

MOTOR LEARNING

Anthropometric Variables and Visual Reaction: A Relationship Study on Volleyball Players

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Abstract

Volleyball is a competitive sport and the main goal is to win or defeat other teams. The purpose of the study was to investigate the relation between selected anthropometric variables and reaction time of volleyball players. Fourteen district-level volleyball players from Bolpur, Birbhum, and West Bengal were selected as subjects. The age of the subjects was 19 to 25 years. Anthropometric segments (i.e., height, weight, arm length, leg length, BMI, and reaction time) were the variables of the study. Pearson product-moment correlation coefficient was used to find out the relationship. The level of significance was set at 0.05. There is a positive relationship between reaction time and weight, arm length, leg length, and BMI, but there is a negative relationship between height and reaction time of volleyball players.

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Volleyball is one of the most popular sports in the world. In 1895, Willam G. Morgan started the game of volleyball and he named it “Mintonette” for business people. Later, Professor Alfered Halstead, seeing the nature of the game, suggested that the name “Mintonette” be replaced with “Volleyball.”

Afterward, in the year 1947, the Fédération Internationale de Volleyball was established as the international controlling federation of the game, followed by different national federations formed to control the game nationally. In India, the Volleyball Federation of India was established in the year 1951.

Volleyball then developed rapidly around the world. In 1949, the volleyball world championships was launched. In 1964, volleyball was introduced in the Olympics for first time in Tokyo.

From the era of inception to the present era, the game has changed. It was started as a outdoor game but became a specialized indoor game. Initially, it was started as a recreation game but is now a specialized sports in which every player plays a specific roll in specialized positions such as spiker, setter, and libero.

Currently, volleyball is a competitive sport and the main goal is to win or defeat other teams, which requires a high level of performance and sound tactical system. A high level of performance demands a high level of physical fitness, power, mental alertness, reaction time, and anthropometric characteristic and a good level of co-coordinative abilities and various other factors.

Anthropometric measurements are a series of quantitative measurements of the muscle, bone, and adipose tissue used in the assessment of body composition. The core elements of anthropometry are height, weight, body mass index (BMI), body circumferences (waist, hip, and limbs), and skinfold thickness. Additionally, anthropometric measurements can be used as a baseline for physical fitness and as a method of tracking the progress of fitness (Casadei & Kiel, 2020).

Reaction time is the time interval between the application of a stimulus and the appearance of appropriate voluntary response by a subject. It involves stimulus processing, decision making, and response programming. Reaction time can be altered by a number of factors both physiological and pharmacological (Nene et al., 2011).

Seeing the basic demand of the present volleyball, we formulated this study with the basic intention to find whether any relationship exists between selected anthropometric characteristics and reaction time.

Method

Design of the Study

Purposive design was used by which the volleyball players were selected as subjects for the this study.

Selection of Subjects

The study was conducted on 14 district-level male volleyball players from the age category of 19 to 25 years. All the players were from Bolpur, Birbhum, and West Bengal, India. Before the start of the test, the participants were informed about the aim of the study and also told the details of the procedures of the test.

Selection of Variables

Anthropometric variables of height, weight, arm length, leg length, BMI, and reaction time were the variables of the study. Data were collected on two alternative days. On first day, data were collected on reaction time. On the next day, data were collected on selected anthropometric variables.

Criterion Measure

Height was measured with a stadiometer in meters. Weight was measured with a weight machine in kilograms. Arm length was measured with a measuring tape in centimeters. Leg length was measured with a measuring tape in centimeters. BMI was measured with weight in kilograms divided by height in meters squared. Reaction time was measured with an audio visual reaction timer in seconds.

Statistical Procedure

For the purpose of understanding the relationship between reaction time and selected anthropometric variables, Pearson product-moment correlation coefficient was used. The level of significance was set at 0.05.

Results

Table 1 shows the descriptive statistics of selected anthropometric segments and reaction time. Table 2 shows a clear relationship between reaction time and height ($r = -0.07$), reaction time and weight ($r = 0.20$), reaction time and arm length ($r = 0.01$), reaction time and leg length ($r = 0.08$), reaction time and BMI ($r = 0.22$). Figure 1 shows a graphical presentation of the relationship between selected anthropometric segments and reaction time.

Table 1

Mean and Standard Deviation of Selected Anthropometric Segments and Reaction Time

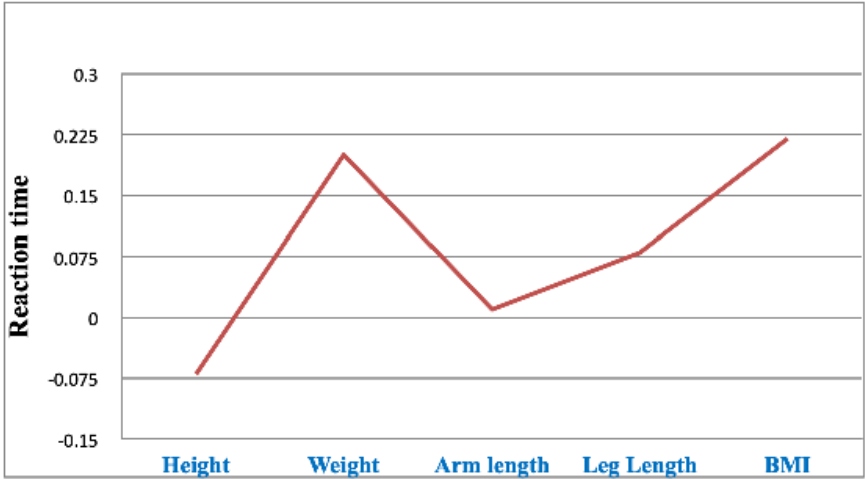
Variables	<i>M</i>	<i>SD</i>
Height	1.73	0.05
Weight	65.07	6.45
Arm length	77.36	3.65
Leg length	94.21	5.94
BMI	21.67	2.23
Reaction time	0.31	0.08

Table 2

Pearson Product-Moment Correlation Coefficients Between Selected Anthropometric Segments and Reaction Time of Volleyball Players

Anthropometric variable	<i>N</i>	Correlation coefficient
		<i>r</i>
Height	14	-0.07
Weight	14	0.2
Arm Length	14	0.01
Leg Length	14	0.08
BMI	14	0.22

Figure 1
Graphical Presentation of the Relationship Between Selected Anthropometric Segments and Reaction Time



Discussion

The results reveal a positive relationship between reaction time and selected anthropometric segments (i.e. weight, arm length, leg length, and BMI) and a negative relationship between reaction time and height.

This may be because reaction time is a co-coordinative component of performance-related physical fitness. In case of reaction time with an adequate stimulus, muscles are excited and excited muscles contract. This is immediately followed by relaxation. The general anthropometrical measures are dependent upon the genetic factor and may also depend on the nature of the activity, the training age of the player, and the position played in volleyball. We selected the volleyball players from the district level. The players had received proper training and had practiced the game on regular basis under proper guidance. This may be the reasons for such a result.

The results of the study are also supported by another study. The Sudheer et al. (2017) study reveals a positive relationship between BMI and visual reaction time. The probable reason for this positive correlation between BMI and visual reaction time is that elevations of BMI can lead to pathophysiologic changes such as vascular

changes, impaired insulin regulation, systemic inflammation, and reduced cardiovascular fitness, which can impact cognitive functioning, thereby slowing the processing capability and leading to a longer reaction time (Sudheer et al., 2017).

Conclusion

This study reveals positive relationships between reaction time and weight of district-level male volleyball players, between reaction time and arm length of district-level male volleyball players, between reaction time and leg length of district-level male volleyball players, and between reaction time and BMI of district-level male volleyball players. It also shows an inverse relationship between height and reaction time of district-level male volleyball.

References

- Casadei, K., & Kiel, J. (2020). Anthropometric measurement. In *StatPearls*. National Library of Medicine. <https://www.ncbi.nlm.nih.gov/books/NBK537315/>
- Nene, A. S., Pazare, P. A., & Sharma, K. D. (2011). A study of relation between body mass index and simple reaction time in healthy young females. *Indian Journal of Physiology and Pharmacology*, 55(3), 288–291.
- Sudheer, C., Jagadeesan, S., & Kammar, F. K. (2017). Impact of BMI on visual reaction time in individuals with BMI in Normal range. *International Journal of Physiology*, 5(2), 10–12. <https://doi.org/10.5958/2320-608X.2017.00045.2>