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Original Research Article

Comparison of Biomotor Fitness Variables between Basketball and Volleyball Players in Ignatius Ajuru University of Education

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Abstract

Background: The purpose of this study is to compare the biomotor fitness variables between basketball and volleyball players in Ignatius Ajuru University of Education. This study adopted an ex post facto research design. ***Methodology***: The population for this were all volleyball and basketball players, from which a sample size of 10 participants from each team were selected. To test for balance, a stork stand test was carried out, vertical jump test was used to test for power, an Illinois Agility Test (IAT) was used to test for agility, a 30m sprint/dash was used to assess the speed of the participants, and timed push-up test for muscular endurance. Statistical Package for Social Sciences (SPSS) version 25 was used for data analysis. ***Results & Discussion***: The findings revealed a 0.13 percent difference in power which was no statistically significant difference ($p>.05$, $p=0.987$). There was 30.8 percent in balance which was statistically significant ($p<05$, $p=0.037$). A 1.4 percent difference in agility was not deemed statistically significant ($p>.05$, $p=0.827$). Volleyball players' performed 13.1% better in muscle endurance test, though not considered statistically significant ($p>.05$, $p=0.142$)**.** ***Conclusion & Recommendation*****:** Based on the findings from the study, it was evident that biomotor fitness variables among volleyball and basketball players in Ignatius Ajuru University of Education was virtually the same as the players demonstrated no significant difference in most biomotor variables such as speed, agility, power and muscular endurance. While being a jack of all trade (sports) makes one better than a master of none, in sports there is need for proper focus on a specific sports niche. Thus, coaches and trainers of volleyball and basketball players should help both category of players concentrate their efforts on a specific sport so as to achieve maximum biomotor fitness required for maximal performance in a specific sport.

Keywords: Biomotor Fitness, Volleyball and Basketball Players, Muscular Endurance, Ignatius Ajuru University.

INTRODUCTION

Training for performance within a sport highlights certain requirement in specific fitness abilities. Although each sport differs in its requirements, they are requiring the same biomotor abilities, though at varying degrees. The recognition of relevant biomotor characteristics in particular sport contributes significantly to success in sports contest, it is also a key factor that brings the differences in performance of athletes during contest. Sports performance is dependent on a complex and nuanced diversity of variables, among which are physical (general and particular conditions), psychological (personality and motivation) and body (body morphology and motor composition) factors (Campos *et al.*, 2009). Therefore, the relationship between biomotor variables and sports performance is an important aspect to be analysed.

Biomotor is the ability of humans to move as seen through the eyes of breathing, bones, joints, energy, and the nervous system, so that if energy can be fulfilled and stored in the muscles, movement will occur. When it comes to transforming energy into muscles, all of the body's systems play a critical part (Endang *et al.*, 2021). According to McCarroll (2017), there are five important biomotor fitness, namely strength which is the ability to produce force, speed which is the ability to move rapidly, endurance which is the ability to resist fatique, flexibility the ability to attain large ranges of motion, coordination which refers to the ability to move the body in order to accomplish a task, power which is the combination of speed and streghth, and agility which is a combination of speed and coordination.

Basketball and Volleyball are unique sports that can improve overall fitness and confidence for players of all age groups. Both games require upper and lower body speed, agility, flexibility, strength and motor abilities in general. Basketball is one of the world's most popular and widely viewed sports. Basketball was originally played with a soccer ball. The first balls made specifically for basketball were brown, and it was only in the late 1950s that Tony Hinkle, searching for a ball that would be more visible to players and spectators alike, introduced the orange ball that is now in common use. Basketball is a sport played by two teams of five players on a rectangular court. The objective is to shoot a ball into the ring for getting points (Singh, 2014). Volleyball is a team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules. It has been a part of the official programme of the Summer Olympic Games since 1964 (Malakar, 2014).

Fitness is a physiological state of well-being that decreases the risk of hypokinetic disease (i.e., diseases related with physical inactivity and disuse) and is a basis for participation in sports and health that enables an individual to carry out the tasks of daily living (Donnelly *et al.*, 2016). While motor fitness is generally a subset of physical fitness, it is interesting to note that physical fitness comprises a set of measurable health- and skill-related attributes, such as: CRF, muscular strength and endurance, body composition, and flexibility, whereas MF includes: Speed, agility, coordination, balance, and power (American College of Sports Medicine, 2002).

Physical fitness and biomotor competence are considered key components for the development and general health in adolescents and athletes' population (Raghuveer *et al.*, 2020). Motor competence has been associated with body weight in addition to self-efficacy and general well-being (Robinson *et al*., 2015). Further, biomotor competence is directly associated with physical fitness as it reflects the ability to perform goal-directed movements that involve large muscle groups or the whole body (Barnett *et al.*, 2016). Accordingly, motor competence provides the foundation for various sport-specific skills, particularly during middle and late childhood (Stodden *et al*., 2008), which will influence physical fitness (Barnett *et al*., 2016) and subsequent physical activity (PA) (Lloyd *et al.*, 2014). In addition, high biomotor competence and physical fitness have been suggested to induce relatively permanent behavioural choices that transfer into adulthood (García-Hermoso *et al.*, 2019) and are considered key components in the promotion of an active lifestyle (Stodden *et al.*, 2008).

Volleyball and basketball are active sports with frequent changes of speed, a large number of jumps and active use of all muscle groups. Explosive power is a very significant ability basketball and volleyball and is manifested through various variants of jumps, starting acceleration, and sudden changes in direction of movement, deceleration, abrupt stopping and passing (Aksović *et al.*, 2021). A lack in sufficient explosive power could impact a player's performance, especially when taking account of other high-performance players.

A very important segment of fitness derived from the general fitness is biomotor fitness. This aspect of human fitness while related to the general fitness and wellbeing focuses on one's abilities to move as seen from breathing, bones, joints, energy, and the nervous system so that if energy can be fulfilled and stored in the muscles, a movement will appear. All systems in the body have a very important role in converting energy into muscles. This also occurs in the biomotor component because it is a physical condition needed by athletes (Endang *et al.*, 2022). Biomotor is the movement of the human body that is influenced by organ systems such as neuromuscular, respiratory, blood circulation, energy, bones, joints so that these components are the overall physical condition of sports. All sports activities

in the majority contain components of strength, speed, endurance and complex movements that require extensive joint motion. The dominant biomotor elements in rhythmic sportsmanship are flexibility, strength, agility, speed, endurance, power, and coordination. A person's biomotor is very influential when doing various physical activities (Endang *et al.*, 2022).

The development of biomotor fitness is as important as developing key volleyball and basketball skills including speed and jumping, coordination and balance as they help in many specific actions like movement, receiving, setting, spiking and blocking, therefore nowadays players need to have high muscle strength and good biomotor fitness, and even if the actions in volleyball are fast and intense, the players must be agile and well prepared physically (Gabbett *et al*., 2008). Balance and agility are biomotor qualities that are more easily learned and developed at young ages, with specific training and during the appropriate age levels. Biomotor response can be influenced by balance training, many scientists stating that a superior balance level in experienced athletes may improve decision-making and motor responses (Balter *et al.*, 2004), while other sports specialists assert that a better level of balance and agility results from more training and influence the ability of proprioceptive and visual cues (Sopa & Szabo, 2015).

Becoming a sport champion is a long-term process that begins with the involvement of children and adolescents in sport. The first stage of a sports career is a functional development of component of competitive sport and it always lays the foundations for future championships. Maintaining an appropriate training system is key in championship building. Training must be optimized to achieve the best results and aimed at rationalizing the improvement of a contestant's functions and skills at every stage of their biological and sporting development. High-level sport performance can only be achieved by contestants in the right conditions. Selecting the appropriate morphological criteria for a given sport is vital because the body's somatic structure is strongly determined by genetics, which can be modified by training only to a limited extent. However, developing the optimal skills for sports depends on a long-term development of specific fitness components, and in select sports such as volleyball and basketball, development of desirable biomotor fitness variables.

Optimal athletic performance in ball games, including Volleyball (VB) and Basketball (BB), requires complexity of proficiency in multifaceted components such as physical, physiological, mental and tactical traits. The physical traits include biomotor variables. Scientific and sporting communities have recognized the importance of physical fitness factors in athletic performance which brought up the need to access physical fitness parameters.

The aim of this study was to compare the biomotor fitness variables between basketball and volleyball players in Ignatius Ajuru University of Education.

This study was specifically designed to achieve the following:

1. Compare power of volleyball and basketball players in Ignatius Ajuru University of Education.
2. Compare balance of volleyball and basketball players in Ignatius Ajuru University of Education.
3. Compare speed of volleyball and basketball players in Ignatius Ajuru University of Education.
4. Compare agility of volleyball and basketball players in Ignatius Ajuru University of Education.
5. Compare muscular endurance of volleyball and basketball players in Ignatius Ajuru University of Education.

METHODOLOGY

Study Area

This study was carried out in Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Rivers State. The university has six faculties viz: Faculty of Education, Faculty of Humanities, Natural and Applied Sciences, Faculty of Vocational and Technical Education, Faculty of Social Sciences and Faculty of Business Studies. The institutions have staff strength of about 913 workers (academic and non-academic) and 25,000 students admitted between 2013 – 2018 academic sessions (Office of the Director for Academic Planning, IAUE, 2022).

The selected tertiary institution where this study was carried out: Ignatius Ajuru University of Education (IAUE), lies at the latitude/longitude, 4.804520, 6.932487 (GoogleMaps, 2019). From Ignatius Ajuru University of Education, Port Harcourt, study participants were recruited.

Research Design

This research focused on comparing biomotor fitness variables among volleyball and basketball players. This study adopts an ex post facto research design. An ex post facto research design is an approach in which groups with traits that already exist are compared on a dependent variable is known as. Ex post facto research, also known as "after the fact" research, is considered quasi-experimental because the subjects are not randomly assigned; instead, they are grouped based on a specific characteristic or trait.

By adopting this research design, this study through some basic experimentation aims to describe and compare the biomotor fitness levels of volleyball and basketball players and subsequently, compare these

values against each other. So doing, the researcher hopes to reach the research objectives, answer research questions and conduct test of hypothesis.

Population of the Study

The population for this study are all the forty-four (44) volleyball and basketball players in Ignatius Ajuru University of Education, Rumuolumeni Port Harcourt. There are twenty-four (24) volleyball players registered in the school's volleyball team while there are twenty (20) basketball players registered in the school's basketball team, making a total of forty-four (44) persons in the study population (IAUE Sports Unit Records, 2021).

Table 1.0: Population distribution

Team	Number of players	Gender		Total
		Male	Female	
Volleyball	24	12	12	24
Basketball	20	10	10	20
Total	**44**	**22**	**22**	**44**

Sample and Sampling Technique

The sample for this study were twenty (20) randomly selected players from the total population of volleyball and basketball players. Ten (10) players were selected from the respective teams.

The study adopted a total sampling technique that enabled the researcher to sample all athletes in the population of interest.

Instrument for Data Collection

The instruments for data collection were chosen based on the techniques employed for data collection. The following techniques and associated instruments were adopted for the study:

a. **Stork stand test:** This test was adopted to test for balance. It involves the use of a stork, or a flat non-slippery surface, stopwatch and recording sheet.
b. **Vertical jump test:** This test was adopted to test for power. It involves the use of a measuring tape, marked wall, chalk/marking material (or vertec/jump mat).
c. **Illinois Agility Test (IAT):** The IAT was adopted to test for the participants' agility levels. It involves the use of a stopwatch, and cones for marking out the IAT course.
d. **30m sprint/dash:** This test is adopted to evaluate the participants' level of speed. The running track and a stop watch were the two main instruments for this study.
e. **Timed push-up test:** This test was adopted to test for the participants' muscular endurance.

Validity of the Instrument

The ability of an instrument to measure what it is designed to measure is defined as its validity (Baumgartner *et al.*, 2007). With this in mind, all of the instruments used in the study were standardized, and a construct validity test was performed to ensure that the instruments were accurately measuring what they were supposed to. This is used to ensure that the instrument is measuring what it is supposed to measure. Three expert assistants who were familiar with the use of the chosen instruments and techniques for the study were used to validate all of the instruments that would be used. They were given the instruments for expert feedback and suggestions. The validation process was completed by presenting the instruments to the research supervisor for his opinion on their suitability. Following the experts' and research supervisor's instrument reviews and checks, their recommendations were acknowledged, and appropriate instrument modifications were made, resulting in the final set of instrument choices presented herein.

Reliability of the Instrument

Reliability of Stork Stand Test: Saporito *et al.,* (2015) reported that the stork stand test was a reliable test for balance, with a reliability coefficient of 0.76.

Reliability of Vertical jump test: Vertical jump testing has been shown to be a valid and reliable measure of lower-body explosive power. The reliability of the jumping tests ranged from 0.97 to 0.99 for Cronbach's alpha coefficients, from 0.93 to 0.97 for interitem correlation coefficients and from 2.1 to 2.8 for coefficients of variation (Sattler *et al.,* 2012).

Reliability of the Illinois Agility Test: Studies have shown that tests including the IAT had excellent interrater reliability and moderate to good test-retest reliability with a reliability coefficient of over 0.76 reported in most studies (Raya *et al.,* 2013).

Reliability 30m sprint test: Nigro *et al.,* (2016) reported a reliability of 0.94 and 0.98 for sprint test in measuring speed.

Reliability of timed push-up test: Salimin *et al.,* (2017) reported a reliability score of 0.89 for timed push-up tests.

METHOD OF DATA COLLECTION

Data collection involved subjecting the subjects (volleyball and basketball players) to specific fitness tests designed to assess the presence and/or lack of some motor fitness attributes of interest as well as report the extent to which they are present or lacking. These tests were administered in the gymnasium and laboratory of the Department of Human Kinetics Health and Safety Education, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education. Disruptive tests and tests that requires a lot of space were conducted in

the Exergaming facility of Ignatius Ajuru University of Education. The biomotor fitness tests were administered at least twice and the best result was recorded.

Following a brief warm-up phase, the biomotor fitness tests were administered in-line with the motor fitness variables of interest. The following biomotor fitness tests were administered to assess specific biomotor abilities:

a. Stork stand test for balance
b. Vertical jump test for power
c. 30m sprint for speed
d. Illinois Agility Test (IAT) for agility

a. **Balance test:** To test for balance among the volleyball and basketball players, a stock stand test was carried out. The stork balancing test demands the individual to stand for as long as possible on one leg. The purpose of a stork stand test is to measure an individual's balance. The test requires very few and simple equipment such as a flat and non-slippery surface, a stopwatch and recording sheet. The pre-test phase involves explaining the test procedures to the subject. Perform screening of health risks and obtain informed consent using the Physical Activity Readiness Questionnaire (PAR-Q). Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up. The procedure for a stork stand test for balance involves first removing the shoes and place the hands on the hips, then position the non-supporting foot against the inside knee of the supporting leg. The subject is given one minute to practice the balance. The subject raises the heel to balance on the ball of the foot. The stopwatch is started as the heel is raised from the floor. The stopwatch is stopped if any of the follow occur: The hand(s) come off the hips; the supporting foot swivels or moves (hops) in any direction; the non-supporting foot loses contact with the knee; and the heel of the supporting foot touches the floor. This test is rated on a time (seconds) basis, the more time the athlete spends of the test, the better their balance.

b. Power test: The vertical jump test is a common test for power. It is a test of lower body power. The test was first described nearly 100 years ago (Sargent, 1921). The test measures the leg muscle power which is commonly utilized by both volleyball and basketball players. To perform this test, a measuring tape or marked wall, and chalk for marking wall (or Vertec or jump mat) were required. The pre-test involves explaining the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up. The test procedure involves making the athlete stand side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. This is called the standing reach height. The athlete then stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The jumping technique can or cannot use a countermovement (see vertical jump technique). Attempt to touch the wall at the highest point of the jump. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded. The jump height is usually recorded as a distance score.

c. 30m Sprint Test for Speed: The aim of this test is to determine acceleration and speed. Equipment required include a measuring tape or marked track, stopwatch or timing gates, cone markers, flat and clear surface of at least 50 meters. The procedure involves running a single maximum sprint over 30 meters, with the time recorded. A thorough warm up is administered before the exercise, including some practice starts and accelerations. The test is started with the subject in a stationary position, with one foot in front of the other. The front foot must be on or behind the starting line. This starting position should be held for 2 seconds prior to starting, and no rocking movements are allowed. The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and encourage them to continue running hard through the finish line. Two trials or more are usually allowed, and the best time is recorded to the nearest 2 decimal places. The timing starts from the first movement (using a stopwatch) or when the timing system is triggered, and finishes when the chest crosses the finish line and/or the finishing timing gate is triggered. Reliability is greatly improved if timing gates are used. Also, weather conditions and the running surface can affect the results, and these conditions should be recorded with the results.

d. Illinois Agility Test: The test is conducted in a course 10-metre-long and 5 meters wide. Cones are used to mark different points in the course, four (4) cones to mark the start, finish and the two (2) turning points; four (4) other cones are placed down the centre an equal distance apart. Cones in the centre are spaced 3.3 meters apart. Subjects lied on their front (head to the start line) with hands by their shoulders, when the 'Go' command is given, the stopwatch is started, and the participant got up quickly and ran around the course in the direction indicated, careful not to knock the cones over; subject were required to run to the finish line, at which the timing is stopped. And the time recorded in seconds. An excellent score is under 15.2 seconds for a male, and less than 17 seconds for a female.

e. Muscular Endurance: To test physical endurance, a timed push up was performed with the palms and toes contacting the floor, the torso and legs in a straight line, the feet slightly apart, and the arms and shoulders extended and at a right angle to the body. The patient pulled the torso low to attain a 90-degree angle at the elbows while keeping the back and legs straight, then returned to the original position with both arms outstretched. This action was repetitive, and continued

until subject was exhausted, or could no longer keep in rhythm. The scoring: The total time becomes the quantitative measure, of one minute.

METHOD OF DATA ANALYSIS

Descriptive and inferential statistics were used for the analysis of data. Descriptive statistics namely; mean and standard deviation were used to answer the research questions 1 to 4. The inferential statistics of t-test was used for the test of hypotheses. The International Business Machines' (IBM) Statistical Product and Service Solutions (SPSS) v.25 was used for data computation and analysis.

RESULTS AND DISCUSSION

Table 1: Comparison of Power Levels among Volleyball and Basketball Players

Biomotor variable	Minimum (cm)	Maximum (cm)	Mean (cm)	Std. Deviation	Mean difference
Power of volleyball players	36.00	80.00	62.15	13.93	0.08
Power of basketball players	39.00	75.00	62.23	10.46	

The result in table 1 shows the power levels of volleyball and basketball players that were studied. From the results, volleyball players reported a minimum vertical jump score of 36cm and a maximum vertical jump score of 80cm. With a mean ($\bar{x}$) of 62.15±13.93. Among the basketball players, minimum height achieved during the vertical jump test was 39.00cm while the maximum height recorded was 75.00cm. With a mean ($\bar{x}$) score of 62.23±10.46. The mean difference between volleyball and basketball players was 0.08.

Table 2: Comparison of Balance Levels among Volleyball and Basketball Players

Biomotor variable	Minimum (secs)	Maximum (secs)	Mean (secs)	Std. Deviation	Mean difference
Balance of volleyball players	10.00	70.00	33.23	17.02	-10.23
Balance of basketball players	15.00	79.00	43.46	21.36	

The table 2 above reported the balance levels of volleyball and basketball players that participated in the study. Volleyball players reported a minimum stork stand test time of ten (10) seconds, and a maximum stork stand completion time of 70 seconds, yielding a mean ($\bar{x}$) score of 33.23±17.02. Among basketball players, the minimum time spent on during the stork stand test was fifteen (15) seconds and maximum time of seventy-nine (79) seconds, amounting to a mean ($\bar{x}$) score of 43.46±21.36. Comparing the mean values among volleyball and basketball players, it was found that basketball players had significantly better balance values, reporting higher mean time on the stork stand ($\bar{x}$ =43.46) compared to among volleyball players ($\bar{x}$=33.23). The mean difference between volleyball and basketball players was -10.23.

Table 3: Comparison of Speed Levels among Volleyball and Basketball Players

Biomotor variable	Minimum (secs)	Maximum (secs)	Mean (secs)	Std. Deviation	Mean difference
Speed of volleyball players	3.40	5.00	4.10	.48	-0.29
Speed of basketball players	3.20	5.30	4.39	.59	

The results above show the speed levels of volleyball and basketball players recruited in the study. The results show the time for completion of the 30m dash test. From the results, among volleyball players, the minimum time of completion for the 30m dash test was 3.40 seconds and the maximum time of 5.0 seconds, this yielded a mean ($\bar{x}$) score of 4.1±0.48 seconds. For basketball players, the findings reported a minimum speed of 3.20 seconds and maximum speed of 5.30 seconds, with a mean ($\bar{x}$) score of 4.4±0.59. Comparing both results, it is evident that it took volleyball players lesser time to complete the 30m dash test ($\bar{x} = 4.10$) compared to basketball players ($\bar{x}$=4.39). From these results, the mean difference between volleyball and basketball players was -0.29.

Table 4: Comparison of Agility Levels among Volleyball and Basketball Players

Biomotor variable	Minimum (secs)	Maximum (secs)	Mean (secs)	Std. Deviation	Mean difference
Agility of volleyball players	10.50	22.60	16.55	3.47	0.24
Agility of basketball players	12.00	20.10	16.31	2.89	

The results above show the agility of volleyball and basketball players recruited for the study. From the results, it was seen that it the minimum time of completion of the Illinois Agility Test (IAT) among volleyball players was 10.50 seconds and the maximum time was 22.60 seconds, with a mean ($\bar{x}$) completion time of 16.55±3.45 seconds. Among basketball players, the minimum time of completion was 12.00 seconds, and a maximum time of completion of 20.10 seconds. The study reported a mean ($\bar{x}$) IAT completion time for basketball players of 16.31±2.89. Comparing the results, it is clear that the difference in agility was not so significant, the mean difference between volleyball and basketball players was 0.24.

Table 5: Comparison of Muscular Endurance Levels among Volleyball and Basketball Players

Biomotor variables	Minimum (secs)	Maximum (secs)	Mean (secs)	Std. Deviation	Mean difference
Muscular endurance of volleyball players	20.00	80.00	55.23	17.77	7.23
Muscular endurance of basketball players	14.00	78.00	48.00	18.11	

The table above shows the muscular endurance levels of volleyball and basketball players. These results showed the results of a timed push-up test - the length of time the players were able to endure push-ups. The findings revealed that among volleyball players, the minimum duration for push-ups done was 20 seconds and the maximum duration was 80 push ups. Volleyball players reported a mean ($\bar{x}$) muscular endurance score of 55.23±17.77 seconds. Among the basketball players, the minimum duration was 14.00 seconds in a timed push-up test, while the maximum duration was 78.00 seconds. The mean ($\bar{x}$) score for basketball players was 48.00±18.11. The mean difference between volleyball and basketball players was 7.23.

Test of Hypothesis 1

H01: There is no significant difference in the mean power values of volleyball and basketball players in Ignatius Ajuru University of Education.

Table 6: Result of Hypothesis 1

Power of volleyball players - Power of basketball players	Paired Differences					t	df	P-value
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
	-.077	16.07	4.46	-9.79	9.63	-.017	12	.987

Conventional criteria: $p<.05$

Table 6 showed the result of t-test that compared the mean power values of volleyball player and basketball players in Ignatius Ajuru University of Education. The table showed a p-value of 0.987. This is not a significant result, therefore, the hypothesis that states that there is no significant difference in the mean power values of volleyball and basketball players in Ignatius Ajuru University of Education was not rejected.

Test of Hypothesis 2

H02: There is no significant difference in mean balance values of volleyball and basketball players in Ignatius Ajuru University of Education.

Table 7: Result of Hypothesis 2

Balance of volleyball players - Balance of basketball players	Paired Differences					t	df	P-value
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
	-10.23	15.72	4.36	-19.73	-.73	-2.35	12	.037

Conventional criteria: $p<.05$

A paired sample t-test was conducted to compare the mean balance values of volleyball players and basketball players in Ignatius Ajuru University of Education. There was a significant difference in mean balance levels of volleyball and basketball players in Ignatius Ajuru University of Education; t=-2.7347, p=0.037. Thus, the null hypothesis is rejected, there is a significant difference in the mean balance values of volleyball and basketball players in Ignatius Ajuru University of Education.

Test of Hypothesis 3

H03: There is no significant difference in the mean speed values of volleyball and basketball players in Ignatius Ajuru University of Education.

Table 8: Result of Hypothesis 3

	Paired Differences					t	df	P-value
Speed of volleyball players - Speed of basketball players	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
	-.29	.73	.20	-.73	.15	-1.45	12	.174

Conventional criteria: $p<.05$

A paired sample t-test was conducted to compare the mean speed values of volleyball players and basketball players in Ignatius Ajuru University of Education. There was not a significant difference in mean speed levels of volleyball and basketball players in Ignatius Ajuru University of Education; t=-1.447, p=0.174. Thus, the null hypothesis is retained, there is no significant difference in the mean speed values of volleyball and basketball players in Ignatius Ajuru University of Education.

Test of Hypothesis 4

H04: There is no significant difference in mean agility values of volleyball and basketball players in Ignatius Ajuru University of Education.

Table 9: Result of Hypothesis 4

	Paired Differences					t	df	P-value
Agility of volleyball players - Agility of basketball players	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
	.24	3.85	1.07	-2.09	2.57	.22	12	.827

Conventional criteria: $p<.05$

A paired sample t-test was conducted to compare the mean agility values of volleyball players and basketball players in Ignatius Ajuru University of Education. There was not a significant difference in mean agility levels of volleyball and basketball players in Ignatius Ajuru University of Education; t=0.223, p=0.827. Thus, the null hypothesis is not rejected, there is no significant difference in the mean agility values of volleyball and basketball players in Ignatius Ajuru University of Education.

Test of Hypothesis 5

H05: There is no significant difference in mean muscular endurance values of volleyball and basketball players in Ignatius Ajuru University of Education.

Table 10: Result of Hypothesis 5

	Paired Differences					t	df	P-value
Muscular endurance of volleyball players - Muscular endurance of basketball players	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
	7.23	16.58	4.60	-2.79	17.25	1.57	12	.142

Conventional criteria: $p<.05$

A paired sample t test was conducted to compare the mean muscular endurance values of volleyball players and basketball players in Ignatius Ajuru University of Education. There was not a significant difference in mean muscular endurance levels of volleyball and basketball players in Ignatius Ajuru University of Education; t=1.573, p=0.142. Thus, the null hypothesis is retained, there is no significant difference in the mean muscular endurance values of volleyball and basketball players in Ignatius Ajuru University of Education.

DISCUSSION OF FINDINGS

Summary of Findings

The findings from the study revealed the following: The basketball players reported a minimum vertical leap height for power of 39 cm and a maximum of 75 cm, with a mean vertical jump height of 62.23 cm, whereas the volleyball players reported a minimum vertical jump height for power of 36 cm and a maximum of 80 cm. These results are fairly similar; there is just a 0.13 percent difference. To be fair, the findings of the hypothesis test indicate that there was no statistically significant difference between the two (p>.05, p=0.987).

The volleyball players reported a mean balance score of 33.23 seconds in the stork stand test, with a minimum duration of 10 seconds and a maximum time of 70 seconds. With a minimum time of 15 seconds and a maximum time of 79 seconds, the stork stand test produced a mean value of 43.46 seconds, which was 30.8 percent better than the balance of the basketball players.

Ignatius Ajuru University of Education volleyball and basketball players' mean balance scores were shown to differ in a statistically significant way (p<.05, p=0.037).

The participants were put through a 30m dash to assess the speed of basketball and volleyball players. According to the results, volleyball players finished the 30-meter dash in an average time of 4.1 seconds, with a minimum time of 3.40 seconds and a maximum time of 5.0 seconds. In contrast, basketball players finished in an average time of 4.39 seconds, which is 6.6 percent slower than volleyball players who reported a mean completion time of 4.10 seconds. Although there was no statistically significant difference in mean speed between volleyball and basketball players at Ignatius Ajuru University of Education, as indicated in table 8 of the test of hypothesis, this difference is still not thought to be statistically significant (p>.05, p=0.174).

The findings compare the degree of agility between volleyball and basketball players. The participants underwent an Illinois Agility Test (IAT), and their times were recorded and reported as they maneuvered around the agility testing course. The volleyball players' IAT completion times ranged from 10.5 seconds for the quickest completion to 22.60 seconds for the slowest. Basketball players had a minimum completion time of 12.0 seconds, which was actually worse than volleyball players', but their maximum completion time was a little better at 1.4 percent less time, or 20.10 seconds, for basketball players. This discrepancy resulted in a mean completion time for basketball players and volleyball players of 16.3 seconds and 16.5 seconds, respectively. The Illinois Agility Test (IAT) completion time difference was not deemed statistically significant, according to the hypothesis test (p>.05, p=0.827).

Ignatius Ajuru University of Education volleyball and basketball players' scores for physical endurance were revealed by the results. Based on these findings, the time required to complete a timed push-up test was recorded; among volleyball players, a minimum time of 20.0 seconds and a maximum time of 80 seconds was reported. Basketball players completed the task in less time overall, with a minimum completion time of 14 seconds and a maximum completion time that was slightly longer at 78.00 seconds. The results showed that volleyball players completed the timed push-up test on average in 55.23 seconds, while basketball players completed it on average in 48.00 seconds. According to the findings, volleyball players' performance improved by 13.1% in terms of mean muscle endurance. These differences, however, could not be regarded as statistically significant, according to the hypothesis test shown in table 10 (p>.05, p=0.142).

Discussions

From the findings, as shown in table 1, the volleyball players reported a minimum vertical jump height for power of 36cm and a maximum of 80cm, with a mean vertical jump height of 62.15cm, while the basketball players reported a minimum vertical jump height for power of 39cm and a maximum of 75cm and a mean vertical jump height of 62.23cm. These results are very close, and only yielded a difference of 0.13%. Rightly so, the results of the test of hypothesis shows that this difference was not statistically significant (p>.05, p=0.987). Power is an important component of biomotor fitness of basketball and volleyball players, as noted by Goyindaiah & Muni (2019), the playing abilities of both sports participants is highly correlated to this biomotor variable.

This study is partly similar to findings by Ramandeep & Lakhwinder (2015) who found that based on mean differences, basketball players demonstrated better power. However, Ramandeep & Lakhwinder (2015) further found a statistically significant difference in power levels among both groups. Compared to older studies, more recent studies such as that by Rasool and Pathak (2019) seems to align with the current findings. According to Rasool and Pathak (2019), there is no significant difference found in performance of vertical Jump of both the groups' i.e. volley ball and basketball players. Rasool and Pathak (2019) went further to offer an explanation for the findings, which could also be applied to the current study. The results could be attributed to a number of reasons. Players related for this study were intercollegiate players. These players might have played both the games in the same sports calendar. Both volley ball and basketball are short pace games, hence may require same motor fitness components. All the players were ranged between the ages of 18 to 28 years. As per as biomotor activities are concerned both volley ball and basketball games needs almost the same set of activities such as jumping and explosive movements. Hence they may require same motor fitness components for performance. Vidhi and Radhika (2018) who found no significant difference in power among volleyball and basketball players, and this results were reached following the adoption of the same power test as in this study.

The table 2 reported on the mean difference in balance levels among volleyball and basketball players in Ignatius Ajuru University of Education. The volleyball players reported a minimum stork stand test time of 10 seconds and a maximum time of 70 seconds, yielding a mean balance score of 33.23 seconds in a stork stand test. Compared to the basketball players, balance was 30.8% better and improved with a minimum time of 15 seconds in the stork stand test, and a maximum time of 79 seconds yielding a mean value of 43.46 seconds of stork stand. The difference in mean balance scores of volleyball and basketball players in Ignatius Ajuru University of Education was found to be statistically significant (p<.05, p=0.037).

The results from the current study are agreeable with a more recent study by Budhe (2020) in which he concluded that, in a nutshell it can be said that from the findings that insignificant differences were found among Inter-varsity level basketball, handball and volley ball players on the sub-variables of biomotor fitness components such as balance. Mondal *et al.,* (2016) also found a significant difference in balance levels between volleyball and basketball players. Interestingly, Mondal *et al.,* (2016) adopted a different test battery but found similar results. However, the case is different for Vidhi and Radhika (2018) who found no significant difference in balance among volleyball and basketball players.

In comparing the speed of volleyball and basketball players, the participants were subjected to a 30m dash. From the results, the volleyball players completed the 30m dash in a minimum time of 3.40 seconds and a maximum time of 5.0 seconds with a mean completion time of 4.1 seconds; while among the basketball players, the minimum time was better at 3.20 seconds while the maximum time was worse at 5.30 seconds, yielding a mean completion time of 4.39 seconds which is 6.6% worse than that of volleyball players who reported a mean completion of 4.10 seconds. This difference is however, considered not statistically significant as the test of hypothesis has shown in table 8 revealed that there was no statistically significant difference in mean speed among the volleyball and basketball players in Ignatius Ajuru University of Education (p>.05, p=0.174). While Singh & Kerketta (2016) reported better speed among basketball players, the difference is the case in the current study in which better speed was reported among volleyball players. According to Obour *et al.*, (2017), there will always be a gender-significant difference in fitness factors/variables such as speed, thus, findings from a gender-bias study will differ greatly from that in which there is no gender bias. In a recent study by Sharma (2018), no significant difference was found in mean speed among basketball and volleyball players, in agreement with the findings made in the current study.

More recent research, such as the one by Rasool and Pathak (2019), tend to support the current findings when compared to previous studies. Rasool and Pathak (2019) claim that there is no discernible difference between the performance of basketball players and volleyball players in terms of 50m dash for speed. Further explanation of the findings was provided by Rasool and Pathak (2019), which also applied to the current investigation. There are numerous explanations for the outcomes. The participants in this study were collegiate athletes. These athletes may have participated in both contests at the same sporting event. Basketball and volley ball both take place in a small area and are short paced, so both sports may demand similar motor skills. The ages of the players, who were all male, ranged from 18 to 28. Both volley ball and basketball games require a similar set of biomotor activities, such as running and quick motions. As a result, they might need the same motor fitness elements to perform.

The findings of the current study are consistent with those of a more recent study by Budhe (2020), which came to the conclusion that there were no appreciable differences in the sub-variables of biomotor fitness, such as speed, among Inter-varsity level basketball, handball, and volley ball players.

The results presented in table 4 shows a comparison of agility levels among volleyball and basketball players. The players were subjected to an Illinois Agility Test (IAT) and the time it took them to complete the agility testing course was recorded and reported. Among the volleyball players, the minimum time for completion of the IAT was 10.5 seconds and the maximum time for completion of 22.60 seconds was observed. The difference is the case among basketball players who had a minimum time of 12.0 seconds which was actually worse than that of volleyball players but maximum completion time was a bit better with 1.4% less time amounting to 20.10 seconds maximum completion tome for basketball players. This difference yielded a mean completion time of 16.5 seconds for volleyball players and 16.3 seconds for basketball players, a difference of which was somewhat insignificant. The hypothesis test showed that the difference in the mean time for completion of the Illinois Agility Test (IAT) was considered not statistically significant (p>.05, p=0.827). The findings herein are different compared to that by Sanjeev and Shailesh (2011) who reported a significant difference in agility between volleyball and basketball players. This difference could be attributed to a difference in test battery and physical setting. Moreover, with no sex mix, as compared to the current study, it is more likely to find a difference in the fitness variables of interest, as the study by Sanjeev and Shailesh (2011) focused only on male players. The agility levels in this study among basketball players was slightly better than volleyball players which is in disharmony with the findings by Ramandeep and Lakhwinder (2015) who reported that volleyball players had better agility. Findings by Singh and Kertta (2016) aligns towards the current findings in this study as they found better agility among basketball players compared to volleyball players. Additionally, a Ghana-based study by Obour *et al.*, (2017) found that compared to basketball players, volleyball players reported better agility scores in agreement with the current study. These findings by Obour *et al.*, (2017) could be associated with the nature of their study which was not gender bias like the current study, both male and female players representing the school volleyball and basketball teams were all participants for the study. In a recent study by Sharma (2018), no significant difference was found in mean agility among basketball and volleyball players, in agreement with the findings made in the current study. The current study's findings are consistent with those of a more recent study by Budhe

(2020), which concluded that there were no appreciable differences in biomotor fitness sub-variables such as agility among Inter-varsity level basketball, handball, and volley ball players.

The results as presented table 5 revealed the muscular endurance scores of volleyball and basketball players in Ignatius Ajuru University of Education. Based on these results, the time for completion of a timed push-test was reported, among the volleyball players a minimum time of 20.0seconds was reported for the timed push-up test, with a maximum time of 80 seconds. The minimum time for completion among basketball ball players was better at 14 seconds while the maximum time was a bit worse at 78.00 seconds. The results yielded a mean score of 55.23 seconds of timed push-up test for volleyball players and a mean timed push-up test completion of 48.00 seconds among the basketball players. From the results, volleyball players reported better mean muscular endurance at 13.1% improved performance. However, the test of hypothesis presented in table 10 shows that these differences could not be considered statistically significant ($p>.05$, $p=0.142$). Agility is an important component of biomotor fitness of basketball and volleyball players, as noted by Goyindaiah & Muni (2019), the playing abilities of both sports participants is highly correlated to this biomotor variable.

The findings herein are different compared to that by Sanjeev and Shailesh (2011) who reported a significant difference in muscular endurance between volleyball and basketball players. This difference could be attributed to a difference in test battery and physical setting. Moreover, with no sex mix, as compared to the current study, it is more likely to find a difference in the fitness variables of interest, as the study by Sanjeev and Shailesh (2011) focused only on male players. Compared to the findings by Ramandeep & Lakhwinder (2015), volleyball players did better in muscular endurance that as reported by Ramandeep and Lakhwinder (2015) in which volleyball players had worse muscular endurance. The differences in test batteries could be a significant factor in these results but this is inconclusive.

CONCLUSIONS

Based on the findings from the study, it was evident that biomotor fitness variables among volleyball and basketball players in Ignatius Ajuru University of Education was virtually the same as the players demonstrated no significant difference in most biomotor variables such as speed, agility, power and muscular endurance. The only significantly different biomotor variable observed and reported was balance.

The above conclusion is logical as the participants (samples) where sport-exclusive only when it comes to representing the institution in significant contests/competitions, aside from which they actively engage in different sports. By being active in different sports including volleyball (among basketball players) and basketball (among volleyball players), these players must have developed a similar set of biomotor fitness.

RECOMMENDATIONS

Based on the findings and conclusion reached, the following recommendations are hereby considered important:

While being a jack of all trade (sports) makes on better than a master of none, in sports there is need for proper focus on a specific sports niche. Thus, coaches and trainers of the volleyball and basketball players should help both category of players concentrate their efforts on a specific sport so as to achieve maximum biomotor fitness required for maximal performance in the specific sports.

Sports administrators in Ignatius Ajuru University involved in overseeing the training of volleyball and basketball players should concentrate efforts in studying specific biomotor fitness needs of players and designing training programmes aimed to meet the needs of these players.

Sports men and women involved in volleyball and basketball should in a bid to develop their biomotor fitness engage in regular exercise and physical activities so as to maintain an optimal level of biomotor fitness and enhance their fitness levels.

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