

# Determination Of The Relationship Between Trunk Extensor Endurance And Physical Activity Level In Healthy Young Men

Mesut ERGAN<sup>1</sup>, Tuba İNCE PARPUCU<sup>1</sup>, Zeliha BAŞKURT<sup>1</sup>,  
Ferdî BAŞKURT<sup>1</sup>

<sup>1</sup>Suleyman Demirel University Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Isparta, Turkey,

## ABSTRACT:

**Objective:** Although the importance of trunk stabilization increases every day, there is limited evidence for the relationship between trunk muscle endurance and physical activity level. The present study aimed to determine the relationship between trunk extensor muscle endurance and the physical activity level associated with energy expenditure in healthy young men.

**Method:** Sixty young men participated in the study. The International Physical Activity Questionnaire (IPAQ) was used to assess the participants' physical activity level, and the Biering-Sørensen test (BST) was used to assess the endurance of the back extensors. Rating were performed for physical activity (<600 MET-min/week: low activity, 600-3000 MET-min/week: moderate activity, >3000 MET-min/week: high activity) and endurance levels (<90 sec: low endurance, 90-193 sec: moderate endurance, >193 sec: high endurance). Data were summarized with descriptive statistics. The chi-square test was employed to compare the IPAQ and BST ratings, and Pearson's correlation analysis was used to determine the relationship between the IPAQ and BST total scores.

**Results:** The participants' mean age was 21.91±1.86. Thirty-six people (60%) had moderate physical activity, and 38 people (63.3%) had low endurance. The mean IPAQ value was 2272.53±2384.72 MET-min/week, and the mean BST value was 76.11±32.96 sec. There was no statistically significant relationship between the IPAQ and BST ratings. There was a statistically insignificant low-level positive correlation between the IPAQ and BST total scores.

**Conclusion:** According to our findings, it was determined that there was no significant relationship between trunk extensor endurance and the physical activity level associated with energy expenditure in healthy young men.

**Keywords:** Trunk extensors, endurance, physical activity, healthy men, energy expenditure

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## I. Introduction

Physical activity is defined as activities that involve energy expenditure by using muscles and joints, increase heart and respiratory rate, and can be done at different intensities. Sports done during the day (walking, running, cycling, etc.), housework, transportation, leisure activities, and exercises for a healthy life are considered physical activities<sup>1</sup>. An inactive lifestyle increases the frequency of various health problems such as cardiovascular diseases, diabetes mellitus, obesity, some types of cancer, and musculoskeletal problems<sup>2</sup>. Regular participation in physical activity ensures healthy weight, bone mass, and muscle function and prevents falls in older adults<sup>3</sup>. Whereas today's technological developments, business life, urbanization, and other factors adversely affect human health, the fact that regular physical activity reduces the risk of mortality due to various diseases and increases the quality and duration of life increases the importance of physical activity even more<sup>1</sup>.

The trunk facilitates the transmission of force and angular moments between the lower and upper extremities during daily living activities. Moreover, ensuring proximal stability for distal mobility while keeping body weight within the support surface is a kinetic link that maintains balance. While trunk muscle strength is essential for maintaining daily living activities, trunk muscle endurance plays an important role in preventing injuries by stabilizing the spine during long-term physical and sports activities<sup>4</sup>. There is also evidence indicating that trunk muscle endurance is linked to many conditions, from athletic performance to preventing low back pain<sup>5</sup>. Furthermore, low endurance in the back extensor muscles was reported to be associated with increased low back pain, decreased proprioception, worsening of balance, and decreased productivity at work<sup>6</sup>.

Gibbons et al. stated that young age and low body fat percentage, high-frequency and intensity exercise, and work and leisure activities involving physical load affected static back endurance time statistically significantly<sup>7</sup>. Although this studies provides some insight into the factors contributing to a person's trunk endurance performance, there are few studies carried out on the relationship between trunk muscle endurance and physical activity level. The present study aimed to determine the relationship between trunk extensor endurance and the physical activity level associated with energy expenditure in healthy young men.

## II. Material and Methods

Sixty healthy young men participated in our study. The participants were selected on a voluntary basis. Prior to the study, the aim and content of the study were explained to the participants, and they signed a written informed consent form stating that they would participate voluntarily. As data collection tools, a socio-demographic data form was applied to the participants, the International Physical Activity Questionnaire (IPAQ) was applied to evaluate the physical activity level, and the Biering-Sørensen test (BST) was applied to evaluate the endurance of the back extensors.

### *Biering-Sørensen Test*

The BST was used to measure trunk extensor endurance. During the test, the participants were placed on the bed in the prone position, with the SpinaIliaca Anterior Superior (SIAS) level coinciding with the edge of the bed. The lower extremities were fixed to the bed in alignment. Before starting the test, the participants were asked to rest by placing the upper half of their body on a chair. Then, they were instructed to keep the upper body isometrically in a horizontal position as much as possible, with the arms folded over the chest. In all endurance tests, the maximum time they could maintain the position was recorded, and verbal feedback was given for minimal shifts<sup>8</sup>. Endurance levels were graded as low endurance (<90 sec), moderate endurance (90-193 sec), and high endurance (>193 sec)<sup>9</sup>.

### *International Physical Activity Questionnaire*

Physical activity level was evaluated with the Turkish version of the IPAQ. The short version of the questionnaire was used in our study. This form consists of seven questions that provide information about sitting, walking, moderate-intensity activities, and time spent in intense activities. Physical activity levels were classified as low activity (<600 MET-min/week), moderate activity (600-3000 MET-min/week), and high activity (>3000 MET-min/week)<sup>2</sup>.

### *Statistical Analysis*

The statistical analysis of all data acquired from the participants was performed with the IBM SPSS Statistics version 20.0 software. The participants' data were summarized with descriptive statistics. The chi-square test was conducted to compare the IPAQ and BST ratings, while Pearson's correlation analysis was used to determine the relationship between the IPAQ and BST total scores.

## III. Results

The participants were asked questions reflecting their socio-demographic characteristics such as age, body mass index (BMI), smoking, and alcohol consumption. The participants' mean age was 21.91±1.86 years, and their mean BMI was 23.80 kg. Thirteen people (21.7%) smoked, and 16 people (26.7%) consumed alcohol. Thirty-six people (60%) had moderate physical activity level, and 38 people (63.3%) had low endurance. The mean IPAQ value was 2272.53±2384.72 MET-min/week, and the mean BST value was 76.11±32.96 sec. Table 1 contains the distribution of the IPAQ and BST values.

**Table 1. Distribution of the IPAQ and BST Values**

		N	%
<b>IPAQ</b>	Low activity	12	20
	Moderate activity	36	60
	High activity	12	20
	Total	60	100
<b>BST</b>	Low endurance	38	63.3
	Moderate endurance	22	36.7
	Total	60	100
<b>IPAQ: International Physical Activity Questionnaire</b> <b>BST: Biering-Sørensen Test</b>			

Upon comparing the IPAQ and BST ratings, no statistically significant relationship was observed between the two variables (Table 2).

**Table 2. Examination of the Relationship Between the IPAQ and BST**

		BST				p*
		Low endurance		Moderate endurance		
		N	%	N	%	
IPAQ	Low activity	6	10.0	6	10.0	0.443
	Moderate activity	25	41.7	11	18.3	
	High activity	7	11.7	5	8.3	

\*:Chi-Square Test, IPAQ: International Physical Activity Questionnaire, BST: Biering-Sørensen Test

There was a statistically insignificant low-level positive correlation between the IPAQ and BSTtotal scores (Table 3).

**Table 3. The Correlation Between the IPAQ and BST Total Scores**

		BST	IPAQ
BST	r	1	0.155
	p		0.23
IPAQ	r	0.155	1
	p	0.23	

IPAQ: International Physical Activity Questionnaire,  
 BST: Biering-Sørensen Test  
 r: Correlation Coefficient

#### IV. Discussion

Core muscles are an important muscle group used in basic daily living activities such as sitting and walking, as well as advanced activities, and therefore they must be strengthened to perform activities and prevent injuries<sup>10</sup>. Physical activity should be transformed into a lifelong lifestyle. When physical activity is started in the early period, it can help prevent numerous health problems that may occur in older ages<sup>11</sup>. According to the data of the Turkish Statistical Institute for 2022, it is seen that the rate of the young population in Turkey is as high as 15.2%<sup>12</sup>. To prevent many health problems that may be encountered in older ages, it is essential to evaluate the physical activity level and indirectly the trunk muscle endurance, especially in young people, and to associate them with each other.

The present study was conducted to investigate the relationship between the physical activity level associated with energy expenditure and trunk extensor endurance scores. According to the results of our study, most of the healthy young men had moderate physical activity level (36 people, 60%) and low trunk extensor endurance (38 people, 63.3%). No statistically significant relationship was found between the participants' trunk extensor endurance and physical activity level.

Some authors indicated a relationship between physical activity and the muscle strength and endurance of back extensors. However, calculations regarding the energy spent during physical activity were not made in these studies<sup>7,13</sup>. Another study stated that there was a weak correlation between upper and lower extremity muscle strength and physical activity level, but physical activity might not be effective in decreasing muscle strength due to age and disease<sup>14</sup>. Bayraktar et al. found no relationship or correlation between the isometric endurance of trunk muscles in women and men and physical activity associated with energy expenditure<sup>5</sup>. In the study conducted by Akduman et al. on female and male university students, increasing intense physical activity caused an increase in anterior plank and lateral plank test times. However, activities such as walking and sitting did not impact the plank test times. In conclusion, it was stated in the study that there was no statistically significant relationship between physical activity levels and core endurance, and it was stressed that physical activity levels might be related to core strength rather than core endurance<sup>11</sup>. The study by Kapduler and Polfound a significant relationship between trunk stability and physical activity in young adults. Men have better trunk stability compared to women. A significant relationship was observed between physical activity level and plank test time<sup>15</sup>. It is seen that there are conflicting results in the literature. The reasons for such results obtained in our study are as follows. First, if a person performs only some leisure activities as exercise or physical activity, or if he/she walks and does not do special exercises for the trunk extensors, an increase in trunk extensor endurance is not expected, but the person can be active according to the IPAQ. In this case, the person's physical activity level associated with energy expenditure will be high, but trunk extensor endurance will be low. Second, since we used the questionnaire, which is a subjective assessment method, to determine physical activity level, the participants are likely to influence the results. They may present themselves as overactive or inactive people. Bayraktar et al. also emphasized these results<sup>5</sup>. To reach definite conclusions,

there is a need for new studies with wide participation, comparing men and women and using objective methods.

## V. Conclusion

Considering the results of the present study, physical activity level is not significantly affected by trunk extensor endurance. Hence, people should be directed to exercises aimed at increasing trunk endurance.

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