Correlation of Trunk Muscle Endurance in Different Body Mass Index among College Student

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I. INTRODUCTION

It is one of the fundamental elements of muscular performance which has its relevance to activities like bending and lifting activities of daily living, being examples of activities in which the ability to resist fatigue in trunk extensors, especially in an industrial setting[2]. In order to maintain proper position of spine the back extensors are responsible to maintain lordos is thus controlling rate and flexion magnitude with the ground reaction forces[3]. Endurance (a measure of fitness) is the ability to work for prolonged periods of time and the ability to resist fatigue. It includes muscular endurance and cardio vascular endurance. Muscular endurance is defined as the ability to perform repeated contractions over a period of time for an isolated group of muscle, whereas as cardiovascular endurance is defined as the ability to perform dynamic exercises for larger muscle groups, such as walking swimming, or biking for long periods of time. Low back pain occurs as a result of trunk muscle with the poor endurance in the lumbar spine which induce strain on the passive structures[4]. For people with low back pain there is a lower muscular endurance when compared to people not with the low back pain[5]. The inactivity and pain make trunk muscles fatigue under normal conditions and hindering to act continuously throughout the day and trunk muscle with lower endurance contributes to low back pain[6]. To prevent lumbar pain, the endurance of the stabilizers is most important and there is a poor association between the spinal health and strength of lumbar stabilizers[2,7]. To maintain spinal stability, motor control is an important factor and motor control errors arise with increase in reduced endurance and fatigue which occurs as a result of improper muscle forces[4]. To improve performance and to reduce disability subsequently the training of trunk muscle endurance is recommended with increased fatigue threshold[5]. For the aetiology of low back pain , trunk extensors with poor endurance have not only been implicated but also been with the occurrence of low back pain for the first time[4,6]. Muscle endurance is the ability to exert a force repeatedly against a resistance performing with multiple repetitions for a group of muscles as like swimming or running. Decreased lumbar pelvic or core stability has been suggested to contribute to the aetiology of lower extremity injuries, particularly in females. Students who reported low back pain were found to have trunk extensor with decreased endurance[14]. And this found to be the predictor of LBP[11,12]. In trunk muscle endurance deficits there occurs an imbalance of flexion and extension trunk muscle endurance. The imbalance of flexion and extension endurance is associated with the cause of low back pain proving that extensor having with less endurance than flexor[19]. This testing procedure provides clinician a time intensive, expensive. Trunk muscle endurance testing is necessary for two reasons. One, these muscles are predominantly muscle fibers with type I[16, 17] that appears to occur as a result of deconditioning which is more anaerobic. Two, isometric strength of trunk muscles maximum was not associated with low back pain in an athlete. The term endurance training generally refers to training the aerobic system as opposed to anaerobic. First, Hansen in 1964 described the evaluation of isometric of trunk muscle endurance and later in 1984 it is followed Biering Sorensen which was known as the 'Sorensen test' and considered as a popularity tool for low back pain in males within next years[25]. This consists of measuring a person's amount of time that enable him to hold the unsupported upper body in a horizontal prone position fixing the body to the examining table.

II. AIM OF THE STUDY

The aim of the study is to find out of the correlation of trunk muscle endurance in different body mass index among college students.

III. NEED FOR THE STUDY

There is a chance of low back pain due to decrease in muscle endurance.

There are only limited studies were done on the trunk muscle endurance in college population.

Previous studies are done only by comparing trunk muscle endurance and studies comparing body mass index with endurance is still lagging.

IV. METHODOLOGY

STUDY DESIGN	**:** Non-experimental
STUDY TYPE	**:** observational type
SAMPLING METHOD	**:** convenient sampling
SAMPLE SIZE	**:** 100
DURATION	**:** 6 weeks

STUDY SETTING : SRM College of physiotherapy, SRM University, Kattankulathur.

INCLUSION CRITERIA

Age: 18- 23
Male and female
Body mass index
Underweight :(<18.5)
Normal :(18.5-22.9)
Over weight :(23-26.9)
Obese :(>27)

EXCLUSION CRITERIA

Low back pain
Spinal cord injury (or) compression
Any fracture
Cardiovascular disease
Hypertension (or) Hypotension

MATERIALS USED

Strap
Stop watch
Weight machine
Stadio meter

PROCEDURE

Informed consents were obtained from the subjects and the Subjects were selected based upon the inclusion and the exclusion criteria

Flexor endurance This testing procedure was used to assess the flexor endurance of the trunk. For testing trunk flexion endurance the subjects were made to lie in a supine position with both hips and knee in 90 degrees of flexion, trunk inclined on the table of about 60 degrees. The stabilization were achieved by using a strap across over the dorsum of feet. The subjects were instructed to cross both their arms across the chest, placing their hands on their shoulders. The subjects maintained their position until they could able to hold and the time was measured using the stopwatch. The time being measured when the subject made to lie in a above comfortable position until the subject visually re-established contact with the table.

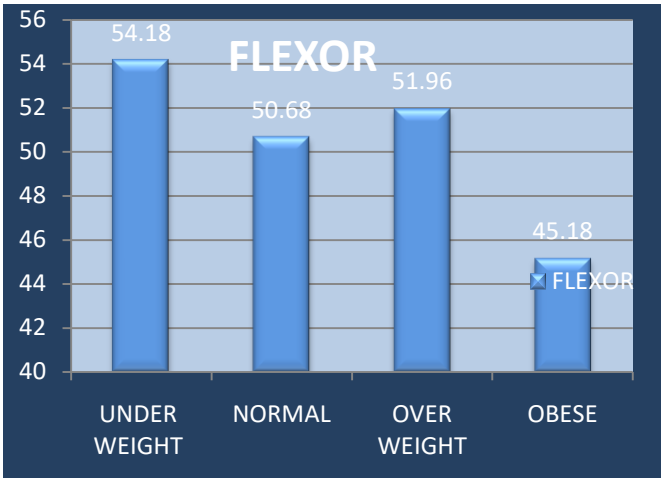
Extensor endurance test This testing procedure is used to assess the back extensor endurance. For testing trunk extension endurance the subjects were made to lie in a prone position.The subject slower body was fixed to the table by applying a straps across the knee and stabilization was made by placing one hand on the subjects lower back and one hand on the lower leg.The subjects upper body was off from the surface plinth, (from just above the level of anterior superior iliac crest) . Initially, the subjects upper limbs were lifted off from the table and instructed to cross both their arms across the chest, placing their hands on their shoulders and instructed to maintain in a horizontal position as long as possible.The subjects maintained their position until they could able to hold and the time was measured using the stopwatch. The time being measured when the subject made to lie in a above comfortable postion until the subject visually deviated from the position.

V. DATA ANALYSIS

The table 1: shows the significance of the flexor endurance and extensor endurance among the students with different body weight.

	AGE	GENDER		VALUE X2	DF	SIGNIFICANCE	MEAN
		MALE	FEMALE				
UNDER WEIGHT, NORMAL, OVER WEIGHT, AND OBESE FLXOR ENDURANCE	18-23	60	40	1.307	3	.727	54.18 50.68 51.96 45.18
UNDER WEIGHT, NORMAL, OVER WEIGHT, AND OBESE EXTENSOR ENDURANCE	18-23	60	40	9.291	3	.026	56.60 61.68 41.10 42.62

GRAPH 1: THE GRAPH SHOWS THE CORRELATION OF FLEXOR ENDURANCE AMONG THE UNDERWEIGHT, NORMAL, OVERWEIGHT AND OBESE INDIVIDUA



GRAPH 2: THE GRAPH SHOWS THE CORRELATION OF EXTENSOR ENDURANCE AMONG THE UNDERWEIGHT, NORMAL, OVERWEIGHT AND OBESE INDIVIDUALS

VI. RESULTS

The study states that there is no correlation between spinal flexor and extensor endurance among college students with different body weight.

The table 1 shows the significance of the flexor endurance and extensor endurance among the students with different body weight.

VII. DISCUSSION

The study aimed to find out the correlation of trunk muscle endurance in different body mass index among college students. **Noha Abdel Kader Abdel Kader Hasan** has concluded that according to the body mass index, muscle strength of the quadriceps, triceps, and abdominal muscles are more in obese children when compare to the underweight and the normal weight individuals. But in case of the muscle endurance was relatively very low in the obese children when compare to the other weight group children.Similarly in this study for underweight, normal, overweight, obese have a flexor and extensor endurance is less than normal, when compared with there body mass index. Hence, the study is negative. **Maffiuletti Nicola A** proved that the obese subjects have the higher level of muscle strength due to move their heavy bodies will provide an internal resistance to their muscles during exercises and that might decrease their ability to sustain for an long duration in functional activities, so the obese subjects show relatively less reduced muscle endurance when compare to the other weight group subjects. But in this study the trunk muscle endurance was relatively lower in all kind of weight groups.

But **Lafortuna** was concluded in his study was that abdominal muscle and quadriceps muscle strength and power were compare to body mass index, have relatively reduced in obese subjects than the lower weight group subjects. Hence his study was controversy to the previous study which was done by Noha Abdel Kader Abdel Kader Hasan. And his study was not compared the muscular endurance in relation with different body mass index. This study has says that no significant difference among the groups in endurance time of trunk muscles.While the results revealed on this study shows the significant reduce in endurance in all kind of body weight groups and there is no significant difference among the groups in endurance time of trunk muscles. This is due to the lack of physical activities in college students. Now days the physical activity among the students is less in all group of students they are accommodate in sedentary lifestyle.

VIII. CONCLUSION

The study concluded that there is no significance of spinal flexor and spinal extensor endurance among college students in different body weight.

IX. LIMITATIONS

- Sample size was too small.
- Study duration is very less.
- Reduced outcome measures available for endurance assessment.

X. RECOMMADATIONS

- More outcome measures are recommended for further studies.
- Sample size can be Larger.
- Further studies are recommended to do the endurance test for upper and lower limbs.

REFERENCES

[1]. Hui L, Ng GY, Yeung SS, et al. Evaluation of physiological work demands and low back neuromuscular fatigue on nurses working in geriatric wards. Appl Ergon 2001;32:479–83.

[2]. Mayer T, Gatchel R, Betancur J, et al. Trunk muscle endurance measurement. Spine 1995;20:920–7.
[3]. Lavangie P, Norkin C. Joint Structure and Function: A Comprehensive Analysis, 3rd edition. Philadelphia: FA Davis, 1992.
[4]. Chok B, Lee R, Latimer J, et al. Endurance training of the trunk extensor muscles in people with subacute low back pain. Phys Ther 1999;79:1032–42.
[5]. Manniche C, Hesselsoe G, Bentzen L, et al. Clinical trial of intensive muscle training for chronic low back pain. Lancet 1988;2:1473–6.
[6]. Ebenbichler GR, Bonato P, Roy SH, et al. Reliability of EMG time-frequency measures of fatigue during repetitive lifting. Med Sci Sports Exerc 2002;34:1316–23.
[7]. Nourbakhsh MR, Arab AM. Relationship between mechanical factors and incidence of low back pain. J Orthop Sports Phys Ther 2002;32:447–60.
[8]. Hamberg-van Reenen HH, Ariens GAM, Blatter BM, et al. Physical capacity in relation to low back, neck, or shoulder pain in a working population. Occup Environ Med 2006;63: 371–7.
[9]. Jorgensen K, Nicolaisen T. Trunk extensor endurance: determination and relation to low-back trouble. Ergonomics 1987; 30:259–67.
[10]. Moffroid MT, Haugh LD, Haig AJ, et al. Endurance training of trunk extensor muscles. Phys Ther 1993;73:10–7.
[11]. Alaranta H, Luoto S, Heliovaara M, et al. Static back endurance and the risk of low-back pain. Clin Biomech (Bristol, Avon) 1995;10:323–4.
[12]. Biering-Sorensen F. Physical measurement as risk indicators for low-back trouble over a one-year period. Spine 1984;9: 106–9.
[13]. Biering-Sorensen F. Physical measurements as risk indicators for low-back trouble over a one-year period. Spine. 1984;9(2):106-11
[14]. Alaranta H, Hurri H, Heliovaara M, Soukka A, Harju R. Non-dynamometric trunk performance tests: reliability and normative data. Scand. J. Rehabil. Med. 1994;26(4):211-215.
[15]. McGill S, Grenier S, Bluhm M, Preuss R, Brown S, Russell C. Previous history of LBP with work loss is related to lingering defi cits in biomechanical, physiological, personal, psychosocial and motor control characteristics. Ergonomics. 2003; 46(7): 731-746.
[16]. MacDonald DA, Moseley GL, Hodges PW. The lumbar molted dus: Does the evidence support clinical beliefs? Man Ther. 2006;11(4):254-263.
[17]. Thorstensson A, Carlson H. Fibre types in human lumbar back muscles. Acta Physiol Scand. 1987;131(2):195-202.
[18]. Renkawitz T, Boluki D, Grifka J. The association of low back pain, neuromuscular imbalance, and trunk extension strength in athletes. Spine J. 2006;6(6): 673-683.
[19]. McGill S, Grenier S, Bluhm M, Preuss R, Brown S, Russell C. Previous history of LBP with work loss is related to lingering defi cits in biomechanical, physiological, personal, psychosocial and motor control characteristics. Ergonomics. 2003;46(7): 731-746.
[20]. McGill SM, Childs A, Liebenson C. Endurance times for low back stabilization exercises: clinical targets for testing and training from a normal database. Arch Phys Med Rehabil. 1999;80(8):941-944.
[21]. Chan RH. Endurance times of trunk muscles in male intercollegiate rowers in Hong Kong. Arch Phys Med Rehabil. 2005;86(10):2009-2012.
[22]. Kontio M. Effects of maturation and physical activity on muscle mass and strength in prepubertal girls during two-year follow-up [Master's thesis]. Sports Medicine Department of Health Sciences University of Jyva¨ skyla¨ ; 2005.
[23]. Ramos E, Frontera WR, Llopart A, Feliciano D. Muscle strength and hormonal levels in adolescents: gender related differences. Int J Sports Med 1998;1(9):526–31.
[24]. Deforche B, Lefevre J, De Bourdeaudhuij I, Hills A, Duquet W, Bouckaert J. Physical fitness and physical activity in obese and non-obese Flemish youth. Obes Res 2003;11(3):434–41.
[25]. Dumitrescu L, Ritchie M, Brown-Gentry K, Pulley J, Basford M, Denny J. Assessing the accuracy of observer-reported ancestry in a biorepository linked to electronic medical records. Genet Med 2010;12:648–50.
[26]. Lafortuna C, Bizzini M, Maffiuletti N, Jubeau M, Munzinger U, Agosti F, et al. Differences in quadriceps muscle strength and fatigue between lean and obese subjects. Eur J Appl Physiol 2007;101(1):51–9.