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Original Research Article

Effect of Core Stabilization Exercise in Improving Trunk Endurance

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ABSTRACT

Aim: To find the effectiveness of core stabilization exercise on trunk extensors endurance exercise protocol in healthy subjects.
Methodology: 30 subjects from the community were selected according to the inclusion criteria. Before starting core stabilization and trunk extensor exercise, assessment was done. Trunk extensor endurance was measured using Sorensen test at 0 week .Then for one and half month weekly 4 days core stabilization and trunk extensor exercise was carried out. Then at sixth week again Sorensen test was performed to check the endurance.
Results: Data analysis shows insignificant difference between the improvement in trunk endurance of experimental group and improvement in trunk endurance of control group after 6th week. t-value of experimental group is t = -5.02(p = 0.00) and t-value of control group is t = -3.61(p = 0.00). There is insignificant difference between experimental and control group. So null hypothesis is accepted i.e. there is absolutely no effect of core stabilization exercise on active trunk extension endurance exercise protocol.
Conclusion: Both active trunk extension endurance exercise and core stabilization exercise are effective in improving endurance. Core stabilization exercises didn't show any significant over a trunk extensor endurance training protocol in improving endurance of trunk extensors.

Key Words: Core, Stabilization, Endurance.

INTRODUCTION

Muscular endurance is the ability of an isolated muscle group to perform repeated contraction over a period of time, with intensity of the activity being moderate. [1] It is one of basic elements of muscular performance that has great relevance to activities of daily living lifting and bending in which the ability of trunk extensor to resist fatigue being important in industrial setting. [2] Poor endurance of trunk muscle may induce strain on passive structure of lumbar spine and hence result in low back pain.[3] Muscle been identified as a potential source of low back pain[4,5] as failure to protect passive structure from excessive loads may result in

damage to pain sensitive structure and produce pain.[6]

Endurance of lumbar stabilizer is most important key for preventing lumbar pain.[2,10] Trunk muscle endurance training has been recommended as means of increasing fatigue threshold and improving performance and reducing disability.[11] Improving endurance of trunk extensor therefore appears to be sound and promising approach for preventing low back pain and hence justification for conducting this study among individual without low back pain.

The trunk extensor training protocols used in studies focused extensively on erector spinae composed of longissimus, spinalis, i.e. mobilizers of trunk at expense of stabilizers such as transverse abdominus and multifidus that are affected majorly in individuals with back pain. So trunk extensor training protocol may need to be used in conjugation with specific stabilizing exercise for multifidus and transverse abdominals.

Core stabilization exercise links to the most effective abdominal training and increases ones strength and stamina. Core strengthening exercise program aims to improve stabilization and support to the spine providing the muscles of arms and legs. The muscles mainly involved in maintaining the trunk extensor stability are multifidus and transverse abdominus. This therefore helps in improving the endurance of trunk extensors and preventing future backache hence the study between the core stabilization exercises and the trunk extensors is carried out among individuals.

Core Stability- Core stability is the ability of body to control the whole range of motion of a joint thereby not creating deformity, neurological deficits, or incapacitating pain. Core stability is the strengthening of the corset of muscle surrounding the back and abdomen

Core musculature- It consists of 29 pairs of muscle that support the lumbopelvic hip complex in order to stabile the spine, pelvis and kinetic chain during functional movement. Transversus Abdominus, Multifidus, Diaphragm and pelvic floor muscle are the main muscle. These muscles are also known as the ‘core’ or ‘power house’ muscles and provide a solid base upon which all other muscle can work upon to initiate movement. Comprehensive strengthening program of this core muscle can be used for injury prevention, rehabilitation and sport performance enhancement. Strengthening the core is essential to prevent all forms of injury around the lower back areas.

When all these muscles contract together, they keep the spine in its most stable position (the neutral zone) & aid in preventing injury. They are known to contract prior to any limb movement & so they function in keeping the centre, or core of the body rigid during all movement. Recent evidence has found that in people with low back pain these muscles fails to contract before limb movement & so the spine is vulnerable to injury. Thus retraining these muscles to contract at the right time is the fundamental theory of core stability.

This study therefore aimed to investigate effects of core stabilization exercise on a trunk extensor endurance exercise protocol in apparently healthy subjects.

Core Stabilization Exercise

The rehabilitation and retraining of the so-called core stabilizers of the lumbar spine (transversus abdominus and multifidus), to provide increased stability around the neutral zone (Boden, 2002).

METHODOLOGY

30 subjects from the community of K.J.Pandya College of physiotherapy within the age group of 18-23years were recruited for the study on the fulfillment of inclusion criteria.

Procedure:

Normal subjects are selected with the age 18 to 23.The study procedure and rationale are explained to subjects and their informed consent of participation is obtained. Subjects are consequently recruited but randomly assigned into either a controlled or experimental group by asking them to pick a piece of paper on which either E (experimental) or C (control) is inscribed.

A two group pre-test-post-test randomized control trial design is used for subjects being recruited through convenience sampling. Age as at last birthday and gender are noted while there body weight and height are measured and recorded using standardized procedure. Their Body Mass Index then estimated as weight in Kilo grams and divided by height in meters square. The endurance of the trunk extensor muscles are measured with the modified Sorensen test.

Exercises given to control group: Active spinal extensor exercises.

Exercises given to experimental group: Active spinal extensor exercises and Core stabilization exercises.

Week-wise exercises for Control group:

First week	Lifting trunk to neutral from prone position with pillow under stomach and arms by the side.
Second week	Bridging.
Third week	Single leg extension in prone lying.
Fourth week	Single leg extension from 4 point kneeling position.
Fifth week	Alternate arm & leg extension from 4 point kneeling.
Sixth week	Single leg bridging.

Week-wise exercise for Experimental group:

First Week	Patient in sitting position. Instruct patient to preset the deep muscles with drawing-in maneuver, and then alternately flex & extend each upper extremity.
Second Week	Patient in hook lying position. Instruct patient to preset the deep muscle with the drawing-in maneuver, then alternately flex one hip & knee to 90degree & return to the starting position.
Third Week	Patient in quadruped position. Instruct patient to preset the deep muscles with drawing-in maneuver, and then alternately slide one leg along the mat toward extension & return.
Fourth Week	Patient in hook lying position. Instruct patient to preset the deep muscles with drawing-in maneuver, then alternately let one knee move away from the mid line & return, keep the feet in the same position, this creates hip rotation & abduction.
Fifth Week	Patient sitting on Swiss ball, then flex & extend alternate arm.
Sixth Week	Patient sitting on Swiss ball lift up the foot from ground & raise up the arm.

Sorenson Test: Procedure in which subject is made to lie prone on a rectangular box keeping upper half body (from ASIS) out of the box. i.e. upper half body is kept unsupported. Subject is then asked to maintain the upper body in a horizontal alignment while firmly strapped to the table over the pelvis, thigh & lower leg. The time for which subjects could maintain the position is evaluated.

Inclusion criteria:

1. Age: 18-23 years
2. Sex: Male and Female
3. BMI: 18-24

Exclusion criteria:

1. Acute inflammatory conditions of back
2. Spinal fractures
3. Systemic conditions affecting muscular performance
4. Spinal instability
5. Obesity

Tools and Materials

- Weighing Scale
- Height meter
- Rectangular Wooden Box (80x50x20.3cm)
- Stop Watch
- Velcro Straps

Statistical test:

Independent t test with the p value adjusted using Bonferroni correction was used to the experimental and control groups at week 0, and week 6 of the study.

Results

Data analysis shows insignificant difference between the improvement in trunk endurance of experimental group and improvement in trunk endurance of control group after 6^{th} week. t-value of experimental group is $t = -5.02 (p = 0.00)$ and t-value of control group is $t = -3.61 (p = 0.00)$

There is insignificant difference between experimental and control group. So

null hypothesis is accepted i.e. there is absolutely no effect of core stabilization exercise on active trunk extension endurance exercise protocol.

Table 1: Comparison between 0th and 6th week result of experimental group.

Week	Mean	N	Std. Error Mean	SD	t-value	p
0 week	61.93	15	8.41	32.59	-5.02	0.00*
6 week	98.40	15	9.80	37.97		

Here, P = 0.00 is highly significant because P < 0.05
This suggests that improvement in trunk endurance after performing core stabilization exercise along with active trunk extension exercise for 6 weeks is highly significant.

Table 2: Comparison between 0th and 6th week result of control group.

Week	Mean	N	Std.Error Mean	SD	t- value	P
0 week	57.26	15	7.15	27.70	-3.61	0.00*
6 week	77.06	15	5.86	22.70		

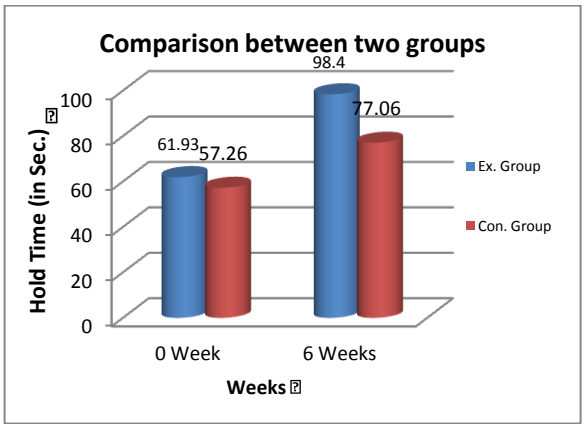
Here, P = 0.00 is highly significant because P < 0.05
This suggests that improvement in trunk endurance after performing active trunk extension exercise for 6 weeks is highly significant.

Table 3: Comparison between 6th week result of experimental and control group.

Group	Mean	N	Std.Error Mean	SD	t-value	P
Experimental	98.40	15	9.80	37.97	1.86	0.07*
Control	77.06	15	5.86	22.70	1.86	0.07*

Here, P = 0.07 is non significant because P > 0.05
This suggests that difference between trunk endurance improvement seen in experimental group and trunk endurance improvement seen in control group is not significant.

Graph 1: Comparison between mean values of Pre and Post test scores of experimental and control group.



DISCUSSION

The purpose of the study was to determine the effect of core stabilization exercise on active trunk extensor endurance exercise protocol in healthy subjects. Here in this study we made 2 groups, which were given different exercises. Before starting exercise protocol trunk endurance of each subject of both groups was measured using Sorenson test. Similarly the test was carried out after 6th week

The score was analyzed using student t-test. From the analysis it was seen that there was significant difference between pre test and post test scores of both groups. Which suggest that there was improvement in trunk endurance of both experimental and control group after performing exercises for 6 weeks. But here no statistically significant results were found between the post test scores between the control group and experimental group.

The reason for insignificance would be that core stabilization exercises might not be so much effective in improving trunk extensors endurance of normal population either because of the inability of normal subjects in proper activation of core stabilizers or the duration of the study might not be so much effective in getting results in normal healthy population.

The study was conducted for four days weekly for one and half month taking 10 to 12 min per day, so there may be need to increase the duration of the study to get a statistically significant outcome in normal healthy population over active trunk extension endurance exercise.

Babatunde O.A (2007): concluded that he trunk extensor endurance exercise protocol was effective for increasing the isometric endurance of trunk muscles.

Professor Eyal Lederman in his article "Myths of core stabilization" concluded that core stability exercises are no more effective and will not prevent injury more than any other forms of exercise. Thus core stability exercises are no better than other forms of exercise for back care.

In the study conducted by Cairns, Mindy C.; Foster, Nadine E; Wright, Chris on September 2006 they concluded that, there was no effect of core stabilization exercises on recurrent low back pain. They took 2 groups: conventional physiotherapy consisting of general active exercise and manual therapy, and conventional physiotherapy plus specific spinal stabilization exercises. Both group showed improved physical functioning.

No statistically significant differences between the 2 groups were seen for any of the outcomes measured and there was no additional benefit of adding specific spinal stabilization exercises to a conventional physiotherapy package for patients with recurrent LBP, similarly when studies were conducted on healthy subjects it was concluded that there was no effect of core stabilization on trunk extensors.

George A Koumantakis, Paul J Watson and Jacqueline A Oldham on March 2005 examine the usefulness of the addition of specific stabilization exercises to a general back and abdominal muscle exercise approach for patients with sub acute or chronic nonspecific back pain by comparing specific muscle stabilization enhanced general exercise approach with a general exercise. But there were no differences between the 2 exercise approaches for any of the other out comes. They concluded that a general exercise program reduced disability in the short term to a greater extent than stabilization enhanced exercise approach in patients with recurrent LBP.

The mode of action of stabilization retraining still remains unclear, because it has not been shown to be capable of mechanically containing an unstable segment, even upon improvement of muscle activation. Other than this no direct long term effect of stabilization exercises on the status of the local stabilizing muscles has been demonstrated.

Stabilization exercises do not appear to provide additional benefit to patients with sub acute or chronic low back pain who have no clinical signs suggesting the presence of spinal instability.

CONCLUSION

From this study it is concluded that both active trunk extension endurance exercise and core stabilization exercise are effective in improving endurance. Core stabilization exercises didn't show any significant over a trunk extensor endurance training protocol in improving endurance of trunk extensors.

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