IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

A STUDY TO FIND OUT CORRELATION BETWEEN TRUNK MUSCLE ENDURANCE AND NORMAL BODY MASS INDEX AMONG COLLEGE STUDENT WITH SEDENTARY LIFESTYLE BETWEEN AGE 18-25 YEARS

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ABSTRACT:

INTRODUCTION: The endurance of trunk muscles is very important as they are important stabilizers of spine and called as postural muscle. Student with prolong sitting had a risk of LBP as it requires higher trunk muscle endurance and decreasing this endurance could lead to future risk of low back pain. Therefore, it becomes important to find out trunk muscle endurance in student population. The purpose of this study is to find out correlation of Trunk muscle endurance with normal BMI.

AIM: To evaluate the correlation between trunk muscle endurance and normal Body Mass Index among college student with sedentary lifestyle.

METHOD: In this study, 56 participants with normal BMI and sedentary lifestyle were included based on inclusion and exclusion criteria. The trunk flexors and extensors endurance were assessed by Kraus- Weber and Sorenson test respectively. The relationship of trunk flexors and extensors endurance with BMI was analysed using Karl Pearson correlation test.

RESULTS: The results showed that BMI is not related with trunk flexor (r–0.08) and trunk extensor endurance (r -0.214). The TFE is positively correlated with TEE (r=0.58). Trunk extensor endurance was higher than trunk flexor endurance.

CONCLUSION: The results of the study showed that there is no correlation between trunk flexors and extensor endurance. Also, there is strong positive relationship between trunk flexor and extensor endurance. Trunk extensor endurance was higher than trunk flexor endurance.

KEYWORDS: Body Mass Index (BMI), Kraus-Weber test, Sorenson test, Trunk Extensors Endurance (TEE), Trunk Flexors Endurance (TFE).

INTRODUCTION

Muscular endurance is the ability of an isolated muscle group to perform repeated contraction over a period of time or sustain contraction over time at a certain level. Most of our daily activities require some muscle endurance. The muscles of the trunk are very important as they not only act as prime movers or antagonist to movement caused by gravity during dynamic activity also, they are important stabilizers of spine and called as postural muscle [1].It has been suggested that sufficient trunk muscle endurance contributes to spinal stability over strenuous and prolonged physical tasks and therefore may be important for many of the complex and demanding tasks performed by an individual [2].The trunk muscle includes trunk flexors and extensors. The trunk flexors are rectus abdominus, external and internal obliques, transverse abdominis and trunk extensors are erector spine, multifidus. The back extensors especially the Multifidus and Erector Spinae stabilizes the lumbar segments and abdominal muscles such as obliques and transverses abdominals are considered to provide an important stiffening effect on the spine by increasing the intra-abdominal pressure [3]. Decreased endurance of abdominal and lumbar musculature influences the occurrence of muscular imbalance [4]. Low levels of static endurance in the trunk muscles are associated with higher rates of low back pain (LBP), postural defects, decreased proprioceptive awareness, poor balance, and decreased productivity in the workplace, increased muscular fatiguability and soft tissue overloads on passive structures of the lumbar spine [5].

The original meaning of the word 'sedentary' is related to the higher propensity to be sitting down. Students spent an average of 11.88 ± 3.46 hours per day engaged in sedentary behaviours [6]. Lucky Anggiat et al. (2018) resulted that student with prolonged sitting more or less than 3 hours in a day had a risk of LBP. There is 74.6 % incidence of LBP among university students. [7] Prolonged sitting posture is the most important causative factor for the onset of non-specific low back pain in student population. Engaging into such activities which requires prolong sitting would require higher trunk muscle endurance and decreasing this endurance could lead to future risk of low back pain and spine related problems [26].

Patients who reported low back pain were found to have decreased trunk extensor endurance than flexors which causes the imbalance of flexion and extension endurance and this found to be the predictor of LBP [8]. Therefore, it becomes important to find out trunk muscle endurance in student population and to predict future risk of low back pain as well as to prescribe intervention to improve endurance.

A number of isometric tests of trunk muscle endurance have been described for the trunk extensors and flexors musculature. Two of the most popular methods are the Kraus-Weber test for flexors and the Sorensen test for extensors described in the literature, McGill et al. (1999) found these tests to be reliable with a reliability coefficient >0.97[9][19]. The purpose of this study is to evaluate trunk muscle endurance in college students with normal BMI and sedentary lifestyle and to find out correlation of Trunk muscle endurance with normal BMI.

HYPOTHESIS

HYPOTHESIS

There is correlation between trunk muscle endurance and normal BMI among college student with sedentary lifestyle.

NULL HYPOTHESIS

There is no correlation between trunk muscle endurance and normal BMI among college student with sedentary lifestyle.

AIM

To evaluate the correlation between trunk muscle endurance and normal BMI among college student with sedentary lifestyle.

OBJECTIVE

To assess endurance of trunk flexors and extensor muscles.

To evaluate relationship between trunk muscle endurance and normal BMI.

METHODOLOGY

Study Type - Cross-sectional study

Sampling technique - purposive sampling technique

Sample size – 56

Duration of study – 6 months

Inclusion criteria

Both males and female college students between age 18-25 year with normal BMI (18.5-24.9) with sedentary lifestyle.

Exclusion criteria

1. Non-specific low back pain,
2. Subjects engage in sports or gym,
3. Thoracic and cervical pain,
4. Spinal deformity, fracture,
5. History of neurological, orthopaedic and cardiopulmonary diseases,
6. Congenital or acquired chest wall deformity.

Materials

1. Stadiometer
2. Weight machine
3. Couch
4. Stool
5. Timer
6. Assessment sheet

Outcome Measures

1. Kraus-Weber Test
2. Sorenson Test
3. International Physical Activity Questionnaire (IPAQ)

PROCEDURE

Ethical clearance was taken from the ethical committee prior to the commencement of the study.

In this cross-sectional study, a brief demographic data of all participants was obtained and BMI was calculated, 56 participants with normal BMI were included in study. The International Physical Activity Questionnaire (IPAQ) short form was utilized to find out subjects with sedentary lifestyle. [28,29] A written consent was taken from all participants. Procedure was briefly explained to the participants by therapist. The trunk flexors and extensors endurance were assessed by Kraus- Weber and Sorenson test respectively.

Trunk Flexor Muscles Endurance Test (Kraus-Weber Test)

Each subject was in a sit-up position with arms crossed over the chest, hips and knees flexed 90º and trunk rested against the back support angled 60º from the couch. The feet were stabilized manually together. At the beginning of the test, the back support was drawn 10 cm behind and the subject was instructed to maintain the position as long as possible. A stopwatch was used to count the holding duration from the time the back support was moved behind. The test ended when the subject were unable to maintained the position or any signs of fatigue were noticed or reaches a maximum holding duration of 300 seconds.

Fig no 1: Kraus-weber test

Trunk Extensor Muscles Endurance Test (Sorenson Test)

Each subject was instructed to lie prone with his/her Anterior Superior Iliac Spine (ASIS) in line with the edge of a couch. The lower body was stabilized on the couch manually at the level of lower thighs and legs; while the upper body was not supported by the surface of the couch by asking the participants to rest their arms on the stool in front of them. At the beginning of the test, each subject was given instructions to lift the upper limbs from stool support and cross over the chest with hands resting on opposite shoulders and maintain the horizontal position as long as possible. A stopwatch was utilized to record the holding duration from the time the upper hands were crossed over the chest until the subject could no longer maintain the horizontal position or fatigue or reaches a maximum holding duration of 300 seconds.

Fig no 2: Sorensen test

STATISTICAL ANALYSIS

Demographic characteristics were analyzed by descriptive statistics. The relationship of trunk flexors and extensors endurance with normal BMI was analyzed using Karl Pearson correlation test. Data was analyzed with mini -tab 13. Statistical significance was set at $p \leq 0.05$.

RESULTS

The descriptive statistics were used to evaluate the subject's demographic data which is shown in table no 1. The mean age of subjects was 20.89 ± 1.17 and BMI 21.42 ± 2.23. The gender distribution of subjects shown in table no 2 and graph 1.

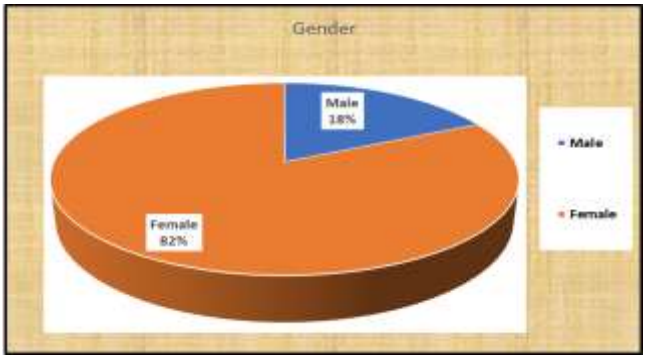
Table no 1 demographic data of participants

Variables	Mean	SD
Age (Years)	20.89	1.17
Weight (Kg)	55.82	7.64
Height (cm)	160.74	7.97
BMI	21.42	2.23

Table no 2 Gender distribution of subjects

Variable	Groups	Frequency	Percentage
Gender	Male	10	17.86
	Female	46	82.14

Graph no 1: graph showing gender distribution



The Karl Pearson correlation coefficient was used to find out correlation between trunk muscle endurance and BMI which is shown in table no 4 and graph 3,4,5.

The result shows that BMI is not related with TFE with correlation coefficient (r) is – 0.08 and p value 0.52. Also, BMI is not related with TEE with correlation coefficient (r) is – 0.214 and p value 0.11. The TFE is positively related with TEE with correlation coefficient (r) is 0.58 and p value 0.00. The scattered diagram of correlation between trunk flexor endurance and normal BMI shows the same results. The average TFE score was 34.95 ± 26.02 and average TEE score was 48.57 ± 27.99. It shows that TEE is more than TFE showed in table no 2 and graph no 5

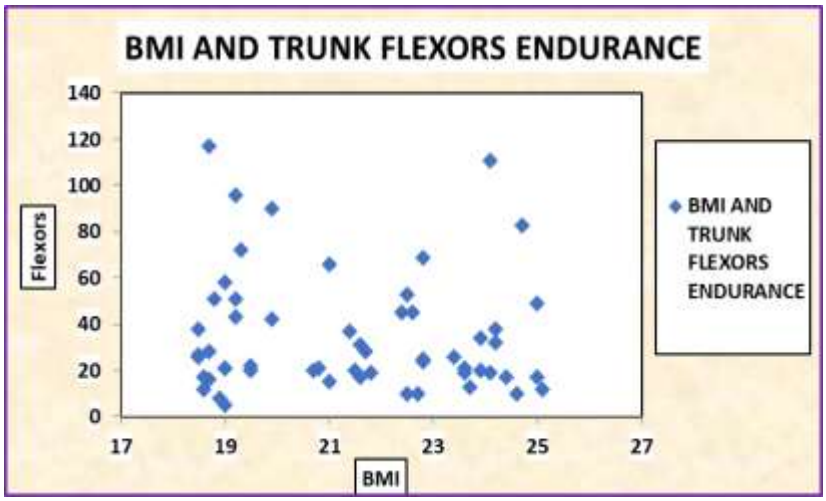
Table no 3 relationship of trunk flexor and extensor endurance with BMI

Karl Pearson correlation coefficient		**Normal BMI**	**TFE**	**TEE**
Normal BMI	r	1	-0.08	-0.214
	p	-	0.52	0.11
	n	56	56	56
TFE	r	-0.08	1	0.58 *
	p	0.52	-	0.00
	n	56	56	56
TEE	r	-0.214	0.58 *	1
	p	0.11	0.00	-
	n	56	56	56
*** Correlation is significant at the 0.05 level**				

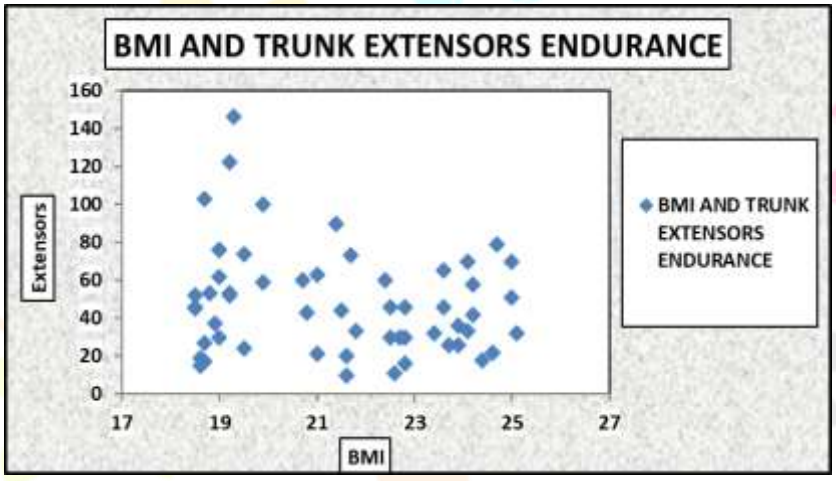
table no 4: average of TFE and TEE

Groups	**Mean**	**SD**
Trunk Flexors	34.95	26.02
Trunk Extensors	48.57	27.99

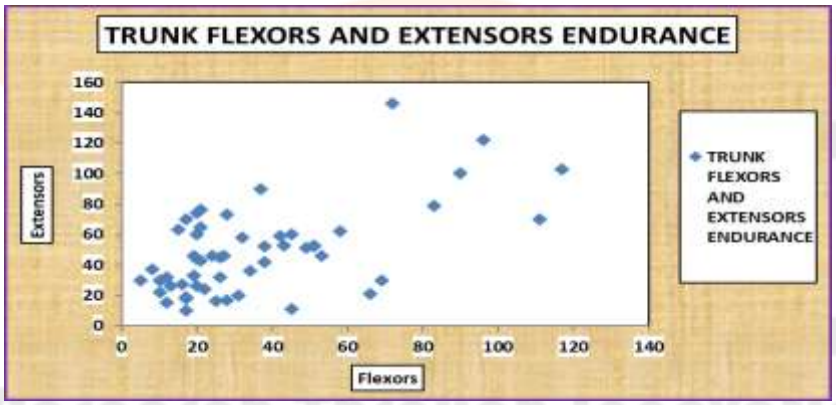
Graph no 2: scattered diagram showing relationship between TFE and normal BMI



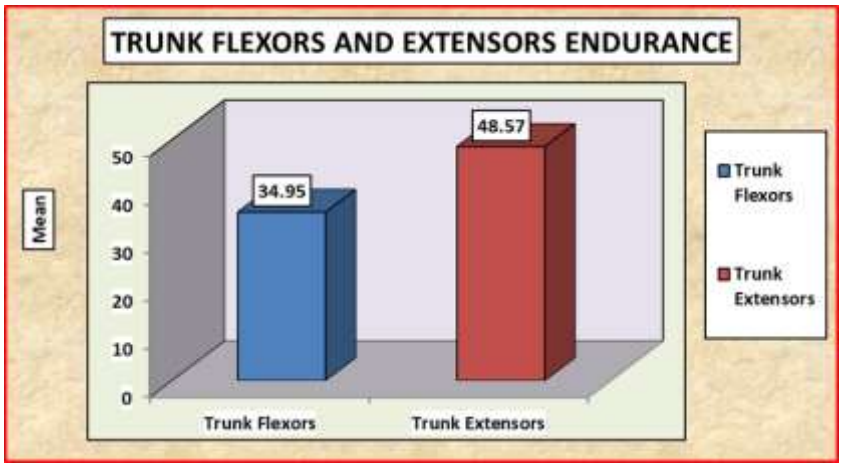
Graph no 3: scattered diagram showing relationship between TEE and normal BMI



Graph no 4: scattered diagram showing relationship between TFE and TEE



Graph no 5: comparison between trunk flexor and extensor endurance



DISCUSSION

The main objective of this study was to find out correlation between trunk muscle endurance and normal body mass index among college students with sedentary lifestyle. The results of the study showed that there is no correlation of trunk flexors (r= -0.08, p= 0.52) and extensor endurance (r= -0.214, p= 0.11) with normal BMI among college students with sedentary lifestyle. This finding agreed with the work of Karthikeyan et al. (2017) who studied relationship between trunk muscle endurance and normal BMI among university students with sedentary lifestyle. The results revealed that normal BMI is unrelated to trunk flexor endurance (r = -0.162, p = 0.01) and extensor endurance (r = -0.160, p = 0.01) [24].

E.W. Mahmoud et al. (2015) studied the correlation between anthropometric measurements and trunk muscle endurance for normal young girls also confirmed the result of the present study. The results showed that there is negative correlation between body mass index trunk muscle flexor endurance (r = -0.36, p = 0.001) and extensor endurance (r= -0.30, p= 0.001) for girls in government primary school children[4].Doymaz F. et al (2006) done a study analyzing the effects of physical characteristics of trunk muscle endurance in healthy Turkish subjects also supports the result of the present study as the results showed there was significant negative correlation between BMI and trunk flexor endurance (r = -0.46, p =0.00) and extensor endurance (r= -0.36, p = 0.00) [25].

Trunk flexors and extensors are postural muscles which are rich in type I fibers and have larger diameter muscle fibers. These muscles are suited for low levels of activity for a longer duration of time [24]. Greater percentages of type I fibers than type II fibers are found in all back muscles, which is reflective of their postural control and stabilization function.

Sustained postures require continual, small adaptations in the stabilizing muscles to support the trunk against fluctuating forces. Large repetitive motions also require muscles to respond so as to control the activity. In either case, as the muscles fatigue, the mechanics of performance change and the load is shifted to the inert tissues supporting the spine at the end ranges. As described above, with poor muscular support and a sustained load on the inert supporting tissues, creep and distention occurs, causing mechanical stress. Prolong mechanical stress will cause injuries and degenerative changes which further leads to LBP.In addition, injuries occur more frequently after a lot of repetitive activity or long periods of work when there is muscle fatigue. Inactivity has been shown to change muscle fiber composition and may be one reason for decreased function in patients with low back pain [1].

Also, there is strong positive relationship between trunk flexor and extensor endurance (r=0.58 p= 0.00) which means as flexors endurance increases, extensor endurance also increases. This finding agreed with the work of Karthikeyan et al. (2017) who found that there is strong positive relationship between trunk flexors and extensor endurance (r = 0.68, p= 0.01)[24].

The prevalence of LBP is associated with higher BMI and low physical activity. Although all subjects in our study were healthy with normal BMI, trunk muscles endurance was less. This may be due to the lack of physical activities in college students. Now days the physical activity among the students is less as they spent most of their time in sitting while doing lectures, studies, using mobiles etc. [6] So, it is very clear that a person with normal BMI is not necessary to have an adequate endurance of the trunk muscles also they have higher risk of LBP in future. As spine endurance and stabilization exercises are well known to enhance the endurance of spinal stabilizers, they should be added in general fitness program to avoid future risk of LBP in student population.

CONCLUSION

The main objective of this study was to find out correlation between trunk muscle endurance and normal body mass index among college students with sedentary lifestyle. The results of the study showed that there is no correlation between trunk flexors and extensor endurance. Also, there is strong positive relationship between trunk flexor and extensor endurance. Trunk extensor endurance was higher than trunk flexor endurance

LIMITATIONS

In this study, endurance of lateral flexors musculature is not taken into consideration.

SUGGESTIONS

Further studies can be performed including endurance of lateral flexor musculature. Further studies are recommended to do the endurance test for upper and lower limbs, adults with different BMI, gender differences, time spent on sitting, biomechanical factors (pelvic alignment), ergonomic factors, with and without low back pain in different BMI groups.

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