

OVERWEIGHT, A CULPRIT AFFECTING BACK ENDURANCE: A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Studies reveal that reduced muscle endurance has a major impact, leading to decrease in quality of life. Hence early diagnosis and prognosis is essential for leading healthy life. Lack of muscle endurance has shown to be related to decreased proprioceptive awareness and decreased productivity in the workplace and daily activity. Hence, the purpose of this study was to evaluate isometric endurance time of healthy normal population for trunk extensors and flexors. **Method:** In this cross-sectional study, 100 participants were randomly recruited by convenient sampling and trunk muscle endurance was assessed using trunk flexor endurance test and Sorensen's test. **Results:** The results of the study revealed-mean back endurance for extensor muscles was 47.66secs and 52.82secs for males and females respectively. Similarly, for trunk endurance for trunk flexors was 52.82secs and 112.86secs for males and females respectively. **Conclusion:** The study concluded that trunk muscle endurance for females was more as compared to males and also, with increase in BMI there is decrease in trunk muscle endurance.

KEYWORDS: Trunk endurance, BMI, Sorensen's test, Trunk.

INTRODUCTION

Low back pain is one of the major musculoskeletal disorder experienced by today's population. According to a study, low back pain is associated to reduce muscle endurance, which is more common amongst adolescents [1,2]. It has been estimated that about 80% of the population will experience low back pain at some point of time in life and one of the major cause being reduced trunk muscle endurance [1]. It has been suggested that adolescent low back pain has important role in future complications.

Dysfunctional movement pattern causes changes in flexibility of muscle, its endurance and strength. This change will lead to neural changes, decreased stability of spinal structures [1]. All these factors will further alter the ability of trunk muscles to maintain appropriate levels of activation of group of muscles over long period of time. All these changes will indeed, lead to muscle imbalance which will indirectly effect lumbo-pelvic rhythm [2].

Muscle endurance can be defined as the ability to produce work over time or the ability to sustain effort. Studies reveal that reduced muscle endurance has a

major impact, leading to decrease in quality of life. Hence early diagnosis and prognosis is essential for leading healthy life [3].

Back extensor muscles are considered to be the postural muscles that aid in maintaining upright standing posture and controlling lumbar forward bending. Also, lack of muscle endurance has been shown to be related to decrease proprioceptive awareness and decreased productivity in the workplace [4]. The major reason behind reduced muscle endurance is reported to be decreased muscle activity, sedentary life style, increased mechanical load on spine, psychological factors and the social environment [1].

There are various studies done to evaluate trunk muscle endurance which involves using of EMG, biofeedback unit, prone double straight-leg raise test, the arch-up test and many more are used for evaluation of trunk muscle endurance. But evidence of Sorensen's test being used trunk muscle endurance is found to be scarce but reliable. Also, in a study conducted by Demoulin and his colleagues revealed that Sorensen test is by far the most reliable test for assessing trunk extensor muscle endurance [5].

To our knowledge, there are hardly few studies done to find out normal values and correlation of BMI with endurance in Indian youngsters. Hence, the purpose of this study was to evaluate isometric endurance time of healthy normal population for trunk extensors and flexors. This endurance time can be used further to form "normal" relative ratios.



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MATERIALS & METHODS

Study design: Cross-sectional study

Ethical approval: Ethical clearance was obtained from IEC DVVPF's COPT, Ahmednagar.

Study place: The study was conducted at Dr. Vitthalrao Vikhe Patil Memorial Hospital, Physiotherapy OPD.

Time frame: The study duration was 1 year

Sample size: A total 100 healthy participants who met with the inclusion and exclusion criteria were randomly selected.

Inclusion criteria: health Males and females, between 18-25years were included in the study.

Exclusion criteria: Participants who had undergone any back or abdominal surgery within the 6months span, having low back pain, involved in gymnastic activities and with cardiopulmonary problems were excluded in the study.

For assessing back endurance, Sorensen's test was used.

Methodology: Participants were made to lie in prone position on the table, with posterior superior iliac spine (PSIS) placed at the edge of the table. Stabilization for the participants was done using three straps-one at the pelvis, second behind the knees and third around the ankle (Figure 1). Participant was instructed to curl his arms across the chest, with hip and knee extended. As a precautionary measure, a chair was placed in front of the participants, for when the fatigue sets in participants can hold the chair. To begin with, participants were instructed to perform concentric contraction to place the spine in horizontal position. The test challenges back endurance up till 240 seconds. The said test was stopped when participants were no longer able to maintain the horizontal position, and becomes too fatigued to continue or experienced pain (Figure 1) [8, 10].

For trunk flexor endurance test, the participants were initially instructed to lay in supine lying with hip and knee 90° flexion. They were then instructed to curl their arms around the chest and flex their trunk to 60°. Also, toes were secured using under toe strap or by



Figure 1. Showing Sorensen's test



Figure 2. Showing trunk flexor endurance test

examiner. Trunk flexor endurance test is time based test, failure occurs when trunk falls below 60° (Figure 2) [8, 10].

A stopwatch was used to keep a check on the time. Three trials were taken for each test and average of the three readings was considered.

Data analysis: Pearson's correlation co-efficient was calculated using Instat ver. 3. Mean isometric endurance for back extensors was found to be low in males as compared to females. (Table 1 and Figure 1)

RESULTS

Table 1. Showing mean extensor and flexor endurance for males and female

Parameter	Males	Females (Mean±SD)
Isometric endurance for back extensors (Seconds)	52.56± 47.7	55.12 ± 57
Isometric endurance for back flexors (Seconds)	66.82± 52.8	112.5± 114

Mean isometric endurance for back flexors was more in females as compared to males. (Table 1)

Correlation co-efficient (r) for BMI and back extensor muscle endurance was found to be -0.5387 and -0.3218 for males and females respectively. (Table 2)

Table 2. Negative correlation co-efficient in males and females for trunk extensor muscle endurance.

	Males	Fe-males
Trunk extensor muscle endurance.	-0.5387	-0.3218
Trunk flexor muscle endurance.	-0.4647	-0.3218

and Figure 3).

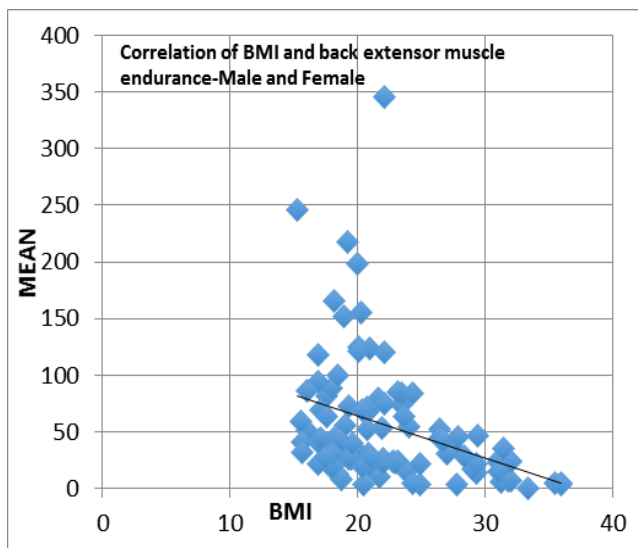


Figure 3. Showing correlation co-efficient for BMI and back extensor muscle endurance for males and females.

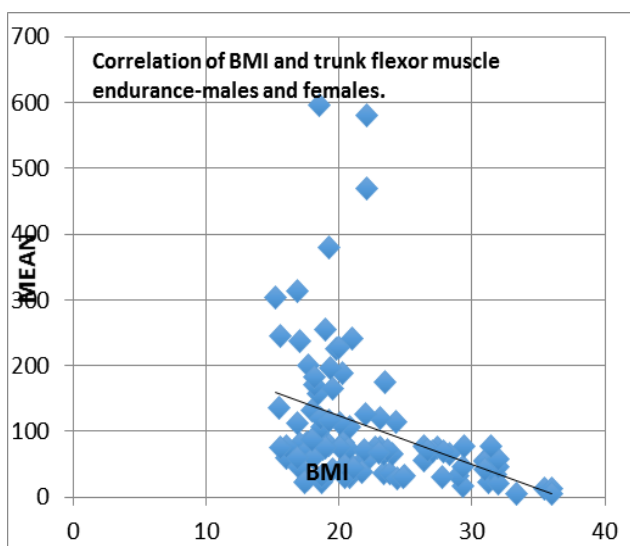


Figure 4. Showing correlation of BMI and trunk flexor muscle endurance-males and females.

When BMI was correlated with mean back flexor muscles endurance, the mean was found to be -0.4647 and -0.3218 for males and females respectively. (Figure 4).

DISCUSSION

The findings of the present study show strong negative correlation between BMI and back muscle endurance. Trunk flexor endurance was more as compared to back extensors. Also, when back muscle endurance was compared between male and female group, females were found to have greater strength as compared to males. A similar study done by Noha Abdel Kader Hasan and his colleagues supports our study. In their study, 75 children were included and were evaluated for abdominal and trunk endurance test. The study did show that- the BMI of children had a negative correla-

tion with the endurance time of abdominal and back extensor muscles [7].

As the BMI increases, person will go into high risk of obesity. A study says that people with high BMI are less physically active and physically fit than people with normal BMI [6]. This will lead to higher proportion of fast-fatigable fibers in the skeletal muscles of obese human requiring higher levels of muscle power than normally expected to move their limbs during exercises or while performing the test. This will decrease their ability to sustain the activity for longer period of time [7]. Also, it has been proven that obesity leads to postural changes in the body. These postural changes will lead to increased load on the spine, thereby, exerting more load on the erector spinae muscle [4]. Another reason behind reduced trunk muscle endurance is increased fatigability of the muscles. This increasing fatigue rate is due to increase in the force required for long term contraction of muscles, which in long run will lead to progressive low back pain [9].

The theory behind muscle fatigue is well explained in the study done by Sandra K. Hunter and colleagues. According to their study, the required muscle force during a task is obtained by varying the number of motor units recruited, and the rate of motor neuron discharge. For submaximal contractions, the interaction between the inputs to the motor neuron pool and the intrinsic properties of the motor neurons which result in progressive increase in the number of activated motor units and modest changes in discharge rate. So, the muscle force will be influenced by the initial increase and subsequent decrease in the discharge rate of motor-units [11].

Decreased trunk muscle endurance leads to changes in posture. This change in posture will lead to increased strain on the spine. This continuous deterioration in posture will affect muscle flexibility leading to reduced ROM, flexibility. All these factors together contribute in producing low back pain which will indeed hamper the functional mechanical advantage of the joint [12]. The prevalence of reduced muscle endurance and low back pain has been found to be related to increased BMI. This is due to increase in weight alters spinal biomechanics and loading creating excess strain to be put through structures [12].

The study was limited only to the young adults within a particular region. Also, the sample size was small. Hence, further study with the consideration of population from different regions and larger sample size should be done.

CONCLUSION

The mean trunk endurance for female was found to be more than males. Also, as the BMI increases there is decline in trunk endurance.

CONFLICT OF INTEREST: None.

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