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EFFECT OF CORE STABILIZATION EXERCISE ON A TRUNK EXTENSORS ENDURANCE TRAINING PROTOCOL

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ABSTRACT

Objective: The objective of the study was to find the effectiveness of core stabilization exercises over a trunk extensor endurance training protocol (TEEP) in improving trunk extensor endurance.

Methods: 30 physiotherapy students in the age group of 18-23 from KJPCP were conveniently selected and randomly allocated to a control and experimental group having 15 subjects each. Experimental group was given a trunk extensor endurance protocol along with a core stabilization program and control group was given only TEEP. Both exercises were given for half an hour each, 6 days a week, for 6 weeks.

Results: It was found that core stabilization exercises along with TEEP is not significantly different from trunk extensor endurance training protocol alone in improving endurance of trunk extensors.

Conclusions: TEEP protocol alone is effective in improving trunk extensor muscle endurance and its combination with core stabilization exercises will not produce any significant improvements over use of TEEP alone.

Key words: Trunk extensor endurance training protocol (TEEP), core stabilization exercises, Modified Sorenson test.

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 setting². Poor endurance of trunk muscle may induce strain on passive structure of lumbar spine and hence result in low

back pain^[1,7]. Muscle has already 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^[6,7,12].

Endurance of lumbar stabilizer is a very important key for preventing lumbar pain^[8,9,10]. 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^[12,20,21].

The trunk extensor training protocols used in previous studies focused extensively on erector spinae composed of longissimus and spinalis, that is on a mobilizer of trunk at expense of stabilizers such as transverse abdominis and multifidus that are affected majorly in individuals with back pain^[13,22].

Even though core stabilization exercises are being used widely in clinical setting its effect on dynamic stabilizers of spine remains unexplored. Trunk extensor endurance training protocol may need to be used in conjugation with specific stabilizing exercise of multifidus and transverse abdominals for a better result in back problems in patients. Core stabilization exercise through effective abdominal training is supposed to increase ones strength and stamina. So the training of trunk/ spinal stabilizers is therefore supposed to help in improving the endurance of trunk extensors or mobilizers and preventing potential development of backache in the future. It would of great importance if core stabilization programs with the emphasis on abdominals are found to have an effect on extensors of spine. Thus the purpose of this study is to investigate whether the application of core stabilization exercise along with a trunk extensor endurance protocol can improve trunk extensor endurance than the use of extensor training protocol alone in apparently healthy subjects.

MATERIALS AND METHODOLOGY

Materials

1. Rectangular Wooden Box (80x50x20.3cm)
2. Stop Watch
3. Weighing scale
4. Height meter/inch tape
5. Velcro Straps
6. Two pillows
7. Data collection sheet and pen

Methodology

30 normal healthy subjects from the campus of K.J.P College of physiotherapy within the age group of 18-23years were recruited for the study, on the fulfillment of inclusion criteria. A two group pre-test-post-test non randomized controlled trial design was used for subjects being recruited through convenience sampling. The study procedure and rationale were explained to subjects and their informed consent of participation obtained. Subjects were conveniently 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) was inscribed. Age as on last birthday and gender were noted while their body weight and height were measured and recorded using standardized procedures. Their Body Mass Index was then estimated as weight in Kilo grams divided by height in meters square.

The subjects in experimental (B) group were given a standard trunk extensor endurance training protocol (TEEP) previously used by Babatunde O.A et al (2007)¹⁴, 4 days a week along with core stabilization exercises for the same number of days. Five standard core stabilization exercises, with the emphasis on abdominal activation, as given by 'Therapeutic exercises', 5th ed were used. All the exercises were started in supine hook lying position. First exercise was abdominal activation using 'drawing in' procedure as in standard core stabilization methods. Second exercise was hip knee flexion extension of alternate legs up to 90 degrees of knee flexion, dragging the feel on bed. Third exercise included flexion extension of alternate legs, without dragging, up to 90 degrees of hip knee flexion. Fourth exercise was flexion extension of both legs together up to 90 degrees of knee and hip flexion without dragging of foot. Fifth exercise was straight elevation of lower limbs up to 45 degrees. In

each exercises abdominals were contracted for 10 seconds. Each exercise was repeated 25 times per session in subject's comfortable speed and those who required for break were given a single break of 30 seconds during each exercise. In between different exercises each subjects were given 1 minute rest. Duration of each exercise was between 25-30 minutes per day. The control (A) group had under gone only TEEP for the same duration and number of days. The outcome measure was the trunk extensor muscle endurance (TEME) using modified Sorenson test. TEME of both groups were calculated on day 1 and after 6th week. And the 6th week score of both E and C groups were also compared.

Statistical methods

Statistical test used was student's t Test. With in groups Pre and post test scores were compared using paired t test and In between group pre and post test group scores were compared using unpaired t test. Level of significance was kept at 0.05. Data was analyzed using SPSS version 14.

RESULTS

Pre test scores didn't show significant difference between two groups proving the homogeneity of the groups..Group E did show significant difference between pre and post test scores($t=5.043$ sig=.000).Similarly group C also did show significant difference between pre and post test scores($t=5.386$,sig=.000).But on comparison of post test scores between two groups, it was found that there were no significant differences($t= -1.499$,sig=.145).

DISCUSSION

From the analysis it was seen that there was significant difference between pre test- post test scores of both groups but no statistically significant results were found between the post

test scores between the group A (TEEP) and group B(TEEP + core stabilization) .

The reason for insignificant difference would be that core stabilization exercises might not be so much effective in improving trunk extensor endurance of normal population either because of the inability of normal subjects in proper activation of core stabilizers or the duration of 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 a half month taking less than half hour 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 a trunk extensor training protocol.

In the study conducted by Cairns, Mindy C.; Foster, Nadine E.; Wright, Chris on September 2006 it was concluded that there was no effect of core stabilization exercises on recurrent low back pain^[15,23]. That study used 2 groups: conventional, physiotherapy consisting of general active exercise and manual therapy; and conventional physiotherapy plus specific spinal stabilization exercises. Both groups showed improved physical functioning. No statistically significant differences between the 2 groups were shown for any of the outcomes measured, at any time 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 examined 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 a specific muscle stabilization–enhanced general exercise

approach with a general exercise. But there were generally no differences between the 2 exercise approaches for any of their outcomes other than self reported disability¹⁶.

They concluded that a general exercise program reduced disability in the short term to a greater extent than a stabilization-enhanced exercise approach in patients with recurrent nonspecific low back pain. 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. Stabilization exercises do not appear to provide additional benefit to patients with subacute or chronic low back pain who have no clinical signs suggesting the presence of spinal instability. Similarly in healthy subjects correct contraction of the stabilizing muscles could not be achieved initially and subjects had to be constantly corrected by the treating physical therapist also each time new exercises were introduced^[17,18]. This too can be attributed to the minimal effect of core stabilization exercises on the experimental group. Professor Eyal Lederman in his article 'myths of core stabilization' Concluded that Core stability exercises are no more effective than, and will not prevent injury more than, any other forms of exercise. Core stability exercises are no better than other forms of exercise for back care¹⁹.

In the light of existing literature it can be easily concluded that core stabilization exercises have controversial validity and their inability to produce significant changes to trunk extensor endurance in normal healthy population in comparison to a specific trunk extensor endurance training protocol is well in sync with their controversial validity.

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Table 1 : Mean and Standard deviation of group A (week 0-week 6)

Week	Mean	N	Std Deviation	Std Error mean
ZERO	52.7720	15	22.7747	5.8804
SIXTH	76.6120	15	27.6709	7.1446

Table 2 : Within group comparison of group A(week 0-week 6) using *paired t test*

	Paired Differences					t	df	Sig (2 tailed)
	Mean	Std Deviation	Std Error mean	95% Confidence interval of the difference				
				Lower	Upper			
Week 0-week 6	23.8400	17.1437	4.4265	14.3461	33.3339	5.386	14	.000

Table 3: Mean and standard deviation of Group B (week 0-week 6)

Week	Mean	N	Std Deviation	Std Error Mean
Zero	61.2073	15	37.7894	9.7572
SIXTH	97.7207	15	32.5235	8.3975

Table 4: Within group comparison of group B (Week 0-week 6) using *paired t test*

Pair	Paired differences					t	df	Sig (2 tailed)
	Mean	Std Deviation	Std Error mean	95% confidence interval of the difference				
				Lower	Upper			
Week -0 Week-6	36.5133	28.0410	7,2403	20.848	52.0419	5.043	14	.000

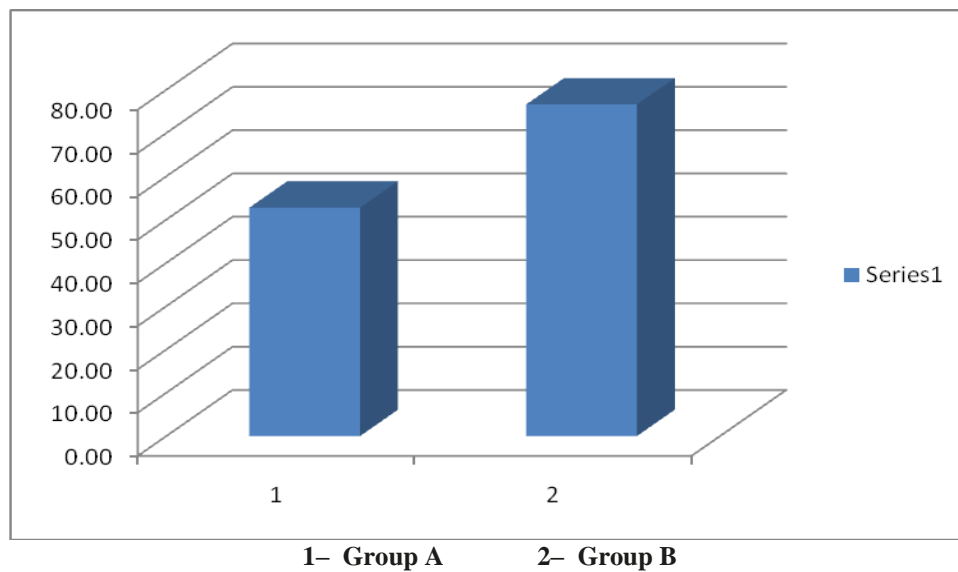
Table 5 . Comparison of mean and standard deviation between group A and group B.

Groups	Numbers	Mean	Std Deviation	Std Error mean
Group A	15	23.7960	17.1188	4.4202
Group B	15	36.5133	28.0410	7.2402

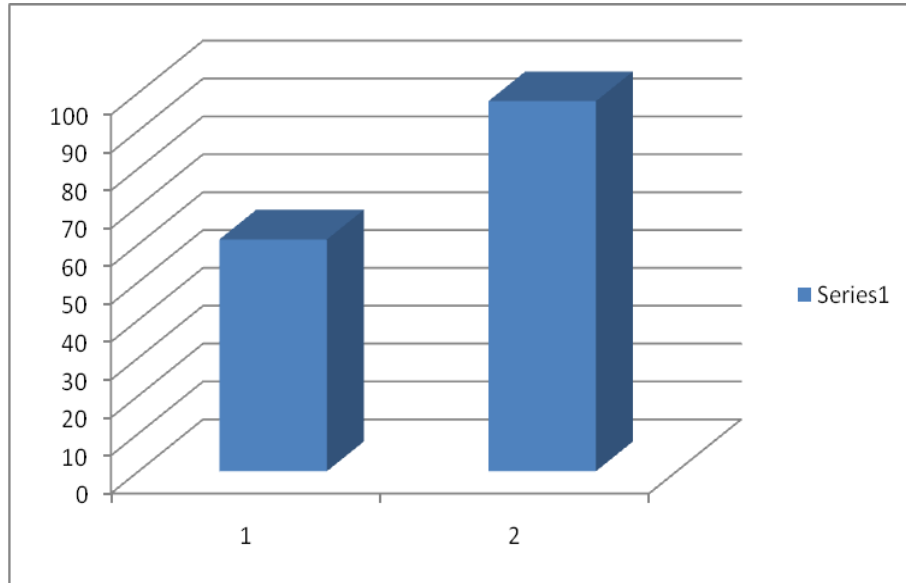
Table 6. Analysis of post-test scores of Group A and Group B using *unpaired t test*

	Levenes test		t-test for equality of means						
	F	Sig	t	df	Sig(2 tailed)	Mean difference	Std Error Difference	95% confidence interval of difference	
								Lower	Upper
Equal variances assumed	2.481	.126	-1.499	28	.145	-12.713	8.4827	-30.093	4.658
			-1.499	23.163	.147	-12.7173	8.4827	-30.258	4.823
Equal variances Not assumed									

Graph 1 : Group A : Comparison of mean values of pre and post test scores

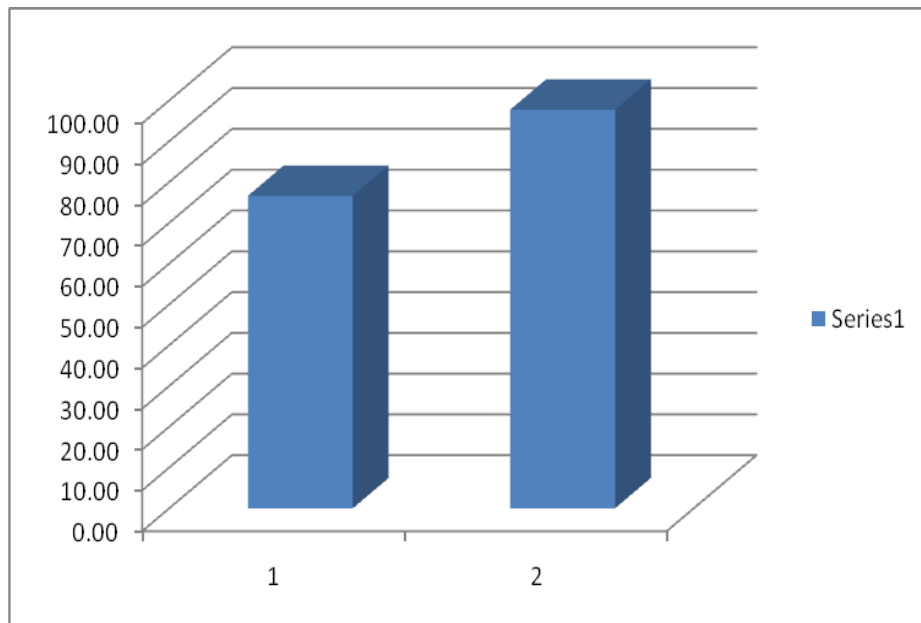


Graph 2: Group B: Comparison of mean values of pre and post test scores



1- Group A 2- Group B

Graph 3 Comparison of mean values of post test scores of Group A and Group B



1- Group A 2- Group B