; it is now accepted that muscle dysfunction in chronic LBP may not simply be a problem of muscle strength or endurance. Instead, the problem may be one of altered neuromuscular control mechanisms affecting muscular stability of the trunk and movement efficiency (8).

The Core strengthening Method is an exercise method popular for decades in dance training and the dance medicine community. The Core strengthening Method is a unique approach to training in mind-body awareness and control of movement and posture. Specialized apparatus provides an opportunity to train a variety of movement patterns and postures. The neuromuscular demands of traditional Core strengthening methods can be quite high and therefore a modification of this method is necessary for application to physiotherapeutic interventions.

Global stability mechanisms to control the lumbar-pelvic region are then incorporated into this background of segmental lumbar control. This may be achieved by incorporating specific activation of the gluteal muscles to stabilize the lumbarpelvic region while performing hip extension (15).

MATERIAL AND METHOD:

It includes the samples, equipment used, various protocols or method employed to get required information and statistical analysis of the obtained information for results and subsequently the conclusion. Thus it must be planned with great care to have reliable and valid information for authentic results and conclusions.

Sample design – Experimental study.

Sample size – 40 subjects with nonspecific chronic low back pain.

- Core strengthening group (Group A = 20).
- Control group (Group B = 20).

Sampling area – Clinical Settings

Experimental Approach to the Problem

This study addressed the question as to whether 6 weeks of core strengthening based therapeutic exercise training would improve the nonspecific chronic low back pain and lumbo-pelvic stability relative to the activity of TrA customary in training regimen. There was 6-weeks training protocol where test-retest design was used to identify the effects of core strengthening based therapeutic exercise with low back pain patients. The exercises were performed 3 times a week for 6 weeks.

Subjects

The study was approved by Institutional Ethical Committee Of alashree Institute of Paramedical Sciences, Jabalpur (M.P). Sample contained 40 subjects with mean age (29.9±3.35), body weight (67.7±5.6), height (167.9±5.0), and BMI (24.12±2.40) were randomly selected and assigned to the following two groups of equal numbers, Group-A experimental (Core strengthening) group and control group-B.. All participants were not refrained from their training. All subjects provided a written, informed consent to participate in the study. Consent form contains detailed information of demographic history and nature and brief procedure of study. All subjects were educated how the TrA muscles of the lumbar spine plays an important role in lumbo-pelvic stability and their impact on low back pain and the betterment of the performance and were explained about the apparatus and tests to be administered during study. Only then, the subjects who volunteered to participate in the study were recruited. 40 subjects were chosen to determine the effect of exercise training, 20 subjects were randomly and equally divided into two groups. They answered specific questions regarding their training strategies, pace and past injury history to identify their background. Experimental group-A underwent Core strengthening based therapeutic Exercises and Control group B underwent only routine exercise for 6 weeks. Sessions lasted for 60 minutes with 20 minutes warm up and cool down (10 minutes each) and 40 minutes of core strengthening based therapeutic exercises. The exercises had been performed three times per week and were increased gradually from 2 to 5 repetitions in first three weeks and 6 repetitions in 4-6 weeks. Control group continued with their routine exercise training. Pre and post tests were performed for the two groups.

Criteria for subject selection

Inclusion criteria

Ø Subjects with low back pain
Ø Subjects with aged between 30 to 35 years.

Exclusion criteria

Ø Subject with recent injuries.
Ø Subject undergoing rehabilitation after injury.
Ø Subject with cardiac problem.
Ø Subject with respiratory problem.
Ø Subject with psychological problem.

Parameters

1. Height 2. Weight 3. BMI 4. Lumbo-pelvic stability.

Tools for measurement

1. Stadiometer. 2. Weighing machine. 3. Pressure biofeedback unit. Material and Method
4. The TrA isolation formal test 5. The lumbo-pelvic stability test
6. Oswestry low back pain disability questionnaire

Procedure

Anthropometrical measurements

1. Height
It is the erect length from the sole or feet to the vertex of the head.
2. Body weight (weighing machine) with minimal clothing and bare foot
3. Body mass index
It is derived from body mass and stature BMI = body mass (kg) stature (m)2

Testing procedures

Apparatus

A Stabilizer pressure biofeedback unit (Chattanooga Group, Inc.) was used to indirectly measure the subjects' ability to perform a TrA isolation test, and to monitor lumbo-pelvic stability.

The pressure biofeedback uni consists of an inelastic, three-section air-filled bag, which is inflated to fill the space between the target body area and a firm surface, and a pressure dial for monitoring the pressure in the bag for feedback stand this, it is necessary to consider the orientation of the abdominal muscles. The majority of the muscle fibres of the rectus abdominis, obliquus externus abdominis and obliquus internus abdominis run either vertically or obliquely from the pelvis to the rib cage. When these muscles contract they can flatten the abdominal wall, but do not narrow the waist beyond this. In contrast, the fibres of the transversus abdominis are horizontal and can therefore produce a concavity of the abdominal wall without movement of

the spine. Thus when the transversus abdominis contracts in isolation, concavity of the abdominal wall results, whereas substitution by the other abdominal muscles simply flattens the abdomen. Measurement of the elevation of the abdominal wall from the supporting surface, with the patient in the prone position, allows identification of both how well the transverses

abdominis can be contracted and whether this action can be performed in isolation. The motion is assessed using the pressure biofeedback unit. The principle underlying the use of the pressure biofeedback lmit in this test is that, when the unit is placed under the abdomen, it initially conforms to the patient's shape.

The TrA isolation formal test

All subjects were familiarized with the abdominal hollowing action in the four point kneeling position (Hodges et al., 1996) where substitution strategies can be identified (Richardson and Jull, 1995) and corrected before the test. Once the abdominal hollowing action was understood and practiced once, the test was conducted. The subjects lay prone, arms by the side, with the pressure sensor under the abdomen, navel in the centre and the distal edge of the pad in line with the right and left Anterior Superior Iliac Spines (Hodges et al., 1996). The PBU was inflated to 70 mmHg .[16] The subjects were instructed to draw in their lower abdomen to support the weight of the abdominal contents off the pad, on exhalation without any movement of the pelvis or trunk [16]. Normal breathing commenced throughout the drawing-in action and the contraction was held for 10 s.[16] A successful performance reduced the pressure by 6–10 mmHg and indicated correct localized contraction of the TrA independent of the other abdominal muscles A drop of o6 mmHg, no change or an increase in pressure indicated a fail test result .[16]

The lumbo-pelvic stability test

The subject was in supine crook lying position, with 701 of hip flexion to place the lumbar spine in mid-position.[16] A barrier was positioned to standardize and limit leg movement to 901 hip flexion. After randomly selecting the initial test leg, the PBU was placed beneath the lumbar spine from S1 to L1 and inflated to 40 mmHg. The resting leg was placed on weighing scales ensuring that the subject was not pushing through this leg for stability and counterbalance Subjects were instructed to breath in and out, then hold the abdominal hollowing action throughout, beginning the test movement on the end of exhalation and A unilateral heel-lift in the sagittal plane was performed requiring flexion of the hip from the starting position (701), to the barrier (901), then returning to 701 with the knee flexed [19]. An ability to maintain the registered pressure at 40 mmHg (72 mmHg) during this manoeuvre indicated a successful performance. The tester (RD) was blind to the exercise grouping of the subjects, their intratested reliability was examined in pilot work prior to the study commencing and it was found for the same five subjects on two separate occasions their test result remained the same.

Oswestry low back pain disability questionnaire[20].

The Oswestry Disability Index is an extremely important tool that researchers and disability evaluators use to measure a patient's permanent functional disability. The test is considered the 'gold standard' of low back functional outcome tools.

Scoring instructions: For each section the total possible score is 5: if the first statement is marked the section score = 0; if the last statement is marked, it = 5. If all 10 sections are completed the score is calculated as follows:

Interpretation of scores -- 0% to 20%: minimal disability:

The patient can cope with most living activities. Usually no treatment is indicated apart from advice on lifting sitting and exercise. 21%-40%: moderate disability:

The patient experiences more pain and difficulty with sitting, lifting and standing. Travel and social life are more difficult and they may be disabled from work. Personal care, sexual activity and sleeping are not grossly affected and the patient can usually be managed by conservative 41%-60%: severe disability:

Pain remains the main problem in this group but activities of daily living are affected. These patients require a detailed investigation. 61%-80%: crippled:

Back pain impinges on all aspects of the patient's life. Positive intervention is
required. 81%-100%:

RESULTS AND ANALYSIS

Statistical analysis: The data was analyzed for statistical significance by using the Statistical package for Social Sciences (SPSS 19.0) software. Significance was defined as $p \leq 0.05$ paired t-test was conducted for all the variable of within the groups. Significance was defined as $p \leq 0.05$ unpaired t-test was conducted for all the variable in between the groups. This method was used to see comparison for testing level of significance.

Comparison within the Groups

ObservationTable No: 1 showing comparison between pre and post TrA isolation test in control group

	Control	
Group	TrA ISOLATION TEST	
	Group A	Group B
Pass (0 %)	10%	10%
Fail (0%)	90%	90%
Pass (f)	2	18
Fail (f)	2	18
P value	0.598	
Result	Not significant	

Table No: 2 showing comparison between pre and post TrA isolation test in experimental group

	Experimental	
	TrA ISOLATION TEST	
	Group A	Group B
Pass (0 %)	20%	80%
Fail (0%)	80%	20%
Pass (f)	4	16
Fail (f)	16	4
P value	<0.001 , Result -- significant	

Table No: 3 showing comparison between pre and post lumbo-pelvic stability test in control group

	Experimental	
Paired T test	LUMBO-PELVIC STABILITY TEST (GRADE POINTS)	
Mean	0.25	0.25
SD	0.444	0.444
Number	20	20
P value	1.000, result – Not significant	

Table No: 4 showing comparison between pre and post lumbo-pelvic stability test in experimental group

	Experimental	
Paired T test	LUMBO-PELVIC STABILITY TEST (GRADE POINTS)	
	Pre	Post
Mean	0.35	1.65
SD	0.489	0.813
Number	20	20
P value	0.000	
Result	significant	

Table No: 4.9 showing comparison between pre and post Oswestry Low Back Pain Disability Questionnaire (%) test in control group

Paired T test	Control	
	Oswestry Low Back Pain Disability	
	PRE POST	PRE POST
Mean	38.51	37.72
SD	8.54	8.24

Number	20	20
P value	0.2219	
Result	Not- Significant	

Table No: 5. showing comparison between pre and post Oswestry Low Back Pain Disability Questionnaire (%) test in control group

Paired T test	Control	
	Oswestry Low Back Pain Disability	
	PRE POST	PRE POST
Mean	38.33	24.02
SD	8.02	6.60
Number	20	20
P value	0.0000	
Result	Significant	

DISCUSSION:

The present study was designed as an effort to achieve improved core strength and improve nonspecific chronic low back pain in patients with low back pain. The purpose of the present study was to determining the effect of core strengthening based therapeutic exercises on patients with low back pain.

TrA isolation test

On comparison within group, mean values of both the groups indicate that Core strengthening group (A) is more effective in improving the activity of TrA. It has been advocated that the prone lying TrA isolation test can accurately classify subjects into LBP and painless groups in 80% of subjects ability to dissociate activity in the TrA and internal oblique muscles from that of the rectus abdominis Furthermore, when either an abdominal hollowing or gym exercise including abdominal curl activities was performed over a 10-week programme, rectus abdominis EMG activity increased in the abdominal curl group (O'Sullivan et al., 1998). In the present study, the rectus abdominis muscle may have substituted for the deep abdominals in the 66% of abdominal curl training subjects who failed the TrA isolation test. Therefore this may be due to a motor learning recruitment of the rectus abdominis, and not due to a TrA dysfunction. This should be considered in further research. It is evident from the present study that the Core strengthening subjects passed the TrA isolation test, then the control group. This supports the view that Core strengthening trained subjects incorporate higher levels of deep abdominal muscle activity than control group subjects. Therefore this activity may be useful for maintaining the stability function of the deep abdominal muscles, but requires further study.

Oswestry Low Back Pain Disability Questionnaire

The main finding of this study was that a program of specific exercise directed at retraining neuromuscular control, provided by a physiotherapist, and based on the Core strengthening method was more efficacious in reducing pain intensity and functional disability levels when compared to usual care. In this study there were significant improvements in mean average pain intensity and in functional disability levels in the experimental group following treatment that were not apparent in the control group. Both groups completed the study and compliance was high, with 100% attendance at scheduled clinic appointments. Although compliance with the home protocol was not measured, it was monitored on a log, and a verbal report from the treating physiotherapist reported good compliance in general. The ability to exercise without pain, the opportunity to practice at home, and the quick changes in pain and carryover to function relative to previous chronic condition were reported as important motivating factors for compliance.

These investigators found that a training approach that followed the principles of segmental stabilization and neuromuscular control was effective in reducing pain and disability in a group of individuals with chronic LBP related specifically to radiological instability.

Lumbo-pelvic stability

On comparison within group, mean values of both the groups indicate that Core strengthening group (A) is more effective in improving lumbopelvic stability than control group. These results are in agreement with study carried out by which indicated that Core strengthening trained subjects could contract the transversus abdominis and maintain better lumbo-pelvic control than those who perform regular abdominal curl exercises, or no abdominal muscle exercises, Similarly conducted a study to findout effects of 8 weeks Core strengthening training on lumbo-pelvic stability and flexibility demonstrated that 65% and 85% of the subjects from Core strengthening group passed the lumbo-pelvic stability test at 4 and 8 weeks of training respectively. Logical explanations for improvement of lumbo-pelvic control are relevant to specific concepts of Core strengthening in terms of role and neural control mechanism of local muscles, motor learning and physiological response to specific volume of Core strengthening program. The concept of Core strengthening focuses on core or the powerhouse and breath control that activates local muscles, especially transversus abdominis, internal obliques, diaphragm, multifidus, and pelvic floor muscle. Several researchers advocate that dysfunction of the TrA muscle may relate to lumbo-pelvic instability and therefore, the incidence of LBP [16,17] Although muscle recruitment strategies stabilizing the lumbar spine are individual The stability of pelvis also depends on the central nervous system to determine the requirements of stability by pre-programmed transverses abdominis contraction to stabilize the spine prior to trunk perturbation from limbs movement and external load to the body's part. By the Core strengthening exercise CNS may enhance the control of the spine when the trunk is challenged by internal and external forces [18]. Based on the results obtained, the Core strengthening based therapeutic exercises enhanced both lumbo-pelvic stability and improve low back pain and disability in patients with low back pain.

CONCLUSION

Based on the results obtained, Core strengthening group showed better results and statistically significant from pre-test to post-test than control group in improving lumbo-pelvic stability and improving low back pain and disability, at the end of the six-week study period. This study opens up a new horizons for the individual to result in better performance and more injury prevention. Carefully designed Core strengthening based therapeutic exercises may, therefore, be recommended for individual in improving their performance in daily activities.

Recommendations for future research

Since there is no set protocol for duration of a lumbo-pelvic stability program, use a variable workout schedule by evaluating training programs of 6 weeks, 9 weeks and 12 weeks or longer in duration for improving lumbopelvic stability and pain and disability with low back pain patients. Increase in number of subject from Conduct the study on the subjects who are not involved in any physical activity or have any kind of musculoskeletal or neurological disorders with an athlete and non-athlete group, Conduct a test with other means to assess the effectiveness of core stabilization or Core strengthening training program. Conduct a study to assess injury rate pre and post the training protocols.

Significance of the Study

- The result of the study would be of great interest and would be helpful to exercise psychologist, physiologist, physical educators and coache to adopt the effect of Core strengthening exercise.
- The findings of the study will provide guidance to physical therapist to prepare training schedules on the basis of the physical fitness capacity of the individual.

- The findings of the study will add to the quantum of knowledge in the area of physical and performance in individual.

- The result of the study may be used to identify the importance of Core strengthening exercise, training to attain remarkable changes in selected physical motor fitness variables.

- With the help of results the study would be able to assess variation inselected physical motor fitness variables among the groups.

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