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The impact of anthropometric characteristics and playing experience on the success of African women's volleyball teams

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ABSTRACT

This study aimed to evaluate the influence of anthropometric characteristics and playing experience on the success of African women's volleyball teams. The researcher purposively included all 12 teams that participated in the 2019 World Women's Volleyball Championship. Among these, two national women's volleyball teams were from Africa (Cameroon and Kenya), while the other ten teams were from different continents. Each team consisted of 14 players, with an average age of 25.95±4.296) years. Anthropometric characteristics such as height, weight, BMI, spike height, and block height of players, as well as their playing experience (calculated as the total number of World Championships, Olympic Games, and other international competitions), and the teams' success rank data were collected via electronic sources from the official FIVB website for comparison purposes. The results showed that the two African women's volleyball teams (Cameroon and Kenya) had players with below-average values in height, spike height, and block height compared to other world teams. A significant difference was also observed in BMI results compared to other world volleyball team players ($p < 0.05$). They also showed an extremely lower average value in playing experience than other world team players. Similarly, they ranked last among all teams, and their success was influenced by their anthropometric characteristics and game experience. Therefore, for the success of African women's volleyball teams, the anthropometric characteristics and playing experience of players should be considered among the selection criteria.

KEYWORDS

Anthropometric Characteristics; Playing Experience; Women; Volleyball; Success

1. INTRODUCTION

Volleyball requires good anthropometric characteristics of players to execute skills such as serving, spiking, and blocking. The physical performance of volleyball players is highly influenced by their anthropometric characteristics. Therefore, the selection and placement of elite players should consider their anthropometric characteristics and their relationship with performance indicators. These may help in identifying potential players with a promising future and in making training more effective (Zhang, 2010). Gabbett & Georgieff (2006) noted that successful volleyball players are tall and lean and are characterized by a high level of jumping ability, as well as technical and tactical skills.

Like various sport activities, in volleyball, the anthropometric characteristics of players influence the level of sport performance (Gaurav & Singh, 2014). Usually, in a volleyball game, attack and block skills constitute approximately 45% of total movements and reflexes, and almost 80% of points are gained through these techniques (Voigt & Vetter, 2003, cited in Cucui & Cucui, 2018). Additionally, Ciccarone et al. (2007), cited in Nesic et al. (2014), concluded that better performance in spike and block, as well as jumping service, depends on the amount of height that players can reach.

During the course of the game, the height of the net separating the opponent teams, the small dimensions of the court, the high ball speed, and the specific game techniques require a specific anthropometric structure. These specificities also influence the body build necessary for the successful performance of different movement structures in competitions (sprinting, direction changes, jumps, and landings) (Milić et al., 2012).

On the other hand, playing experience is among the determinant factors of game success. According to Manuel Flores Araujo (2012), players' experience and competitive success are multidimensional variables. Additionally, individual performance in volleyball has been proven to be reliable and significantly correlated with the amount of experience in volleyball (Bisagno et al., 2019). There is an observable difference in success between African and other world women's volleyball teams. The source of this variation may be of different kinds, among which anthropometric characteristics and playing experience are included. However, the effect of anthropometric characteristics and playing experience on the success of African women's volleyball teams has not been well investigated in comparison with other world teams. Therefore, this research was initiated to investigate the aforementioned variables. The aim of the study is to evaluate the influence of anthropometric characteristics and playing experience on the success of African women's volleyball

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2. METHODS

The FIVB Volleyball World Cup was held from September 14 to 29, 2019, in Lausanne, Switzerland. Twelve teams participated in the women's event. The participating teams were Argentina, Brazil, Cameroon, China, the Dominican Republic, Japan, Kenya, Korea, the Netherlands, Russia, Serbia, and the USA.

The researcher included all 12 teams that participated in the 2019 World Volleyball Championship. Among these, two national women's volleyball teams were from Africa (Cameroon and Kenya), while the remaining ten teams were from other continents. Each team consisted of 14 players, with an average age of 25.95 ± 4.30 years. The data were collected from the FIVB official website (FIVB, 2019). Data on five anthropometric characteristics of 168 women volleyball players were collected for comparison purposes. These characteristics included height, weight, BMI, spike height, and block height. Players' game experience was calculated as the total number of World Championships, Olympic Games, and other competitions they had participated in.

Anthropometric characteristics such as height, spike height, and block height were measured in centimeters, weight in kilograms, and BMI in kg/m^2. Playing experience was recorded as the number of games played, while team success was evaluated based on team ranking in the 2019 World Championship. Comparisons were made using descriptive statistics and Independent Samples t-tests, employing SPSS version 26.

3. RESULTS AND DISCUSSION

In the present study the anthropometric characteristic, playing experience and team success rank data of 12 teams (168 players) were taken and analyzed by comparing African women volleyball teams with other world women volleyball teams.

According to Table 1, the average height and weight of the players were 183.39 and 70.39 respectively. The two fitness related anthropometric characteristics: the spike height and block height were 298.70 and 286.33 correspondingly. Their BMI result showed 20.91 ± 1.56.

Table 1. The average anthropometric characteristics of 2019 World Cup women volleyball championship participants

Anthropometric Variables	N	Minimum	Maximum	Mean	SD
Height	168	160	201	183.39	8.037
Weight	168	53	92	70.39	7.287
Spike height	168	185	340	298.70	17.409
Block height	168	180	338	286.33	18.857
BMI	168	17.63	25.66	20.9128	1.56052

Regarding to sports performance, Zhang (2010) has mentioned that optimal anthropometric characteristics have been considered to be a pre-requisite for good performance in sports. Furthermore, Grgantov et al. (2017) also noted that the players' physique varies according to the performance level as well within a particular sport activity.

As we can observe from Table 2, the two African women's volleyball teams (Cameroon and Kenya) were below the average in height, spike height, and block height compared with players from other world teams.

Table 2. Anthropometric characteristics of African team and other world team players

Group Statistics						
Anthropometric Variables	**Team category as African and other World team players**	**N**	**Mean**	**SD**	**Std. Error Mean**	**p value**
Height	African teams	28	180.29	6.858	1.296	0.025
	Others world teams	140	184.01	8.133	.687	0.015
Weight	African teams	28	71.29	7.537	1.424	0.476
	Others world teams	140	70.21	7.250	.613	0.491
Spike height	African teams	28	293.43	14.318	2.706	0.079
	Others world teams	140	299.75	17.822	1.506	0.047
Block height	African teams	28	277.50	17.360	3.281	0.006
	Others world teams	140	288.09	18.704	1.581	0.006
BMI	African teams	28	21.9264	1.82825	.34551	0.000
	Others world teams	140	20.7101	1.42413	.12036	0.002

Gaurav & Singh (2014) have mentioned that anthropometric characteristics are related to a player's profile and might be used to predict a player's success. On the other hand, weight and BMI results of African teams were higher than others teams. Milić et al. (2017); Gabbett et al. (2007) found that more successful players in all position had a lower BMI and lean than less successful players. The information on the anthropometric characteristics of the players (height, weight, and body mass index)

and their spike and block reach serves as reference values in the selection and training process of volleyball players (Palao et al., 2014). The study by Xing et al. (2006), as cited in Fattahi et al. (2012), confirmed a significant correlation between vertical jump ability and the success rate of spikes and blocks in volleyball games. Additionally, an optimal body structure is apparently an advantage for volleyball performance. Only when a volleyball team is collectively equipped with all the ideal anthropometric characteristics can the team achieve dominance in a game. The height over the net is a decisive factor in volleyball, determined by the athletes' stature and jumping height, and reflected in blocking height and spiking height. All these factors highlight the demand for a specific physique among volleyball athletes (Gao, 2006, cited in Carvalho et al., 2020).

The players' experience averaged 67.47 ± 77.64 games. However, the data indicate that some players had played as few as 0 games, while others had played up to 356 games (Table 3).

Table 3. Playing experience of 2019 World Cup women volleyball champion ship participants

Variable	N	Minimum	Maximum	Mean	SD
Playing experience per number of games	168	0	356	67.47	77.641

As shown in Table 4, the players from the two African women's volleyball teams (Cameroon and Kenya) had much lower average playing experience than players from other world teams. Erfani et al. (2010) demonstrated the clear impact of limited prior game experience on performance parameters.

Table 4. African and other Continents team players' playing experience

Variable	Continental category as African and other continents teams	Mean	SD	Std. Error Mean	p value
Playing experience per number of games	African Team	9.28	7.850	1.850	0.000
	Others world Teams	78.59	65.835	5.960	

The 2019 FIVB Volleyball World Cup competition success by game rank report showed that China, USA, Russia, Brazil, Japan, Korea, Dominican Republic, Netherlands, Serbia and Argentina women teams score rank of 1^{st} -10^{th} respectively while the two African countries Kenya and Cameron women Volleyball teams ranked 11^{th} and 12^{th} accordingly . As noted by (Palao et al., 2014) the competitive experience during a minimum of 10-12 years and the ideal anthropometrics are necessary to achieve peak performance, in addition to physical capabilities and training experiences.

4. CONCLUSIONS

The players from the two African women's volleyball teams exhibited relatively lower anthropometric characteristics (height, spike height, and block height), and their BMI also showed a significant difference. Similarly, their playing experience was much lower than that of players from other world women's volleyball teams. Both anthropometric characteristics and playing experience were identified as key determinants of game success.

5. RECOMMENDATIONS

Based on the result of the finding the researcher forwarded the following recommendations:

1. Lower anthropometric measurements can negatively influence players' performance and game success. Therefore, anthropometric characteristics should be considered among the selection criteria for African women's volleyball teams. Since playing experience has its own significant effect on the success of players, the national federations in Africa should prepare different competitions in which players can get ample playing opportunities to enhance their technical and tactical experiences.
2. Anthropometric characteristics and playing experience were the primary factors considered in comparing the women's volleyball players in this study. Based on these findings, other researchers can investigate additional factors that may determine game success.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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