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Effect of Body Mass Index (BMI), Aggression and Gender on Performance/Coaching of Volleyball Players in Benue State

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Abstract: This study investigated the effect of Body Mass Index (BMI), aggression and gender on the performance/coaching of volleyball players in Benue State. The sample for the study was thirty volleyball players of Benue State Sports council who were purposely selected for the study. The ex-post facto research design was used to conduct the study. Participants' stature and body mass were measured in accordance with the protocol of the International Society for the Advancement of Kinanthropometry [ISAK]. The Body Mass Index (BMI) of the participants was derived as a ratio of his/her weight (in kilograms) to height (in meters) squared (kg/m^2). The aggressiveness of the players was assessed using the Buss Perry Questionnaire. The performance of the volleyball players was assessed during volleyball matches by the average score of three experts' rating on all the five components (serves, volleys, diggings, spiking and blockings). Mean, standard deviation and percentage distributions were used to describe the characteristics of the subjects. The two-way Analysis of Variance was used to test the interaction effect between BMI and aggressiveness on volleyball skills. The independent sample t-test was used to find out gender differences in BMI, and aggression of volleyball players. All statistical analyses were performed on a compatible micro-computer using the Statistical Package for the Social Sciences (SPSS v21) at a probability of 0.05 level of significance. The result of the study indicated that, there was no significant effect of BMI on playing skills of volleyball players in Benue State ($p>0.05$); there was no significant effect of aggression on playing skills of volleyball players in Benue State ($p>0.05$); and there was no gender difference in BMI, aggression and performance of volleyball players in Benue State ($p>0.05$). It was therefore recommended that volleyball coaches should consider the BMI and aggressive levels in selecting their players for optimum performance.

Keywords: BMI, Aggression, Volleyball Players, Performance

1. Introduction

Volleyball is one of the popular sports played all over the world by different people of varying age by both males and females. In competitive sports such as volleyball, the aim of the participating teams is to win the context. As a result of this, many coaches have made concerted efforts to better the performance of their players to achieve maximum performance.

This ranges from physical training/conditioning, dieting among others. It is against this background that recent research has been diversifying to include the assessment of anthropometric variables in relation to volleyball performance. Lidor and Ziv, in a review of literature, concluded that anthropometric data were correlated with volleyball skills' proficiency and game performance [1]. Earlier, Gabbett and Georgiev highlighted the importance of anthropometric characteristics in volleyball players and stated 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 [2]. Gonzalez-Rave, Arija and Clemente-Suarez has demonstrated that body composition (BC) plays a crucial role in a volleyball athlete's performance [3].

Marten, in Mohammadzadeh, and Sami [4] stated that, nowadays, as different types of sport skills and trainings have been proliferated and the records and the gap between athletes have shortened, mental preparation and psychological skills have become increasingly important, so that many coaches and athletes emphasize more on psychological skills to achieve sporting success.

In many sports, the performance of players and teams seems to be influenced by the degree of aggressiveness that is required or which they are able to reach. Some authors conclude that more aggressiveness is positively associated with performance, as in basketball [5] and handball [6]. Moreover, Gambetti and Giusberti in García-García stated that there is evidence that this effect also has a negative impact on other sports and on certain aspects of the game, such as precision and concentration [7]. In view of this, Arkes and Martinez stated that aggressiveness should be taken into consideration when modeling the performance of athletes, together with other variables [8].

It can therefore be deduced from the above that, performance of volleyball players is dependent on a multiplicity of factors. Volleyball players of the Benue State Sports Council (male and female) have not put up an impressive performance in national competitions in the recent past. Despite the concerted efforts made by the state government in improving the standard of sports in the state coupled with the zealousness of the coaches to make a name. It is against this background that the present study assessed the effect of body mass index (BMI), aggression and gender on the performance/coaching of volleyball players of Benue State Sports Council, Makurdi.

The study tested the following hypotheses:

1. There is no significant effect of BMI on the performance of volleyball players of the Benue State Sports Council, Makurdi.
2. There is no significant effect of aggression on the performance of volleyball players of the Benue State Sports Council, Makurdi.
3. There is no significant interaction effect of BMI and aggression on the performance of volleyball players of the Benue State Sports Council, Makurdi.
4. There is no significant gender difference in BMI and aggression on the performance of volleyball players of the Benue State Sports Council, Makurdi.

2. Methods

The ex-post facto research design was used in this study. The sample of the study was thirty volleyball players consisting of fifteen (15) males and fifteen (15) females of the Benue State Sports Council, Makurdi who were preparing for national competitions were purposefully selected for the study. Flexible steel tape (Seca, Hamburg, Germany) was used for measuring stature (height). Digital weighing scale (Omron HN286, Amazon.co.uk) was used for measuring weight. The Buss Perry Aggression Questionnaire (r=0.89) was used to assess the aggressiveness of the volleyball players. Volleyball matches were used to assess the aggressive behavior of players in relation to service, volleying, digging, spiking and blocking.

2.1. Procedure

Data was collected with the aid of two research assistants who were experts in exercise and sports science. Many trial versions of the measurements were carried out in the Physiology Department, College of Health Sciences, Benue State University, Makurdi under the supervision of the Physiology Lab Attendant before the actual data collection process. The method of data collection was organized into the following: anthropometric measurement, assessment of aggressiveness and assessment of volleyball skills performance.

2.2. Anthropometric Measurement

Participants' stature and body mass were measured in accordance with the protocol of the International Society for the Advancement of Kinanthropometry [ISAK] [9]. Participants stood bare-footed with feet together on a level cemented floor, the upper back, buttocks and heels touching the wall, the head held erect and the eyes looking forward so that the Orbitale (lower margin of the eye socket) and the Tragion (the notch superior to the tragus of the ear) were in the Frankfort plane. The point of the greatest height to the nearest 0.1cm was marked off on the wall with a flexible steel tape.

Weight was measured using a digital weighing scale with provision for calibration, and was recorded to the nearest 0.5kg. The scale also provides information on percentage body fat. The body Mass Index (BMI) of the participants was derived as a ratio of his/her weight (in kilograms) to height (in meters) squared (kg/m^2) according to Plowman and Smith [10].

2.3. Assessment of Volleyball Players' Aggressiveness

The aggressiveness of the players was assessed using the Buss Perry Questionnaire (r=0.89) [11]. The questionnaire contains 29 items requiring respondents to indicate their level of characteristics on a five-point scale of extremely uncharacteristic (1), somewhat uncharacteristic (2), neither

uncharacteristic nor characteristic (3), somewhat characteristic (4) and extremely characteristic (5). The score ranges between 29 indicating low aggressiveness to 145 indicating high aggressiveness.

2.4. Assessment of Volleyball Players Skills

The performance of the volleyball players was assessed during volleyball matches by three volleyball coaches. The researcher assessed the skill level of players as they play the match. The number of serves, volleys, diggings, spiking and blockings were recorded per player during the contests. The skill level was divided into two namely good (2) and bad (1). The average score of three experts' rating on all the five components together were considered as the score of volleyball playing ability of the subject.

2.5. Method of Data Analysis

The data for this study was analyzed using means, standard deviations and percentage distributions to describe the characteristics of the subjects. The two-way Analysis of Variance was used to test the interaction effect between BMI and aggressive on volleyball skills. The BMI of the participants were classified as follows: <18, underweight, 18-24, normal weight and >25 overweight/obesity. The aggressiveness of the players was classified as follows: 0-49, low aggressiveness, 50-89, moderate aggressive, 90-145, highly aggressive. All statistical analyses were performed on a compatible micro-computer using the Statistical Package for the Social Sciences (SPSS v21) at a probability of 0.05 level of significance.

3. Results

Table 1 indicated that 50% of the participants were females whereas, 50% were males. The analysis on BMI category also indicated that, 10.0% of the participants were underweight, 25.0% had normal weight, whereas, 2.0% were overweight/obese. The analysis further indicated that, 13.3% of the participants had low aggression, 46.7% had moderate aggression while, 40% had high aggression.

Table 1. *Demographic Characteristics of the participants.*

Gender	Frequency	Percentage (%)
Female	15	50.0
Male	15	50.0
Total	30	100.0
BMI Category	Frequency	Percentage (%)
Underweight	3	10.0
Normal Weight	25	83.3
Overweight/Obesity	2	6.7
Total	30	100.0
Aggressive Levels	Frequency	Percentage (%)
Low aggression	4	13.3
Moderate aggression	14	46.7
High aggression	12	40.0
Total	30	100.0

Table 2. *Two-Way ANOVA Interaction Effect of BMI, Aggression and BMI*Aggression on Performance of Volleyball Skills.*

Skill	BMI		Aggression		BMI*Aggression	
	F-value	P-value	F-value	P-value	F-value	P-value
Service	0.280	0.758	2.092	0.145	2.279	0.144
Volley	0.355	0.705	0.459	0.637	1.164	0.291
Digging	0.326	0.725	0.792	0.465	0.265	0.611
Spiking	0.719	0.497	1.775	0.191	3.742	0.065
Blocking	1.443	0.256	0.963	0.396	0.621	0.438

Table 2 indicated that, there is no significant effect of BMI on service (p=0.758) and aggressiveness on service (p=0.145). There is also no significant interaction effect of BMI and aggression on service (p= 0.144).

The analysis as presented in table 2 also indicated that, there is no significant main effect of BMI on volley (p=0.705) and aggressiveness on volley (p= 0.637). There is no significant combined interaction effect of BMI and aggressiveness on service (p=0.291).

The analysis as presented in table 2 indicated that there is no significant main effect of BMI on digging (p=0.725) and aggressiveness on digging (p=0.465). There is no significant combined interaction effect of BMI and aggressiveness (p=0.611).

The result of the study further indicated that there is no significant main effect of BMI on spiking (p=0.497), and there is no significant main effect of aggressiveness on spiking (p=0.191). There is no significant combined interaction effect of BMI and aggressiveness on spiking (p=0.065).

Finally, the analysis indicated that, there is no significant main effect of BMI on blocking (p=0.256), and aggressiveness on blocking (p=0.396). There is no significant combined interaction effect of BMI and aggressiveness on blocking (p=0.438).

Table 3. *t-test Analysis of Gender Difference in BMI among Volleyball Players.*

Gender	N	Mean	SD	DF	t-value	Sig (2-tailed)
Male	15	23.014	2.17	28	0.117	0.908
Female	15	23.097	1.72			

Table 3 indicated that, there is no significant gender difference among volleyball players of Benue State Sports Council. This means that both male and female volleyball players have the same average BMI.

Table 4. *t-test Analysis of Gender Difference in Aggression among Volleyball Players.*

Gender	N	Mean	SD	DF	t-value	Sig (2-tailed)
Male	15	2.33	0.72	28	0.521	0.606
Female	15	2.20	0.68			

Table 3 indicated that, there is no significant gender difference in aggressive levels (p>0.05) among volleyball players of Benue State Sports Council. This means that both male and female volleyball players have the same average BMI.

4. Discussion of the Findings

This study investigated the effect of Body Mass Index (BMI) and aggression on Benue State Sports Council volleyball players. The result of the study indicated that, there was no significant effect of BMI and aggression on the serve of volleyball players of Benue State Sports Council. The result was not significant even when separated by BMI and aggressive levels. The result of the study was in line with Maghsoud, Rezvan, and Hassan [12] who found no significant relationship between BMI and "serve" performance. However, Sheppard and Borgeaud in Maghsoud, Rezvan, and Hassan showed that there are affirmative significant relations between anthropometric properties (like; height, weight and trunk weight) and serve skill [12]. That means, when a player is taller and has a larger BMI, his/her serve success percentage would be rather improved. The discrepancy in the results is expected since the present study did not limit the scope to a single anthropometric variable and the present study also took the combined effect of BMI and aggression.

The result of the study indicated that, there is no significant effect of BMI and aggression on the volley skill of volleyball players of the Benue State Sports Council, Makurdi. The effect was not seen when the result was separated by BMI and aggression as well as combined effect. The result of the study was at variance with Milić, Grgantov, Chamari, Ardigò, Bianco and Padulo [13] who found that more successful setters dominate in height, in comparison to less successful players in the same positions. However, the finding is novel since previous findings only made use of height which is just an aspect of MBI and aggression was not addressed.

The result of the study indicated that, there was no significant effect of BMI and aggression on the dig pass of volleyball players of Benue State Sports Council. The result of the study was in line with Maghsoud, Rezvan, and Hassan [12] who found no significant relationship between BMI and "dig" performance. It therefore means that, the performance of players in relation to digging is not affected by their BMI and aggression but other factors which the present study did not investigate.

The result of the study indicated that, there was no significant effect of BMI and aggression on spiking skill of volleyball players in Benue State Sports Council. The result of the study was at variance with the findings of Mielgo-Ayuso, Calleja-González, Clemente-Suárez and Zourdos who found that, lower body mass, especially a lower fat mass, seems to be advantageous for spikers and liberos [14]. The players used for this study are all professional players and have been training and majority of the players had normal weight. This may have affected the outcome of the study which showed no effect.

The result of the study indicated that, there was no significant effect of BMI and aggression on blocking skill of volleyball players in Benue State Sports Council. The result of the study was in line with Maghsoud, Rezvan, and Hassan who found no significant relationship between BMI and "block" execution [12]. However, among individual properties, "height" was found to have an affirmative and significant (at level of 0.01) relation with "block" ($^{p=}$0.01, r=0.446). That means; when players' "height" increase, their "block" performance would progress. The result of the study was however at variance with Milić, Grgantov, Chamari, Ardigò, Bianco, Padulo who found that more successful middle blockers and liberos have a significantly lower body mass [13]. Milić et al. further stated that, the importance of height (an index of BMI) was confirmed, especially for the middle blocker position, in which all players, regardless of their efficacy, are taller than average [13]. In the same vein, less successful female volleyball players in all playing positions were characterized by a higher body mass index and dominance of the endomorph somatotype component. In the same light Mielgo-Ayuso, Calleja-González, Clemente-Suárez and Zourdos found that, height which is an index of BMI offers a performance advantage for middle blockers [14].

The result of the study indicated that, there was no significant gender difference in BMI and performance of volleyball skills among volleyball players of Benue State Sports Council. The result of the study was at variance with previous studies. For instance, Palao, Manzanares and Ortega documented gender differences with the females having a better skill than their male counterparts [15].

The result of the study further indicated that, there was no significant impact of aggression on the performance of volleyball players. The insignificant correlation may be due to reasons that players are well experienced and mature, and they knew that aggressive behavior during play results in violations of rules and may bring tension, anxiety, and poor performance. The finding was in line with Varghese, Yadav, and Gray Kumar who found that, there were no significant relationship between aggressive behavior (r = -0.053; p >.05) and playing ability of university volleyball players at Jabalpur, India [16]. Hanegby and Tenenbaum [17], Cox [18], and Wann [19] also found insignificant correlation between aggression and performance, supporting the results of present study. However, in more aggressive contact sports, Campo et al. showed 7 different pre-performance emotions,

with high anxiety and anger associating with poor performance [20]. Similar results were documented among football teams in Spain that aggressiveness has a negative impact on team performance [7]. This they attribute to the fact that, in sports like football, violent attacks aimed at injuring an opponent are usually punished by sending the player off the field, leaving his team short-handed for the remainder of the game. This has no effect on improving team performance.

Finally, the result of the study indicated that, there was no gender difference in aggression and performance of volleyball players. The finding was at variance with Mashhoodi, Mokhtari and Tajik who reported that, the comparison of the aggressive behaviors of male and female athletes shows that male athletes are more aggressive than female athlete [21].

5. Implication of the Result to Volleyball Coaches

Though the result of the present study did not show any effect of BMI on performance of volleyball players as a result of majority of players having normal weight and being professional players, coaches need to be aware of the BMI of athletes. This is because, overweight and obesity have negative implication on the performance of volleyball players. It is also capable of jeopardizing the health status of the athletes thereby affecting their performance. Athletes themselves may not be aware of this and hence may be living a lifestyle that puts their health at risk resulting to poor performance. The coach is therefore in a better position to monitor the factors that can predispose the athletes to overweight and obesity and advise accordingly. At the same time, other athletes especially females may fall prey of weight control which beyond ideal limits can also affect health and to some extent performance. It is therefore logical to put this under control.

At the same time, psychology plays a key role in the performance of athletes in general and volleyball players in particular. Therefore, coaches should inculcate assertiveness to volleyball players to approach their competitions with vigor while keeping to the rules of the game. This has become necessary because, many authorities have demarcated assertiveness from aggressiveness because the late is seen to be negative and targeted as causing violence/injury in sports.

To be effective, the coach has to develop knowledge in a number of areas such as psychology and physiology of volleyball players. This will enable him/her to train the players better for optimum performance. In many situations, the coach has to liaise with a diverse support team, which could include assistant coaches, physiotherapists and strength and conditioning coaches [22]. The ability to manage all these intricacies successfully should culminate in an effective coaching programme. In the same vein, Maghsoud et al stated that, having especial physical properties and physiologic capacities are the most important factors of winning in sport competitions, acquaintance with anthropometric aspects, like; height, weight and BMI, could open a new window for coaches about athletes' situations [12].

6. Conclusion

This study demonstrated that, BMI, aggression and gender does not significantly affect the performance of volleyball players of the Benue State Sports Council, Makurdi. Though the study was at variance with previous findings, it was due to the fact that, the players used in the study were of normal BMI and with similar aggressive levels. Therefore, the coach has to demonstrate good knowledge of ideal body weight and aggression to help the volleyball players to conform to standard that will promote performance.

7. Recommendations

1) Volleyball coaches should consider the BMI and aggressive levels in selecting their players for optimum performance. This will help them to prepare the athletes psychologically and physiologically to enhance good performance during competitions.
2) Coaches should also do regular follow-up of their athletes BMI and ensure that they have normal BMI and take necessary action when they derail from the ideal.
3) Volleyball coaches should be acquainted with psychological skills of their players and they can apply trainings with participatory purposes to control the aggressiveness of the players.
4) Since most authorities' state that aggressiveness does not pay and mostly results to penalties in sports leading to poor performance, coaches should guide players to be more assertive in sports rather than being negatively aggressive.

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