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Effect of Corrective Exercises on Core Stability of Men with Lumbar Hyperlordosis Deformity

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Abstract:

The purpose of the study was to evaluate effectiveness of Corrective Exercises on Core Stability in Iranian middle aged men with the Lumbar Hyperlordosis Deformity. Ninety Man ages between 19 - 25 years (mean age = 22 ± 3 years), randomly selected and they have been not involved in any recruitment program for at least 6 months prior to the study, not had any injury in their body. Subjects were required to be physically suitable for a program of correction exercise and in the Gym. So prior to final selection they are checked out by a physician. During 12-week experimental period, subjects CE(n=45) and Control(n=45) were asked not to change their diet habits and not to take any medicines. T.Test was employed to find out the effectiveness of correction exercise in core stability. Results revealed that correction exercise was highly effective core stability and increase 189 Second from pre to post test (p<0.05).

Keywords: Corrective Exercise, Core Stability, Hyperlordosis

INTRODUCTION

Our posture is usually the relative arrangement of different parts of the body in relation to each other, and this situation is the optimal balance between the muscles and the skeleton (Kapandji, 1985).

The vertebral column supports the body's physical structure and nervous system, enabling movement and sensation. Pathology of the spine can lead to debilitating outcomes on quality of life (DeSai et al,2018).

Spinal cord is one of the most important human body parts and has exclusive structure in different individuals which is affected by heredity and environmental conditions, and changes are made therein depending on the mechanical pressures applied over time. If the pressures applied on different movement planes of spinal cord are asymmetric, the probability of inappropriate changes is increased (Kapandji, 1985). For instance, when the trunk is held for a long time in a special posture, the changes made in tissues protecting the spinal cord result in increase of pressure or tension in structures of that region. During long term, it may cause deformation and failure at end planes of disks and vertebra which will be effective on creation of deformities and pains of this region (DeSai et al,2018 and Huberty,2002).

One of the most important parts of spinal cord is lumbar lordosis that due to the close relationship of lumbar vertebrae with the pelvis, through the sacrum, any change in the pelvis posture results in change of size of this curvature, and subsequently any increase or decrease in the angle of this curvature is effective on the body balance, and followed by various deformities in lumbo-pelvic region (Wagner et al,2012 and Hodges et al,2003).

According to the findings of Kendal (Hodges et al, 2003), lumbar hyperlordosis deformity may be supposed as one of the most common complications due to muscular imbalance in spinal column. Epidemiological data indicates its high incidence, particularly in women and men population (Abasnejad et al,2018 and Taheri et al,2017).

High incidence of lumbar hyperlordosis particularly in Men caused the special attention of researchers to prevention and improvement of this deformity through prescription of corrective exercises. Thus, the researchers of this context believe that using purposeful exercises as corrective movements may help the individuals with lumbar hyperlordosis in order to prevent the deformities and pathologic complications and reduce the enormous treatment costs. Despite of various reports regarding significant effect of corrective exercises on reduction of lumbar lordosis angle,

statistically the academic documents about protection of its desirable effectiveness based on the exercises effect size and are inconsiderable. Furthermore, in previous researches, the improvement of core stability of sufferers has not been paid attention. Hence, study on the importance of effect of corrective movements and effect size of these exercises may provide more appropriate view for prevention and improvement of postural deformities of lumbo-pelvic region, to the state improving and rehabilitating society. Therefore, the results of present study seem to help for clarification of this issue so that in case of observation of desirable effectiveness of corrective exercises program used in the present research, on decrease of lumbar lordosis angle, as well as improvement of core stability of studied individuals, the results of this study can be used for design of corrective and rehabilitation programs for the said deformity, and recommend its use in individuals with similar deformities. On the other side, non-observation of expected effectiveness of exercise program, reveals the serious need to more precise study on the lumbar hyperlordosis deformity and necessity of revision of corrective programs design. So, the aim of the present study was to study Effectiveness of Corrective Exercises on Core Stability in Iranian middle aged Men with the Lumbar Hyperlordosis Deformity.

MATERIALS AND METHODS

Subjects

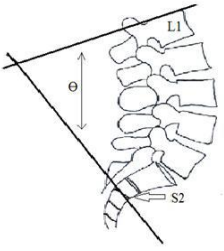
A group of 90 university male students with lumbar hyperlordosis deformity between the ages of 19 - 25 years (mean age = 22 ± 3 years), with 54 ≤Lordosis Angle ≥ 55 randomly selected from the indoor Setare Shahr Gem at Khorm Abad city in IRAN, those selected should not have been involved in any recruitment program for at least 6 months prior to the study, not had any injury in their body. They are enrolled for this study after signing the informed consent form. In order to be eligible for inclusion into the study, subjects were required to be physically suitable for a program of Corrective Exercise (CE). So prior to final selection they are checked out by a physician. During the experimental period, subjects were asked not to change their diet habits and not to take any medicines. They had to avoid consuming caffeine and alcohol one day before the CE session and not indulge in any physical activity during the experimental period.

Subjects gave their written consent prior to enrollment and took cognizance of the compliant requirement of not engaging in any exercise in addition to that required over the duration of the study. During the course of the investigation no subject had medical reasons or withdrew. Than subjects randomly divided in to 2 groups CE or Corrective exercise(n=45) and Control (n=45).

Measurement tools

Lumbar lordosis angle

The angle of lumbar lordosis was measured with a flexible ruler via Youdas (1996) method . The subject remained in the normal standing posture while lordatic angle was measured. The flexible curve was pressed against the spinous processes of the lumbosacral spine, and the points that intersected the adhesive markers were recorded. The points that intersected L1 and S2 were marked, and a line was drawn between them. These two measurements were used to calculate Theta (θ), an index of lordosis, (Figure 1), using the following formula: Θ = 4[Arctan2H/L] Θ = The index of lordosis, L = the length of the curve and H= the height of the curve.



Figre 1. Lumbar lordosis status.

Youdas JW, Garrett TR, Harmsen S, et al. Lumbar lordosis and pelvic inclination of asymptomatic adults. Phys Ther. 1996;76:1066–1081.

Core stability

The McGill tests evaluate isometric strength of the core (McGill et al., 1999). In the- extensor endurance test, the samples are horizontally positioned with the lower extremities fixed to an examination table while the upper body is extended over the edge of the table. In the side bridge test, the samples is in a side-lying and nearly horizontal position, where only the feet and laterally fixed elbow support the

body. In the flexor endurance test, the samples is in a seated position with feet strap tightened, knees and hips flexed to 90° and the torso at a 60° angle relative to the table. In all tests, the samples are asked to hold the fixed positions as long as possible (McGill et al., 1999). It should be noted that the objective of the McGill et al. study was to establish isometric endurance holding times, as well as ratios between torso extensors, flexors, and lateral flexors (stabilizers), for clinical assessment and rehabilitation targets.

Figure 2.- Assessing core stability

In this research, the designed corrective exercises program include stretching exercises, resisting exercises focusing on endurance, and functional stabilizing exercises that were done under direct supervision of tester, for 12 weeks (3 times per week). It is notable that all exercises prescribed in this program have been designed purposefully and based on the academic findings. Progress in the said program was adjusted gradually and based on the individual characteristics of each one of subjects and based on the principle of progressive overload principle, so that each session lasts within 30 to 70 minutes. Each exercise session was held respectively as warming up for 5 minutes (including light aerial activity and stretching exercises).

Statistical analysis

An independent statistician was consulted and utilized for all statistical analyses. Standard descriptive statistics for central tendency (mean) and spread (standard deviation) were applied to all variables measured. Differences between pre- and post test scores within the three experimental groups were determined by the One-way Analysis of variance. Further, effectiveness of 2 treatment modalities were done through Repeated Measure ANOVA taking pre

and post test scores on different parameters, and changes if any between 2 experimental and one control group were verified by considering differential changes from pre to post test session scores. In all analyses, the 95% level of confidence ($p \leq 0.05$) will apply as the minimum to interpret significant differences among sets of data. All computations were performed using the Statistical Presentation system software (SPSS), Microsoft Windows release 22 (2017).

RESULTS

Table 1 shows some anthropometric variables and physiological characteristics of subject. In order to determine the significance of difference between group means on lumbar lordosis angle, and core stability value degree, the data is subjected to independent samples test for pre-test situation. Table 4.1 presents details of the variables selected and obtained results for pre testing between ce and control group.

Table 1: Mean values of various groups on demographic/anthropometric variables and results of Independent Samples Test in pre testing

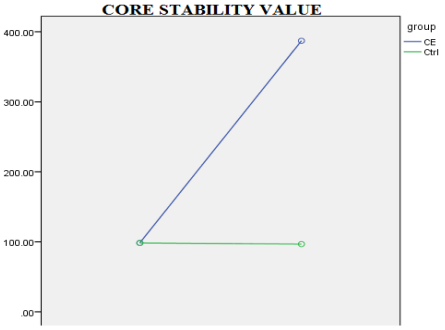
Groups		Control Groups (n=45)	CE Groups (n=45)	Independent Samples Test	
Variable	Units	Pre Test (Mean)+(Std)	Pre Test (Mean)+(Std)	T Value	P value
AGE	Years	20.42±2.23	20.83±2.2	-1.127	.263 NS
HEIGHT	Cm	171.17±0.75	171.33±0.86	-.226	.822 NS
WEIGHT	Kg	70.15±1.23	70.85±0.55	-.207	.837 NS
BMI	kg/m2	20.26±1.41	20.26±1.13	-.084	.933 NS
LUMBAR LORDOSIS ANGLE	Degree	61±6.37	62.00±6.31	-.022	.983 NS
CORE STABILITY VALUE	Second	92.96±31.08	98±23.99	.060	.952 NS

Note: NS-Non-significant

Table 2: Results of T.Test for mean CORE STABILITY VALUE scores of CE and Control groups from pre to post testing

Source of variation	Type III Sum of Squares	df	Mean Square	F value	P value Sig.
Within subject effects					
CHANGE	927297.113	1	927297.113	1920.394	.000
CHANGE * GROUP	947648.113	1	947648.113	1962.540	.000
Error(CHANGE)	42492.400	88	482.868		
Between subject effects					
Intercept	5216323.847	1	5216323.847	8175.129	.000
Group	949826.112	1	949826.112	1488.587	.000
Error	56150.366	88	638.072		

Figure 1: Mean CORE STABILITY VALUE scores of CE and Control groups from pre to post testing



As seen in table 2 and figure 1 , t test revealed a significant increased of core stability value from 98.54 second to 387.21 second from pre to post testing irrespective of the group which was statistically significant. f value of 1920.394 was found to be significant at .000 level. further, when the increased in core stability value verified across 2 different groups-ce and control. from the mean values it is clear that ce group increased its core stability value by 189 second from pre to post testing (from 98.5422 second to 387.2089 second), the control group from pre-test to post-test is almost unchanged in core stability value (from 98.5422 second to 96.8089 second). on the whole we find that ce group increased maximum core stability value, followed by control group least.

By carrying out the statistical analysis, we were framed and tested subsequently. "The 12-weeks of corrective exercises is effective on core stability in Men with lumbar hyperlordosis deformity".

Discussion

Since 12-weeks of corrective exercises was effective on increasing core stability in Men with lumbar hyperlordosis deformity. The increase in the core stability was found to be highly significant as revealed by tests performed though T.Test measure. Further, we find a increase of 189 Second from pre to post test situation in the CE group.

The results of the present study are compatible with studies done by some researchers**.** (Borghuis et al., 2008; Kibler et al., 2006; Vera- Garcia et al., 2015a; Zazulak et al., 2008) Consequently, many different tests have been used to assess core stability in laboratory and field settings. As there is no single accepted definition of this term (Borghuis et al., 2008; Kibler et al., 2006; Reeves et al., 2007; Vera-Garcia et al., 2015a; Zazulak et al., 2008), the characteristics of these protocols and the parameters measured are very different, e.g. trunk/spine stiffness (Brown et al., 2006; Cholewicki, Simons et al., 2010; Vera-Garcia et al., 2007), and endurance time (Chuter et al., 2015; Leetun et al., 2004; Nesser et al., 2008).

Therefore, the main field methodologies used to assess core stability seem to measure different dimensions/components of this concept (like the biomechanical tests presented above) or even other related capabilities (e.g. endurance, strength, etc.) that would not fall within many of the stability definitions, hindering the comparison between core stability studies that use different testing protocols. Furthermore, despite their low cost and easy application, some of these field tests have shown several methodological imitations (i.e. low reliability, poor sensitivity, etc.) (Walker et al., 1987; Weir et al., 2010), which make the data interpretation even more difficult. Future studies should analyse the advantages and limitations of these tests, including their validity as core stability measures (Vera- Garcia et al., 2015b; Weir et al., 2010). The effect of corrective exercises on Core stability seems to be due to the strengthening of the abdominal and lower back muscles consequently the increase of the Core Stability.

CONCLUSIONS

On the basis of the study the following conclusion were drown.
Significant mean difference was found in the Core Stability in CE group. The Corrective Exercise was effective in increasing Core

Stability followed by control groups. So it is recommended that other technique of training such as Electro Stimulation(EMS) compare with Corrective Exercise.

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