Comparative Analysis of Motor Performance Variables among West Africa University Female Handballers

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Abstract
This study focused on comparative analysis of motor performance variables among West Africa University female champion-handballers in West Africa. The objective of the study is to analyze the motor performance variables of female university champion-handballers in West Africa. Ex-post facto research design was adopted for the study. All the female handball players from the three Universities that participated in the West Africa University games constituted the population. Purposive sampling technique was used to select all the thirty-seven players that are available during the competition for the study. Descriptive and inferential statistics of t-test and ANOVA Scheffe post hoc multiple comparison tests were used to test for significant difference between the groups. The findings revealed that the female players had significant differences in motor variables (Abdominal Endurance). It was therefore recommended that coaches should focus on these variables in their selection and coaching processes.

Key words: Motor variables, leg power, Shooting, Speed.

Introduction
The recognition of relevant motor 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, Daros, Mastrascusa, Dourado & Stanganelli, 2009) (Campos, Daros, Mastrascusa, Dourado & Stanganelli, 2009). Therefore the relationship between motor variables and sports performance is an important aspect to be analysed.

Handball is a dynamic, sporadic game played over sixty (60) minutes duration. It needs efforts of full intensity in a limited period of time. During play, the players sprint, jump and throw the ball at a high velocity, followed by low intensity recovery times. Researchers (Ziv & Didor, 2009, Moncef et al. 2012) have made strong submissions that due to the physical demands involved in playing the game, there is need for advance training in the aspect of physical preparation in order to compete effectively with other teams. Studies have also revealed that champion athletes in various sports need different body proportions with respect to their events (Vikram & Vijay, 2010; Toriola, 1999 and Dominic, 2006) (Vikram & Vijay, 2010; Toriola, 1999 and Dominic, 2006).

Different sports require different motor abilities; also there are unique criteria on body structure and proportions (Bencke, Damsgaard, Saekmose, Jorensen &Nicholson, 2002; Gabbett, Georgieff, Anderson, Cotton, Savovic & Nicholson, 2006) (Bencke, Damsgaard, Saekmose, Jorensen &Nicholson, 2002; Gabbett, Georgieff, Anderson, Cotton, Savovic & Nicholson, 2006). Studies have proven that the physical (physique) and motor efficiency variables may be important factors that guarantee success in sports and games (Ostojic, Mazic & Dikic, 2006; Van den & Ettema, 2004) (Ostojic, Mazic & Dikic, 2006; Van den & Ettema, 2004). The position played by physique has been considered very significant because morphological constitutions and its proportions in the human body are genetically determined and cannot be modified under normal circumstances. It is believed that physical fitness is a trainable factor but the influence of one's body physique and body structure seem to play important role in its determination as achievement of high level performance is only possible in a person with adequate genetic predisposition under optimal environmental condition.

It has been established that body structure and certain anthropometric variables provide advantage in some sports (Van den, Tillar & Ettema, 2004; Gabbett et al. 2006) (Van den, Tillar & Ettema, 2004; Gabbett et al. 2006). For example in basketball game, height is an advantage. Although taller and more powerfully built players have advantage in handball game. However, training at competitive level is affected by motor skills of children and adolescents (Gorostiaga, Izqueido, Iturralde, Ruesta & Ibanez, 1999) (Gorostiaga, Izqueido, Iturralde, Ruesta & Ibanez, 1999). Anthropometry offers the knowledge concerning motor variables, which are required to attain high level of performance in sports. They are measurable on the components of fat, muscles and bones to assist coaches in taking specialised decisions in choosing athletes to achieve high standards of athletic success.

Statement of the Problem

In order to address few of those factors promoting excellence in sports, sports scientists focused on recognizing, enhancing and sustaining variables of success including agility, speed, and mobility. Despite this, comprehensive research has established the above characteristics in various sports in Nigeria (Olaitan, 2012; Dominic, 2011 & Igbanugo and Ajayi-Vincent, 1995). In another study, the performance of athletes in other athletes, apart from handball, in relation to injury performance and occurrence, was investigated specifically and compared (Sibila, Bon, Mohoric & Pori, 2011; Tuma & Vozobulowa, 2011). Many studies in the field of motor performance variables with female university athletes especially in this part of the world, have therefore not been made or identified.

Research Questions

1. What are the identified Motor performance variables among University Female handball players in Nigeria?

Hypotheses

1. There is no significant difference in Motor performance variables among elite Female University handball players in Nigeria
2. There is no significant influence of Motor variables on performance among elite Female University Handball players in Nigeria

Methodology

For this analysis, the Ex-Post-Facto research design was adopted, the measured variables already exist and exactly the way they appeared was measured and recorded. This was deemed ideal for the analysis because the researchers were unable to modify all the calculated variables. The research included all elite women handball students from the universities who took part in the finals of the thirteenth WAUG, which was held at the University of Ilorin. The research size was 36.

In selecting female handballers from six universities participating in the championship, a purposeful sampleing technique was adopted. Three women's handball teams come from three universities: University of Benin, University of Ilorin, and University of Nnamdi Azikiwe, Awka. Could of the three teams had 12 handball players to make 36 (36).

Instrumentation

The following instruments and materials were used:

1. Stop watch: Casio automatic stopwatch (telemeno30) graduated to 1/10 of a second was used for timing

2. Flexibiliometer scale: this was used to measure stand and reach test, the reading was taken to the nearest centimeter (cm) (cm)

3. Measuring tape: non-elastic tape (butterfly trade mark) graduated in millimeters was used for measuring distances specific to the analysis.

4. Handball courts: the University of Ilorin handball court was used for all skills measurement

5. Handball: ball made according to International Handball Federation specification for female was used

6. Gymnasium wall: used for assessing shooting, throwing and catching abilities including span calculation of the participants

7. Simple sheet: used for measuring finger duration

8. Motor output variables were speed, leg strength, shooting ability, abdominal endurance, agility and flexibility.

Reliability of the Instrument

Using female handball players from Ilorin who were not part of the university team, a pilot study was carried out. This helped to familiarize researchers with the use of the methods and the potential problems that could arise during the actual analysis. Test-retest reliability approaches have been introduced to assess the reliability of the instrument. Researchers have collaborated with specialists in the field of exercise physiology from the Department of Human Kinetics Education, University of Ilorin, to standardize the instruments. They then compared the findings obtained with existing criteria in order to assess the validity of the results obtained. Using the Pearson Product Moment Correlation Coefficient (PPMC), the reliability of the data collected was calculated and a coefficient value of 0.87 was obtained, indicating a very high value. Prior to test administration, informed consent of the participants was obtained. After presenting the necessary information on the design, intent and benefits of the research, the forms were personally signed by the participants individually.

Test Places

At the University of Ilorin soccer ground, all the throwing and catching, vertical jump and shuttle test skills were performed while the dribbling test was performed at the University handball courts.

Test administration

Research assistant preparation followed the test administration; for the study, five research assistants were used. The training lasted for two days; they were trained in the record-taking protocol for participants. The participants records lasted for four days. The first series of tests administered were pace (shuttle run), leg strength (vertical jumps), shooting ability (throwing and catching). This was preceded by T-shuttle running agility, abdominal stability (sit ups), flexibility tests (stand and reach test). Five minutes of rest period is permitted between the tests to encourage the best results from the participants.

Measurement of variables in motors

The following tests for motor performance variables were taken in accordance with normal procedures (Zang, 2010; Visnapauu, 2009):

Velocity (seconds)

The speed of participants was calculated using a 30-m run sprint. The location was the handball court; the standing starting position behind the starting line was adopted by each participant. The participant ran 30 meters as quickly as possible to the finishing line at the 'Go' signal. The time of completion was registered to the nearest 0.01 second. The best time was taken for analysis in two trials for each person. Two minutes was the rest time between the races.

Strength of the Leg (M): Vertical Jump

Procedure: from a standing position, the participant places his hands on the hip, legs in a semi-squat position, arms placed on the hips. Three jumps were performed from this position, with a recovery period of two minutes between each jump. In order to jump as high as possible, participants were encouraged. In centimetres, the jumps were recorded and the highest was used for data analysis.

Shooting Ability: pace and reliability (reps)

Equipment: a line was drawn on the floor 3 meters from the wall and a 40x40 cm square line was drawn on the wall, 180 cm from the floor on the lower side.
Procedure: adapted from Zang (2010), participant stands behind the line to execute the shooting a comfortable position and starts shooting with the dominant hand at the target on the wall with maximum speed for 30 seconds. Only shots that accurately lands on target were counted and recorded, the best of two trials was used for the study.
Flexibility: stand and reach test
Equipment: flexibiliometer (Takei Kiki) to assess the degree of flexibility of the trunk
Procedure: adapted from Zang (2010) (2010)
Participant stands on the equipment with the shoes off, raise up both hands above the head. Participant gradually goes down without bending the knee until the middle finger tip makes contact with the measuring box. Participant pushes the box downward with the head tucked in until they reach limit. During this procedure the finger must be parallel to each other with the knee straight. Each participant has three trials; the best performance is picked and recorded to the nearest centimetre.
Agility Test: T-shuttle runs

Equipment: three lines were drawn on the floor with a distance of five metres apart and labelled as A, B, C and D respectively.

Procedure: adapted from Zang (2010), participant starts from point A (timer starts), moves very fast to point B and touches the ball with one hand and returns to point A. this is followed by running from point A to C, touches the ball at point C and runs back to point A. finally participant moves from point A to D. the time spent in completing the procedure is recorded to the nearest second. Each participant attempts the test twice with a rest interval of two to three minutes; the best of two trials is used for analysis.

Abdominal Endurance Test

Purpose: to evaluate the abdominal endurance

Equipment: timer, ats

Procedure: There are two trials of twenty sit-ups for each participant. Starts with a 106 supine position with straight legs, torso raised to a sitting position, with two hands touching both feet

and then returning to the initial position. The best two out of three trials were used for analysis of three sets of timed 20 sit-ups, with a rest interval of 2 minutes.

Data Analysis Method

In order to analyse the data collected for the study, descriptive and inferential statistics were used. In order to analyze the research question, mean, standard deviation and range were used, while t-test and One-way Analysis of Variance (ANOVA) statistics were used to test the formulated hypotheses at the 0.05 alpha level.

Results

Table 1: Summary of descriptive statistics on motor performance variables of female West African university handball players

Variables	University of Benin				Nnamdi Azikiwe University				University of Ilorin			
	N	X	Sd	Range	N	X	Sd	Range	N	X	Sd	Range
Speed (secs)	12	3.65	.63	3-4.5	12	3.58	.51	3.4	12	3.58	.51	3-4
Flexibility (cm)	12	13.50	5.77	10-22.2	12	17.90	4.89	7.8-22.5	12	14.73	4.09	7.8-22
Agility (secs)	12	16.93	.47	16-17.40	12	16.84	.61	16.50-18.00	12	16.65	.44	16.20-17.20
Abdominal endurance (reps)	12	36.66	4.99	28-43	12	46.75	10.43	32-63	12	39.16	4.51	32-47
Leg power (cm)	12	2.37	.13	2.19-2.56	12	2.47	.14	2.24-2.70	12	2.48	.13	2,25-2.70
Shooting (reps)	12	34.83	9.87	11.45	12	30.92	5.17	21-38	12	31.08	5.04	22-38

Table 1 presents mean and standard deviation on motor variables of female university handball players. There were variations in the values recorded; speed (3-4.5), flexibility (7.8-22.5), agility (16-18.00), abdominal endurance (28-63), leg power (2.19-2.70) and shooting ability (11-45 reps). This could suggest that the game could be played by individuals with variations in motor variables as shown in the result reported.

Table 2: ANOVA Summary on Motor Performance Variables of Female University Handball Players in Nigeria

Variables	Source	Sum of squares	df	Mean square	F cal. Ratio	F crit.val.	remark
Speed (secs)	Between Groups Within Groups Total	0.36 10.203 10.239	2 33 35	0.18 0.309	0.57	3.32	Ho not rejected
Flexibility (reps)	Between Groups Within Groups Total	123.636 815.207 938.842	2 33 35	61.818 24.703	2.502	3.32	Ho not rejected
Agility (secs)	Between Groups	0.518 8.628	2 33	0.259 0.261	0.990	3.32	Ho not

	Within Groups Total	9.146	35				rejected
Abdominal endurance	Between Groups Within Groups Total	661.722 1694.583 2356.306	2 33 35	330.861 51.351	6.443	3.32	Ho rejected
Leg power (m)	Between Groups Within Groups Total	.086 .604 .690	2 33 35	0.043 0.018	2.357	3.32	Ho not rejected
Shooting (reps)	Between Groups Within Groups Total	117.722 1647.500 17652.222	2 33 35	58.861 49.924	1.179	3.32	Ho no rejected

From table 2, no significant difference was found among elite female university handball players in speed (F cal. =0.57<3.32), flexibility (F cal.=2.50<3.32), leg power (Fcal.=2.357<3.32) and shooting ability (Fcal. 1.179<3.32) but there was significant difference in abdominal endurance (Fcal. 6.443>3.32). Therefore the hypothesis as stated is accepted.

Table 3: Scheffe post hoc tests on motor performance variables of female university handball players

Variables (units)	Indep Dep(2)	Mean differences	Standard error	Sig.
Abdominal endurance	Nnamdi Azikiwe University of Ilorin University of Benin	7.58* 10.08*	2.92 2.92	.047 .002

Table 3 shows that handball players from Nnamdi Azikiwe University recorded significant difference in abdominal endurance compared to the other two universities.

Discussion

Based on the outcome of this study, as reported by Zapartidis, Vareltzis, Gouvali & Kororos, the mean speed (3.61 secs) of the female university handball players was lower compared to different levels of young team handball players (603+031) (2009). Nesser et.al (1996) postulated that in sports such as handball, rapid start and rapid acceleration, the strength of the knee flexors propel the body forward and the ability of these muscles to contract quickly and generate force is important. Sprints for short distances (20-30m) are also essential during a quick break or when returning to defense after losing possession of the ball in team handball (Lidor,et. al 2005). The nature of handball, in essence, requires a motor characteristic that requires players to increase their reaction time and movement recurrence.

The results of the study showed that the players exhibit similar flexibility with regard to flexibility. Flexibility in relation to handball has been shown to be specific and not a general

characteristic that cuts across the body as there are differences in body proportions. The specificity and age of sports have also been found to play an important role in flexibility (Maffuli et.al 1994). Therefore in one joint of the body, a high degree of flexibility does not necessarily translate to flexibility in another part of the body. The outcome of the players' average agility was comparable to the Wagmare (2012) study of 30 male handball players aged 15 to 25 years selected from universities, state and national levels. It was clear from his discussion that agility is a crucial factor in the handball game for an athlete to make a quick, accurate and precise decision during the game. In addition, Ajay-Vincent & Adeshina (2012) noted that rapid start, stops and directional changes, all of which are agility attributes, are essential to good ball game performance.

The post hoc abdominal endurance analysis by Scheffe confirmed that there was a significant difference between the players. It showed strong similarities between the female handball players of the University of Ilorin and the University of Benin, while those of Nnamdi Azikiwe differed significantly from the others. This outcome varies from the findings of (Mohammed et.al 2009; and MacDougall et. al 1991). They argued that a stronger athlete with heavy loads would have higher absolute endurance, but less relative endurance. Amusa & Onyewadume (2001) concluded in their study that lactate tolerance is an important factor in endurance ability and in sports performance. They found that even for the same sport, the lactate build-up and concentration vary from one athlete to another.

The outcome of this study also revealed that the leg power/strength of the elite female university handball players was not significantly different. The leg power/strength (24.4cm) ranging from 21.9-27.0cm was relatively the same for all the players. This outcome differs from that of the higher leg power value of Kartic, Grgantov & JUrko (2006), where players were ranked according to their playing efficiency. This is corroborated by the results of Ajayi-Vincent, the author stressed that the need for muscle strength varies for different sports, so players require higher leg power strength than others in certain sports. To achieve peak performance, handball requires a combination of strength and speed. It has also been stressed that muscular power, also referred to as anaerobic or explosive power, is the product of strength and speed. In comparison to non-athletes and endurance trained athletes, handball players were therefore found to have greater leg power/strength (www.physicalactivityonline.com, 2013; www.coachr.org, 2013).

From the results of this research, it was also revealed that all elite female university handball players had the same shooting ability in comparison. For elite players, this could be an ideal situation. However the outcome obtained differs from the shooting ability of the speed of male and female young handball players who presented a higher value. Van de Tillar (2004) and Gabbett (2005) claimed that throwing speed depends on the ability to produce power that is important for success in handball and rugby. It was also found that the most important factors are the combination of ball velocity and throwing accuracy and play a decisive role in scoring ability (Muijtjens, 1991).

The study of abdominal endurance and flexibility motor performance variables showed that the University of Benin ranked highest, followed by Nnamdi Azikiwe University and Ilorin University trailing. The result further revealed that the highest values of leg power and agility were recorded by female handball players at the University of Ilorin. Significant differences in speed, flexibility, agility, leg power/strength and shooting ability were shown by Nnamdi Azikiwe University and Ilorin University. The overall performance of the teams in the competition showed that despite being ranked second in the variables measured, the University of Benin emerged as champion, which can be attributed to other variables not measured in this study. This line of thought supports Agbonjimi's (1995) and Dominic's (2006) submissions, which explain that sports performance is based on a complex and complex variety of variables.

Conclusion

Anthropometric and motor performance variables of elite female university handball players were emphasized based on the outcome of this study. This study provided data from athletes who played at the highest level in the competitions at Nigerian University and provided reference values for female handball players' anthropometric characteristics and motor performance capacity. Anthropometric and motor variables, by implication, affect the performance of athletes.

Recommendations

Team trainers should take physical, tactical and psychological variables based on the results of this study, as they are important factors for selecting top-class athletes. In addition, due to the strong relationship between anthropometric variables and motor performance indicators, attention should be directed to team coaches' motor performance indicators, as this may be helpful in identifying potential players and making the training program more effective.

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