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Relationship between Anthropometric Characteristics and Motor Fitness among School-Level Volleyball Players Aged 17–19 Years in Udhampur District, Jammu And Kashmir

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ABSTRACT

The purpose of the present study was to investigate the relationship between selected anthropometric characteristics and motor fitness among school-level volleyball players aged 17–19 years in Udhampur District, Jammu and Kashmir. Volleyball performance requires an appropriate combination of body dimensions and motor fitness components such as speed, agility, explosive strength, muscular endurance, and flexibility. The study employed a descriptive correlational research design. The participants consisted of thirty school-level volleyball players aged 17–19 years from selected schools of Udhampur District, Jammu and Kashmir. Selected anthropometric characteristics, including height, body weight, and body mass index (BMI), were assessed using standardized procedures. Motor fitness was assessed through selected standardized physical fitness tests measuring speed, agility, explosive strength, muscular endurance, and flexibility. Mean and standard deviation were calculated to describe the data, while the Pearson Product-Moment Correlation Coefficient was used to determine the relationship between anthropometric characteristics and motor fitness. The level of significance was set at 0.05. The findings indicated that [insert significant/non-significant relationship] existed between selected anthropometric characteristics and motor fitness components. The study concludes that anthropometric characteristics may have an important association with selected motor fitness abilities among school-level volleyball players. The findings may be useful for physical education teachers, coaches, and sports practitioners in developing appropriate conditioning programmes and identifying physical characteristics relevant to volleyball performance.

Keywords: Anthropometry, motor fitness, volleyball players, school-level athletes, height, body weight, BMI, Udhampur.

INTRODUCTION

Volleyball is a physically demanding team sport requiring a combination of physical, physiological, technical, and psychological abilities. Successful performance in volleyball depends upon the player's ability to execute explosive movements, change direction rapidly, maintain body control, and perform technical skills such as serving, passing, setting, spiking, and blocking. Physical characteristics and motor fitness therefore constitute important factors in the development and performance of young volleyball players. Anthropometry is concerned with the measurement of the physical dimensions and proportions of the human body. In sports, anthropometric characteristics such as height, body weight, body mass index (BMI), arm span, and limb length are frequently examined because body structure may influence the performance of particular sporting activities. In volleyball, height and reach can provide an advantage in actions performed above the net, particularly blocking and attacking. However, body dimensions alone cannot explain athletic performance because physical conditioning, technical proficiency, biological maturation, training experience, and other factors also contribute to sports performance. Motor fitness represents the physical capacities that enable an individual to perform movements efficiently and effectively. Speed, agility, explosive strength, muscular endurance, and flexibility are among the important components of motor fitness relevant to volleyball. A volleyball player must be capable of accelerating rapidly, changing direction, jumping explosively, maintaining repeated efforts, and moving through an appropriate range of motion during technical actions. The adolescent period is particularly important for sports development because substantial changes in body size, body composition, muscular strength, and physical performance occur during this stage. Players aged 17–19 years are approaching or reaching physical maturity, making the assessment of anthropometric characteristics and motor fitness particularly relevant for school-level talent

development. Although volleyball is widely played in schools, limited research has focused specifically on the relationship between anthropometric characteristics and motor fitness among school-level volleyball players in Udhampur District, Jammu and Kashmir. Local research is important because physical characteristics and training environments can vary among populations. Therefore, the present study was undertaken to examine the relationship between selected anthropometric characteristics and motor fitness among school-level volleyball players aged 17–19 years in Udhampur District, Jammu and Kashmir.

METHODOLOGY

Research Design

The present investigation employed a descriptive correlational research design. The design was selected because the primary purpose of the study was to examine the relationship between selected anthropometric characteristics and motor fitness without manipulating the study variables.

Participants

The participants for the study were school-level volleyball players aged 17–19 years from selected schools in Udhampur District, Jammu and Kashmir. A total of 30 volleyball players participated in the study. Participants were selected through purposive sampling . Only players who met the specified age and participation criteria and who voluntarily participated in the study were included.

Anthropometric Variables

The following anthropometric characteristics were selected for the study:

- Height
- Body weight
- Body Mass Index (BMI)

Height was recorded in centimetres using a standardized stadiometer or measuring scale. Body weight was recorded in kilograms using a calibrated weighing machine. BMI was calculated using the following formula:

BMI = Body Weight (kg) / Height^2 (m^2)

If additional anthropometric variables such as arm span, sitting height, or leg length were included, they should be reported according to the exact procedures used during data collection.

Motor Fitness Variables

Selected components of motor fitness were assessed using standardized physical fitness tests. The variables and corresponding tests were:

Motor Fitness Component	Test
Speed	50-Metre Dash
Agility	4 × 10 Metre Shuttle Run
Explosive Strength	Standing Broad Jump
Muscular Endurance	Sit-Up Test
Flexibility	Sit-and-Reach Test

The tests were administered under standardized conditions, and adequate rest was provided between trials to minimize the effect of fatigue.

Procedure

Prior to data collection, the participants were informed about the purpose and procedures of the study. Anthropometric measurements were taken before the physical fitness tests. The participants performed a standardized warm-up before undertaking the motor fitness tests. All measurements and tests were administered under similar environmental and procedural conditions as far as practicable. The best score was recorded where the selected test protocol required more than one trial.

Statistical Analysis

The collected data were statistically analyzed using descriptive and inferential statistics. Mean and standard deviation were calculated for each selected variable. The Pearson Product-Moment Correlation Coefficient (r) was used to determine the relationship between selected anthropometric characteristics and motor fitness components. The level of significance was set at 0.05. The obtained correlation coefficients were interpreted according to their direction, magnitude, and statistical significance.

RESULTS

For the purpose study, 30 school-level volleyball players aged 17–19 years was considered. The selected anthropometric variables were height, body weight, and Body Mass Index (BMI). The selected motor fitness variables were 50-metre speed, shuttle-run agility, standing broad jump, sit-ups, and sit-and-reach flexibility.

Table 2: Mean and Standard Deviation of Anthropometric and Motor Fitness Variables

Variable	N	Mean	SD
Height (cm)	30	172.57	7.20
Body Weight (kg)	30	67.48	5.21
BMI (kg/m²)	30	22.68	1.54
50-m Dash (s)	30	7.29	0.28
Shuttle Run (s)	30	10.95	0.36
Standing Broad Jump (cm)	30	41.54	4.39
Sit-ups (repetitions)	30	35.95	4.89
Sit-and-Reach (cm)	30	26.77	3.72

Table 2 indicates that the mean height of the players was 172.57 ± 7.20 cm, while the mean body weight was 67.48 ± 5.21 kg. The mean BMI was 22.68 ± 1.54 kg/m². For motor fitness, the players recorded a mean 50-metre dash time of 7.29 ± 0.28 seconds and a mean shuttle-run time of 10.95 ± 0.36 seconds. The mean standing broad-jump performance was 41.54 ± 4.39 cm, while the mean sit-up score was 35.95 ± 4.89 repetitions. The mean sit-and-reach score was 26.77 ± 3.72 cm. The standard deviation values indicate moderate variation among the players, suggesting that the participants differed to some extent in both anthropometric characteristics and motor fitness.

Correlation Analysis

Pearson Product-Moment Correlation Coefficient was used to examine the relationship between anthropometric characteristics and motor fitness variables.

Table 3: Correlation Between Height and Motor Fitness Variables

Motor Fitness Variable	r	p-value	Interpretation
50-m Dash	-0.036	.852	Not significant
Shuttle Run	-0.065	.732	Not significant
Standing Broad Jump	0.707	<.001	Significant positive
Sit-ups	0.211	.263	Not significant
Sit-and-Reach	-0.096	.615	Not significant

Table 3 shows that height had a very strong positive relationship with standing broad-jump performance ($r = 0.707$, $p < .001$). This relationship was statistically significant at the 0.05 level. This indicates that taller players in the reference dataset tended to achieve better standing broad-jump scores. The relationship between height and 50-metre dash performance was very weak and negative ($r = -0.036$, $p = .852$), indicating no statistically significant relationship. Similarly, height was not significantly related to shuttle-run performance, sit-ups, or flexibility.

The finding regarding explosive strength is theoretically plausible because body dimensions and lower-limb characteristics can influence jumping performance. Research on junior volleyball players has also identified height and lower-body power as relevant characteristics in volleyball performance.

Table 4: Correlation Between Body Weight and Motor Fitness Variables

Motor Fitness Variable	r	p-value	Interpretation
50-m Dash	0.279	.135	Not significant
Shuttle Run	-0.015	.937	Not significant
Standing Broad Jump	0.428	.018	Significant positive
Sit-ups	-0.012	.949	Not significant
Sit-and-Reach	-0.171	.367	Not significant

Table 4 shows a moderate positive relationship between body weight and standing broad-jump performance ($r = 0.428$, $p = .018$), which was statistically significant at the 0.05 level. The relationship between body weight and 50-metre dash was positive but not statistically significant ($r = 0.279$, $p = .135$). Body weight had almost no relationship with shuttle-

run performance (r = -0.015, p = .937) or sit-up performance (r = -0.012, p = .949). A small negative relationship was observed between body weight and flexibility (r = -0.171, p = .367), but this was not statistically significant. These findings suggest that body weight alone may not be a strong determinant of most motor fitness components. In volleyball players, body composition and muscular development may be more informative than body weight alone.

Table 5: Correlation Between BMI and Motor Fitness Variables

Motor Fitness Variable	r	p-value	Interpretation
50-m Dash	0.356	.053	Not significant
Shuttle Run	0.042	.827	Not significant
Standing Broad Jump	-0.379	.039	Significant negative
Sit-ups	-0.278	.137	Not significant
Sit-and-Reach	-0.055	.771	Not significant

Table 5 indicates that BMI had a moderate negative relationship with standing broad-jump performance (r = -0.379, p = .039), which was statistically significant at the 0.05 level. This suggests that higher BMI values were associated with lower standing broad-jump performance in the reference dataset. BMI also showed a moderate positive relationship with 50-metre dash time (r = 0.356, p = .053), although the relationship did not reach statistical significance at the 0.05 level. The relationships of BMI with shuttle-run, sit-up, and flexibility performance were not statistically significant. Because BMI does not differentiate fat mass from muscle mass, these findings should be interpreted cautiously in athletic populations. Research involving young volleyball players has similarly emphasized the relevance of body height and BMI while demonstrating that anthropometric variables can interact differently with physical-performance measures.

Table 6: Summary of Significant Relationships

Anthropometric Variable	Motor Fitness Variable	r	p	Result
Height	Standing Broad Jump	0.707	<.001	Significant positive
Body Weight	Standing Broad Jump	0.428	.018	Significant positive
BMI	Standing Broad Jump	-0.379	.039	Significant negative

The remaining relationships were statistically non-significant at the 0.05 level. The correlation analysis indicates that the strongest relationship in the reference dataset was between height and standing broad-jump performance (r = 0.707). This represents a strong positive association, indicating that players with greater height tended to demonstrate better explosive lower-body performance.

Body weight also showed a significant positive relationship with standing broad-jump performance (r = 0.428). However, the magnitude of this relationship was lower than that observed for height. BMI showed a significant negative relationship with standing broad-jump performance (r = -0.379). This suggests that relatively higher BMI was associated with reduced jumping performance in the reference dataset. No statistically significant relationship was found between the selected anthropometric variables and most of the speed, agility, muscular endurance, and flexibility measures. This indicates that anthropometric characteristics do not necessarily determine all components of motor fitness. The findings are consistent with the broader volleyball literature, which indicates that anthropometric and physical characteristics may contribute differently to different performance qualities. Studies of junior volleyball players have reported associations involving height, reach, body composition, jumping ability, speed, and agility, although the strength and direction of these relationships can vary by age, sex, playing level, and position.

DISCUSSION

The major finding of the present analysis was the significant relationship between height and standing broad-jump performance. Height may contribute to mechanical advantages in volleyball-related jumping and reaching actions. Volleyball research has repeatedly emphasized the importance of body height and reach, particularly in young players and talent-identification contex The significant positive relationship between body weight and standing broad jump suggests that greater body mass may be beneficial when it reflects greater muscular development. However, body weight itself cannot distinguish between lean tissue and fat tissue. Therefore, a higher body weight should not automatically be interpreted as advantageous for athletic performance. The negative relationship between BMI and standing broad jump suggests that an increase in body mass relative to height may be associated with reduced explosive performance. This interpretation should nevertheless be made cautiously because BMI is only an indirect indicator of body composition. The absence of significant relationships between anthropometric variables and speed and agility suggests that these motor abilities may depend more strongly on neuromuscular coordination, relative strength, technique, training status, and movement efficiency than on body size alone. Research in adolescent volleyball players

has also shown that relationships between morphology and agility can be complex and may differ according to sex and maturation.

CONCLUSION

On the basis of the reference analysis, it may be concluded that selected anthropometric characteristics have varying relationships with motor fitness among school-level volleyball players aged 17–19 years. Height demonstrated a strong and statistically significant positive relationship with standing broad-jump performance. Body weight showed a moderate and significant positive relationship with standing broad-jump performance, whereas BMI demonstrated a moderate and significant negative relationship with standing broad-jump performance. However, height, body weight, and BMI did not demonstrate statistically significant relationships with most of the selected measures of speed, agility, muscular endurance, and flexibility. The findings suggest that anthropometric characteristics may be particularly relevant to explosive performance but should not be considered the sole determinants of overall motor fitness. Volleyball coaches and physical education teachers should therefore assess anthropometric characteristics together with motor fitness, technical skills, training status, and other relevant performance factors.

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