

## ORIGINAL SCIENTIFIC PAPER

# Relationships Between Some Morphological Characteristics and the Body Mass Index and the Distance Achieved in Shot Put

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## Abstract

The purpose of this study was to identify the relationships between some morphological characteristics and the body mass index and the distance achieved in shot put. The sample of this study consisted of twenty-one students from Department of Physical Education at Sultan Qaboos University. Morphological characteristics namely body height, legs length, arms length, trunk length, and body weight. Body mass index was calculated as body weight in kilograms divided by height in meters squared. Distance achieved in shot put also was measured. The collected data were analyzed using the statistical package SPSS and the descriptive statistics were expressed as mean (SD) for each variable, while the simple correlation was carried out to detect the relationships between the morphological characteristics, the body mass index and the distance achieved in shot put. The analysis of the data indicates that the distance achieved in shot put was significantly correlated with body height, legs length, arms length and trunk length, while the distance achieved in shot put was not significantly correlated with body weight and body mass index.

**Keywords:** *Morphological Characteristics, Body Mass Index, Shot Put*

## Introduction

Athletics events are activities that depend on achievement of the score and the individual characteristics of the player and his ability to overcome the distance, the time and the height (Hochmuth, 1999). Morphological characteristics play a major role in superiority in the sports field, and that the skillful performance of any sport requires specific morphological characteristics (Khater & Elbeik, 1996). Many researchers confirm that the shape and structure of the body affect on many motor abilities and can improve motor performance by bringing superiority to athletes in various sports activities (Hassanein, 2000, Arifi, Bjelica, & Masanovic, 2019).

Morphological characteristics are particular importance for orientation and selection in most sports disciplines, since in the equation of the specification of almost every sport, the morphological dimensions occupy one of the most important positions.

Identifying talented children, assessing their strength and weaknesses, and planning the training programs in the proper manner are the basis of each work. Therefore, the scientists in all over the world are looking for the standard formula that can improve the performance of elite players and discover talents as precisely as possible (Popovic, Akpınar, Jaksic, Matic, & Bjelica, 2013).

Many researchers hypothesized that practicing athletes might be expected to exhibit structural and functional characteristics that are specifically favorable for their specific sport (S. Singh, K. Singh, & M. Singh, 2010). Since each sport has its own specific demands, every athlete should have specific anthropometrical characteristics and body composition figures for his own sports discipline. Tešanović et al., (2010) analyzed the relations between the body mass index and the anthropometric dimension and the results achieved in shot put. The test population encompassed 112 male

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examinees, and they established that there was a statistically significant importance between the body mass index, anthropometric dimensions – body height and arm length and results achieved in shot put, while no statistical significance was observed in leg length.

It should be noted that the overall evaluation in the process of selecting children for the various branches of athletics should supplement, pay attention on those characteristics that may be assumed higher predictive value than top athletic results, because we cannot disregard trend of biological development, especially anthropometric characteristics. Current knowledge of theory and practice in the field of athletics suggests that when it comes to the morphological characteristics, it is necessary to pay attention to body height, body mass and the topological structure of the body, and the selection of athletic throwing should choose children with high levels of longitudinal skeleton dimensionality, the great mass of the body and a small amount of subcutaneous adipose tissue (Bošnjak, 2006).

Researchers who have studied the research in this area agree that the morphological characteristics are important determinants of success in throwing events (Milanović & Harasin, 2003; Zatiorsky, 1981). The height of the shot release affects the distance achieved, which depends on the arm length and the body height, and that the extension of the body in the moment of the throwing effectively increases the speed of release (Bastouisse, 1997)

Hence, the purpose of this study was to identify the relationships between the morphological characteristics and the body mass index on the distance achieved in shot put of the Physical education department students at Sultan Qaboos University.

## Methods

Testing was conducted on the sample of 21 male students

( $20 \pm 0.66$  yrs) from Department of Physical Education at Sultan Qaboos University who studied athletics course which includes shot put skill. Each subject who participated in testing procedures was provided with an explanation of the study and the envisaged testing procedure. All subjects needed to sign an agreement confirming that they are familiar with the purpose and objectives of the study and the testing protocol, and that they approached testing voluntarily.

Morphological characteristics were measured using anthropometric measurement technique. They were measured body height, legs length, arms length, and trunk length to the nearest 0.1 cm, also body weight to the nearest 0.1 kg. Body mass index (BMI) was calculated as body weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Distance achieved in shot put was measured to the nearest 0.1 cm, each student performed two attempts of shot put to the longest distance using the glide technique with (5 kg) shot, and then the best attempt was selected. All measures data were collected during the final practical exam of second semester of the academic 2017/2018 year at the sports complex for men in Sultan Qaboos University with the students dressed in light clothing.

The statistical package SPSS version 22.0 (Chicago, IL, USA) was used for the statistical analysis of the collected data. The descriptive statistics were expressed as mean (SD) for each variable, while the simple correlation was carried out to detect the relationships between the morphological characteristics, the body mass index and the distance achieved in shot put.

## Results

In table 1 basic descriptive statistical parameters of (body height, legs length, arms length, trunk length, body weight), body mass index (BMI), as well as distance achieved in shot put are shown.

**Table 1.** Central and dispersion parameters of morphological characteristics, body mass index and the distance achieved in shot put (n = 21)

Variables	Minimum	Maximum	Mean	SD
Body height (cm)	158	182	170.85	5.90
Legs length (cm)	71	85	77.64	3.91
Arms length (cm)	75	90	81.83	4.02
Trunk length (cm)	83	95	89.02	3.18
Body weight (kg)	50.80	77.20	72.87	7.10
BMI	18.60	25.20	21.50	1.83
Distance achieved (m)	3.30	8.05	5.73	0.97

Note: BMI - Body mass index ; Mean – Arithmetic mean; SD – Standard deviation

In table 2 the correlations among the individual parameters are shown. The analysis of the data indicates that the distance achieved in shot put was significantly correlated with body height (0.607 at 0.01 levels), and with arms length (0.597 at 0.01 levels). That the body height was significantly correlated with body weight (0.648 at 0.01 level), with legs length (0.861 at 0.01 level), with arms length (0.822 at 0.01 level) and with trunk length (0.765 at 0.01 level). Also, the body weight was significantly correlated with BMI (0.807 at 0.01 level), with arms length (0.615 at 0.01

level), with trunk length (0.761 at 0.01 level). A significant correlation at 0.05 level is seen between legs length and arms length (0.697). Ultimately, the arms length was significantly correlated with trunk length (0.642 at 0.01 level).

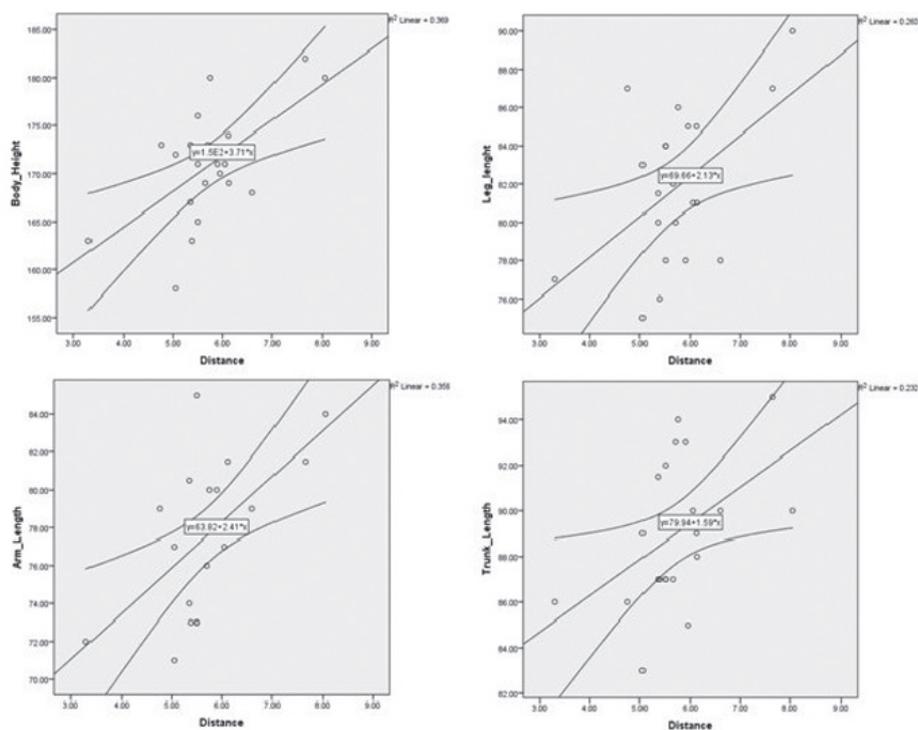
Likewise, the analysis of the data indicates that distance achieved in shot put was significantly correlated at 0.05 level with legs length (0.519) and with trunk length (0.492), while the distance achieved in shot put was not significantly correlated with body weight and with body mass index.

**Table 2.** Correlations between the morphological characteristics, the body mass index and the distance achieved in shot put

Variables	Body Height	Body weight	BMI	Legs length	Arms length	Trunk length	Distance achieved
Body Height	1						
Body weight	.648**	1					
BMI	.077	.807**	1				
Legs length	.861**	.348	-.215	1			
Arms length	.822**	.615**	.154	.697**	1		
Trunk length	.765**	.761**	.415	.331	.642**	1	
Distance achieved	.607**	.393	.038	.510*	.597**	.482*	1

Note: BMI - Body mass index ; \*\* - Correlation is significant at the 0.01 level; \* - Correlation is significant at the 0.05 level

In Figure 1 the correlations between the distance achieved in shot put and body height, legs length, arms length, trunk length is shown.



**Figure 1.** Significant correlations between the distance achieved in shot put and morphological characteristics

## Discussion

The results obtained showed that there is a significant correlation between the distance achieved in shot put and the morphological characteristics namely body height, legs length, arms length, and trunk length, while the distance achieved in shot put was not a significantly correlated with body weight and body mass index. It was confirmed that the higher value of the player's height, arms length, legs length and trunk length, the longer the distance achieved in shot put. These results are consistent with previous research who indicates to that the morphological characteristics play a major role in superiority in the sport field, and that the skillful performance of any sport requires specific morphological characteristics (Khater & Elbeik 1996; Hassanein, 2000). Also, these results are also consistent with Bastouisse 1997, who indicates to that the height of the shot release affects the distance achieved. However, study of Tešanović et al. 2010 indicate that there was a statistically significant correlation between body height, arm length, body mass index and results achieved in shot put, while not exist a significantly correlated between the distance achieved in shot put and the legs length. The results of the current study differed with those of Tešanović et al. 2010 in terms of the relationship between the distance achieved in shot put and body mass index, and distance achieved in shot put and legs length. The researchers attributed these differences in the results to the different samples used in the two studies in terms of age and morphological characteristics.

We can conclude from previous results that the morphological characteristics play a major role in superiority in the shot put. The higher value of the player's height, arms length, legs length and trunk length, the longer higher value of the player's height, arms length, legs length and trunk length, provides the longer the distance achieved in shot put. Hence, in the selection of athletic throwing should choose children with high levels of longitudinal skeleton dimensionality.

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## Conflict of Interest

The authors declare that there are no conflicts of interest.

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