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Comparison of somatotype of inter-university and inter-college volleyball players

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Abstract

This study aimed to explore somatotype differences between inter-university and inter-college volleyball players. A total of 240 male volleyball players were examined, comprising 120 inter-university players (mean \pm standard deviation, body mass 73.3 ± 9.1 kg, stature 184.4 ± 8.8 cm) and 120 inter-college players (mean \pm standard deviation, body mass 70.1 ± 8.5 kg, stature 180.8 ± 6.3 cm), aged between 18-25 years, drawn from various universities in northern India. Somatotypes were assessed using the Heath & Carter method. The findings indicate that inter-university volleyball players exhibited significantly lower endomorphic component ($p < 0.05$) and significantly higher mesomorphic component ($p < 0.05$) compared to their inter-college counterparts. However, no significant difference was observed in the ectomorphic component between the two groups. In conclusion, inter-university players demonstrated superior somatotype characteristics compared to inter-college volleyball players.

Keywords: Somatotype, inter-university, inter-college, volleyball players

Introduction

The anthropometric and somatotype characteristics of players have long been a focal point for athletes, sports coaches, physical education teachers, and sports professionals, deemed crucial parameters contributing to volleyball team success (Gualdi-Russo & Zaccagni, 2001; Duncan *et al.*, 2006; Gaurav *et al.*, 2010; Gaurav *et al.*, 2011) ^[13, 4, 9, 11]. Success in volleyball is believed to be significantly influenced by players' anthropometric characteristics (Gaurav *et al.*, 2010) ^[9]. Performance in volleyball hinges on tactical maneuvers and players' proficiency in fundamental skills such as serving, spiking, digging, and blocking, as well as more position-specific skills. The key attributes of top-level volleyball players encompass age, size, somatotype, technique, and tactical skills (Gjinovci *et al.*, 2014; Sterkowicz-Przybycien *et al.*, 2008) ^[12, 26]. Young volleyball players are typically described as ecto-mesomorphic in somatotype (Duncan *et al.*, 2006; Teixeira *et al.*, 2016) ^[4, 27]. Understanding body characteristics is essential for assessing their significance in achieving success in today's competitive sports (Viswanathan & Chandrasekaran, 2011) ^[30]. Volleyball, being a sport where somatic features significantly influence performance levels during matches, has been shown to exhibit significant somatic characteristics compared to age-matched control groups (Gaurav *et al.*, 2011) ^[11]. In essence, in addition to high levels of technical and tactical skills, optimal body characteristics in each player are imperative for high-level sports performance in volleyball (Palao *et al.*, 2004) ^[20]. Gualdi-Russo and Zaccagni (2001) ^[13] examined the significance of somatometric components among elite volleyball players of both genders, finding somatotype values to vary according to players' roles in the game. Duncan *et al.* (2006) ^[4] utilized the Heath-Carter method to assess the somatotype of junior elite volleyball players, revealing that setters tended to be more ectomorphic and less mesomorphic than centers. There is substantial evidence supporting a positive relationship between somatotype and success in sport and physical performance. Existing somatotype data on athletes serve as valuable guidelines for talent identification and training program selection to enhance performance (Pastuszak *et al.*, 2016) ^[21]. Palao *et al.* (2014) ^[19] discovered that players from the highest-ranked teams exhibited greater body height and weight compared to those from lower-ranked teams.

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Consequently, numerous previous studies have evaluated the anthropometric profiles of volleyball players (Bandyopadhyaya, 2007; Bayios *et al.*, 2006; Gabbett & Georgieff, 2007; Gaurav *et al.*, 2010; Gaurav *et al.*, 2011; Petroski *et al.*, 2013) ^[1, 2, 7, 9, 11, 22]. Thus, the aim of this study was to compare somatotype characteristics between inter-university and inter-college volleyball players.

Materials and Methods

Participants: The study included 120 inter-university male volleyball players (mean \pm standard deviation: body mass 73.3 \pm 9.1 kg, stature 184.4 \pm 8.8 cm) and 120 inter-college male volleyball players (mean \pm standard deviation: body mass 70.1 \pm 8.5 kg, stature 180.8 \pm 6.3 cm) aged between 18-25 years. Participants were purposively sampled from various colleges and universities across northern states of India.

Anthropometric Measurements: Ten anthropometric variables were assessed, including height measured with an anthropometric rod and body mass with a weighing machine, triceps, subscapular, suprascapular, and calf skinfolds using a skinfold caliper, and flexed arm and calf girth measured with a steel tape. Humerus and femur breadth were measured with a sliding caliper. Somatotype was determined using the equations provided by Heath & Carter (1990) ^[3]:

1. Endomorphy: $-0.7182 + 0.1451(X) - 0.00068 (X)^2 + 0.0000014 (X)^3$, where X is the sum of supra-spinal, subscapular, and triceps skinfold, corrected for stature by multiplying the sum of skinfolds by 170.18 divided by body height in cm.
2. Mesomorphy: $(0.858 \times \text{humerus width}) + (0.601 \times \text{femur width}) + (0.188 \times \text{corrected arm girth}) + (0.161 \times \text{corrected calf girth}) - (\text{body height} \times 0.131) + 4.5$. Corrected arm girth = arm girth - biceps skinfold, and corrected calf girth = calf girth - calf skinfold.
3. Ectomorphy: $(\text{HWR} \times 0.732) - 28.58$, where HWR = $(\text{body height in cm}) / (\text{weight in kg})^{1/3}$.

Statistical Analysis

Mean values and standard deviations were calculated. An independent samples t-test was conducted, with significance set at 0.05. Data analysis was performed using SPSS.

Results

Table 1: Comparison of Somatotype between Inter-University and Inter-College Volleyball Players.

| Variable | Group | N | Mean | S.D | t-value |
|------------|------------------|-----|------|------|---------|
| Endomorphy | Inter-university | 120 | 2.57 | 0.86 | 2.17 |
| | Inter-college | 120 | 2.79 | 0.70 | |
| Mesomorphy | Inter-university | 120 | 3.74 | 1.20 | 2.08 |
| | Inter-college | 120 | 3.37 | 1.49 | |
| Ectomorphy | Inter-university | 120 | 3.74 | 1.21 | 0.88 |
| | Inter-college | 120 | 3.60 | 1.15 | |

The somatotype characteristics of inter-university and inter-college volleyball players are presented in Table 1. The mean values of the endomorphic component for inter-university and inter-college volleyball players were 2.57 and 2.79, respectively. Notably, inter-university volleyball players exhibited a significantly lower endomorphic component ($t=2.17$, $p=0.030$) compared to inter-college volleyball players. Similarly, the mean values of the mesomorphic component for inter-university and inter-college volleyball players were 3.74 and 3.37, respectively. The analysis

revealed a significant difference ($t=2.08$, $p=0.039$), indicating that inter-university volleyball players had a significantly greater mesomorphic component than their inter-college counterparts. Regarding the ectomorphic component, the mean values for inter-university and inter-college volleyball players were 3.74 and 3.60, respectively. Interestingly, no significant difference in the ectomorphic component was observed between inter-university and inter-college volleyball players. This comprehensive comparison sheds light on the distinct somatotype profiles of inter-university and inter-college volleyball players, highlighting notable differences in endomorphy and mesomorphy between the two groups.

Discussion

This study aimed to compare the somatotype characteristics of volleyball players between inter-university and inter-college levels, revealing notable differences between the two. Our findings highlight significant disparities in endomorphy and mesomorphy characteristics between inter-university and inter-college volleyball players. However, no significant difference was observed in ectomorphy between the two levels of players. The somatotyping scores of volleyball players in this study ranged from 2.5 to 3.7-3.7, indicating a meso-ectomorphic body type. Interestingly, our results diverge from those reported by Gualdi and Zaccagni (2001) ^[13], who described volleyball players as balanced mesomorphs. Conversely, our findings align more closely with research on Indonesian volleyball players, who exhibited a mesomorphic ectomorph body type with somatotype values of 2.4-3.5-3.7 (Rahmawati *et al.*, 2007) ^[23]. These discrepancies may stem from various factors such as differences in sample characteristics, training regimens, genetic predispositions, and environmental influences. Additionally, variations in methodologies for somatotype assessment could contribute to contrasting findings across studies. Further research exploring the nuanced interplay between somatotype characteristics and volleyball performance across diverse populations is warranted. Such investigations could provide valuable insights into optimizing player selection, training protocols, and performance enhancement strategies tailored to specific somatotype profiles.

Conclusions

The physique of inter-university players is distinguished by a higher mesomorphy component, indicating a more muscular build compared to inter-college players. As a result, it can be inferred that inter-university players demonstrate superior somatotype characteristics compared to their inter-college counterparts.

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