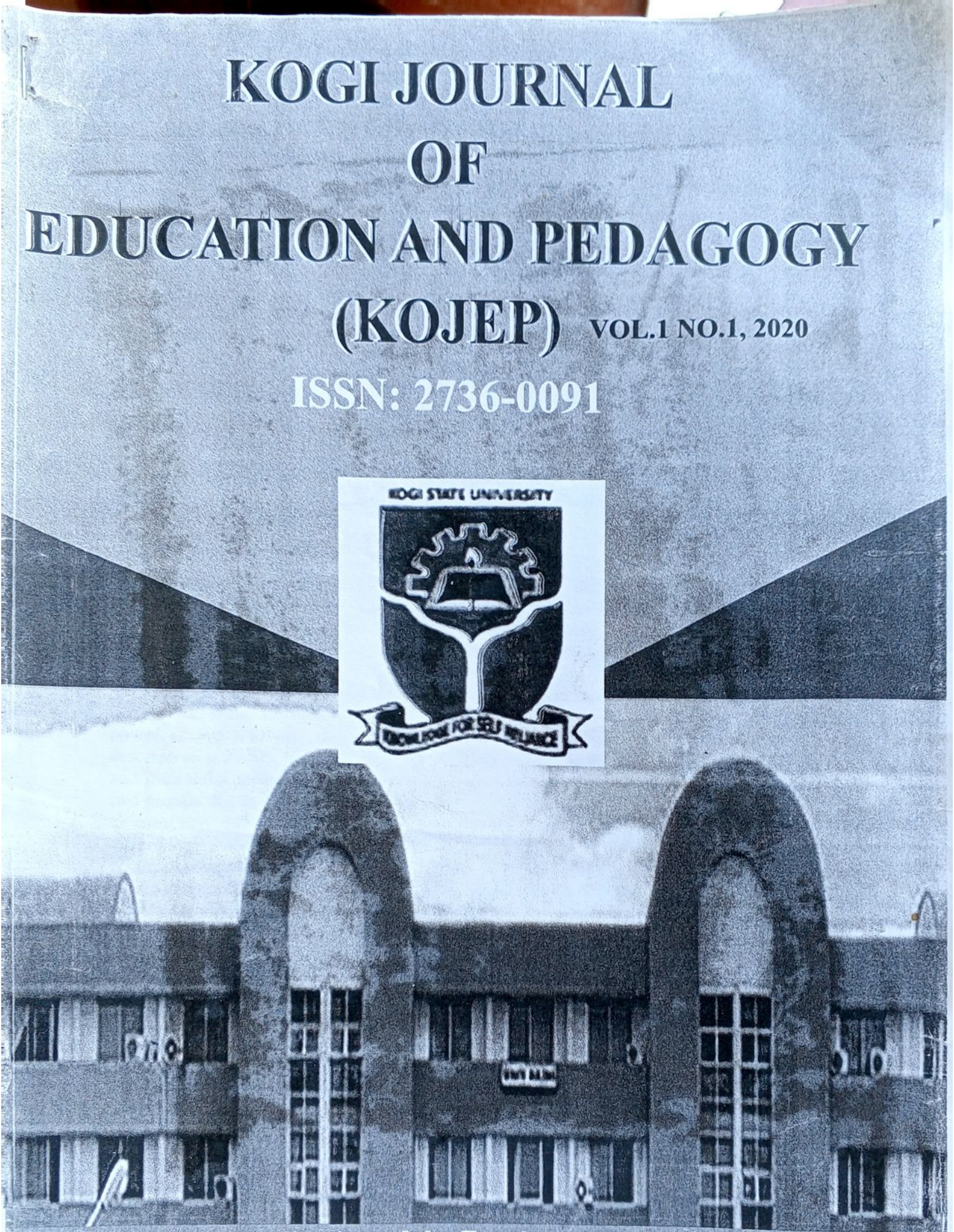
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COMPARATIVE ANALYSIS OF ANTHROPOMETRIC AND PHYSIOLOGICAL CHARACTERISTICS OF NIGERIAN NATIONAL POWER ATHLETE

By

Abubakar, Ojo Nurudeen
Department of Human Kinetics and Health Education, Kogi State University Anyigba
E.mail: Nurudeenabu001@gmail.com
Phone number:*07031535977*

Dominic, Olufunmilola Leah
Department of Human Kinetics and Health Education, University of Ilorin, Ilorin Nigeria
&
Alabidun Mujeeb
Department of Human Kinetics and Health Education, Kwara State University Malete, Ilorin, Kwara State.

Abstract
The purpose of this research work was to find out the significant difference between anthropometric and physiological characteristics of Nigeria national power athlete which are peculiar to combat sport and field throwers. Stratified random sampling techniques were used to select judo, taekwondo, shot put and javelin throwers in Nigeria. Standardized instrument were used to collect the following data for analysis Physical characteristics such as age, height and weight. The anthropometric variables of body girths such as thigh, mid-thigh, hip, wrist, relaxed, contracted, waist circumference and physiological parameters such as speed, leg explosive power, resting heart rate, push up, sit up, power test and anaerobic in sixty seconds (1min). The descriptive statistics of mean, standard deviation (SD) was used to describe the data collected and inferential statistics of ANOVA was used to compare the four athletes and t-test to test the two groups that is combat and throwers at o.05 level of significant and Scheffepost hoc was used to establish differences among the four sports. It was found that there were significant differences among the body circumference except few where significant difference does not occur. It was also found that there were no significant differences among the physiological, cardio-respiratory fitness of the four sports. It was found amongst others that Shotputters are more different to judokas, Taekwondo and Javelin in height, weight and body girths respectively. Therefore, it was recommended amongst others that trainers and coaches should consider the Anthropometric, Physiological and body composition necessary for each game in terms of selection of athlete.
Keyword: Anthropometric, Physiological, Power Athlete, Combat and Throwers

Introduction

Anthropometry is the science that deals with the measurement of size, weight and proportions of the human body size, physique and body composition these are important factor in physical performance and fitness. It is also defined as the science of measuring the human body parts or segments in order to ascertain the average dimensions of the human form at different ages, and in different divisions of race, class among others (Abubakar N.O, Adeoye S.A, Abubakar M.N & Adeola M.F, 2019).

Anthropometry refers to the measurements made of various parameters of the human body such as physical characteristics, body composition and circumference of various body parts (Ross & Marfell-Jones, 2004). Dominic (2012) asserted that anthropometry is a research area within physical ergonomics that is concerned with body measurement such as body size, shape, strength, flexibility and work capacity. Physical characteristics such as age, body weight, height and other standardized tests such as Body Mass Index (BMI) and Waist to Hip Ratio (WHR) has been established to differentiate clearly between physically active and less active counterpart, and also among athletes in different sports and degree of achievements.

Power is the amount of work performed per unit time (Derek, 2006). Power is an element of skill related fitness that is needed to excel in specific Sport athletic performance. Increased strength does not always translate to increased power; for example a strong upper body lifts a high amount of weight. However a strong upper body does not always have the ability to throw a shot put very far if enough speed cannot be generated therefore, strength and power are required to excel in throwing event and other power related Sports (Luann, 2012). Therefore, Power athletes are those that use the maximum exertion of strength within a short burst movement (Wiki.answer.com, 2012).

Judo, a power sport is a Japanese art and Olympic sport. Besides technical skill and tactical strategies, conditional characteristics are also indispensable for success in competition and for training (Franchini, Takito, Kiss, Sterkowiczs, 2005 & Singh et.al 2011). Taekwondo, one of the oldest Korean martial art was an amalgamation of unarmed combat style by three rival Korean kingdoms of Goguryeo, Silla, and Baekje, where young men were trained in an unarmed combat technique to develop strength, speed, and survival skills (Morris, 2006).

Track and field events such as Javelin and Shot-put are marked by an exceptional variety of duration of a single event, energetic demands and a high tempo of energy release. Power athletes both in field athletic events and combat Sports, most times, need to overcome the force of gravity on different distances or height, so also with implement thrown, this point to the need of specific lean body composition as a pre requisite for more efficient and economic performance in a single event. Athletes who have acquired the optimal physique for particular events are more likely to succeed than those who lack the general characteristics (George, 2010).

Statement of the Problem

Several studies have been carried out on inter and intra combat Sports athletes, track and field athletes. Both Sports demand of the athlete speed, strength and power qualities if the athletes must excel. Not only this both field throwers and Combat Sport athletes predominantly perform explosive movements with their legs and arms, anaerobic energy pathways and require fat free mass to generate the force required for their Sports. Some studies compared Judokas (Physical and physiological characteristics of male judokas) Singh et.al, (2011) and Javelin throwers with other athletic events (Analysis of anthropometry, body composition and performance variables of young Indian athletes in southern region (George, 2010). However, there are few scientific studies that has been undertaken to compare athletic throwers with any combat Sport athletes.The researcher from his observation believes that the combat sports athletes and Athletic throwers have some qualities in common since they are both power Sports which require explosive power.

Objective of the Study

This research was carried out to compare the anthropometric and physiological characteristics of Nigerian elite Athletic field throwers and combat Sports of Nigerian top national Power athletes.

Research Questions

1. Is there any difference in the Physical Characteristics such as Age, Weight and height of combat sports and athletic field throwers of Nigerian national power athletes?
2. Will there be any difference among the Anthropometric characteristics such as Waist circumference, Hip circumference, relaxed arm, Contracted arm, Thigh, mid-thigh, and Wrist circumferences of Nigerian national power athletes?
3. Will there be any difference among the Physiological characteristics such as Speed, abdominal strength endurance, Arm strength endurance, leg explosive power and Resting Heart Rate of Nigerian national power athletes?

Research Hypotheses

1. There is no significant difference among the physical characteristics such as Age, weight and height of Nigerian national power athletes.
2. There is no significant difference among the anthropometric characteristics such as Waist circumference, Hip circumference, relaxed arm, Contracted arm, Thigh, mid-thigh, and Wrist circumferences of Nigerian national power athletes
3. There is no significant difference among the physiological characteristics such as Speed, abdominal strength endurance, Arm strength endurance, leg explosive power and Resting Heart Rate of Nigerian national power athletes

Methodology

The research design adopted for this study was ex-post facto. This is because participants were examined based on their pre-existing characteristics without any manipulation or treatment given. The representative samples of four Sports such as Judo, Taekwondo, Shot put and Javelin throwers will be used by measuring the anthropometric and physiological characteristics of the entire four team players. The population of this study comprised of Nigerian Male national Judo, Taekwondo, Shot put and Javelin athlete training in Nigeria.

Stratified sampling technique was used to select the participant for this study. The sample was drawn from all athletes who participated at National Athletic Golden League and Taekwondo competition which were both held in Kwara State and Judo national trial held at Ibadan using purposive sampling technique, while stratified random sampling technique was used to select athlete from combat sports; Judo & Taekwondo and field throws from Athletics to include Shot-putters and Javelin throwers to make the power athletes sample for the study.

The athletes were stratified by sex, Sport type categories and level of competition. 10 male athletes each from combat sports (Judo and Taekwondo) and 9 from athletic field athletes of javelin and 7 Shot-putters were also used for the study. 36 participants, who completed the measurements, made up the sample for the study. The variables measured in this study include physical characteristics such as Age, height and weight. Anthropometric variables such as waist girth, contracted arm girth, relaxed arm girth, palm girth and wrist girth. Physiological variables such as pushup, Situp, heart rate and 20M dash.

Height and Weight: These were measured using the Health- O - Meter (with height and weight) measuring components. The height scale is calibrated in meters from 0.75cm to 2.5metres. Height was recorded to the nearest 0.01m (1cm) the weight scale is calibrated in

Kilograms from 0kg to 140kg. Weight was measured and recorded to the nearest 0.05 kilograms (5grams). The weighing scale has a reliability of 0.96 (Safrix & Woods, 2002). Stadiometer has a reliability coefficient of 0.96 as described by (Willet, 2001).

Anthropometric characteristics: Includes the circumference measure of the waist, hip, relaxed arm, contracted arm, thigh, mid-thigh, palm and wrist, the measurement were recorded in centimeters. These measures were taken in standard anatomical sites around the body as recommended by Kin anthropometric (National Health and Nutritional Examination Survey (NHNES), 2006 and Mueller, 2013).

Age: was determined as given by the subject.

Physiological Characteristics measured include resting heart rate to the millimeter of mercury (mmHg) and beats per minute (bpm) respectively. The Heart rate was measured using Omron Blood Pressure and heart rate monitor. Explosive Leg power was taken using vertical jump. The equipment used was tape measure, wall, step ladder and chalk. The test procedure requires the athlete to warm up for 10 minutes, chalks the end of his/her fingertips, athlete stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (M1), the athlete from a static position jumps as high as possible and marks the wall with the chalk on his fingers (M2), the distance between MI and M2 was recorded. The athlete repeats the test 3 times and the average score was taken. Muscular strength was determined using Epley method which requires participant to lift a certain load to fatigue and the equation was used to estimate muscular strength. That is 1-RM = (0.033 x Load X RTF) + Load. RTF denotes repetitions to fatigue. For this study, the load lifted to fatigue was 30kg.

Results

The data taken from Judokas, Taekwondo athletes, Shot putters and Javelin throwers was analyzed using SPSS statistical package of descriptive statistics of Mean, Standard deviation (SD) to describe data while inferential statistics of ANOVA to check the athlete in their respective sport, T-test to check the group that is combat, thrower and Scheffe post hoc was used to check the level of differences in the variables. The significant level of this research work was determined at 0.05 Significant (alpha) levels which enable the researcher to either reject or accept the hypothesis.

Table1: Mean and ANOVA result for Physical Characteristics of the power athlete

Variable	Group	N	Mean±SD	F	Sig
Age	Judo	10	27 ± 3.89		
(yrs)	Taekwondo	10	27.3 ± 2.31		
	Javelin	9	31.22 ± 3.67	4.93	.006*
	Shot put	7	31.57 ± 2.99		
Weight	Judo	10	71.51 ± 9.01		
	Taekwondo	10	68.68 ± 9.40		
	Javelin	9	88.22 ± 2.54		
	Shot put	7	91.43 ± 3.91	22.18	.000*
Height	Judo	10	187.80 ± 36.44		
	Taekwondo	10	177.20 ± 6.99		
	Javelin	9	183.56 ± 5.55		
	Shot put	7	191.86 ± 5.84	0.85	.48

$P \leq 0.05 df=34$

Table 1 above shows the means and SDs and F value for age, weight and height of the power athletes; among the athletes for age, Judo (27±3.89) taekwondo (27.3±2.31), javelin (31.22±3.67) and shot put (31.5±2.99); the shot putters were the oldest..

The F calculated values for age and weight showed significant difference but not in height. To show the significance difference between the athletes the ANOVA was followed with Scheffe post hoc

Table 2: Scheffe Post Hoc for Physical Characteristics

Age	Judo	10	27.00	
(yrs)	Taekwondo	10	27.30	
	Javelin	9	31.22	
	Shot put	7	31.57	
	Sig		**0.053**	
Weight	Judo	10	68.68	
	Taekwondo	10	71.51	
	Javelin	9		88.22
	Shot put	7		91.43
	Sig		**0.88**	**0.83**
Height	Judo	10	177.20	
	Taekwondo	10	183.56	
	Javelin	9	187.80	
	Shot put	7	191.86	
	Sig		**0.51**	

From table 2, Judokas are not significantly different from others in age and height. There is however, a clear significant difference in the weight among the four groups. Athletic field throwers are significantly heavier than the combat athletes, with the shot putters being the heaviest.

Table 3: Means, and ANOVA results for body circumferences of power athletes

Variable(cm)	Group	N	Mean±SD	DF	F	Sig
Contracted arm girth	Judo	10	58.99 ± 5.81			
	Taekwondo	10	37.10 ± 4.77			
	Javelin	9	43.06 ± 3.29		7.01	.001 *
	Shot put	7	45.89 ± 1.11			
Relaxed arm girth	Judo	10	76.40 ± 9.90			
	Taekwondo	10	79.15 ± 1.06			
	Javelin	9	81.89 ± 2.48		2.57	.025*
	Shot put	7	83.74 ± 2.12			
Waist girth	Judo	10	93,75 ± 7.18			
	Taekwondo	10	92.51 ± 2.82			
	Javelin	9	98.34 ± 2.82		6.49	.001*
	Shot put	7	102,47 ± 1.34			
Hip girth	Judo	10	93.75± 7.18			
	Taekwondo	10	92.51 ± 5.82			
	Javelin	9	97.76 ± 2.37		6.19	.002*
	Shot put	7	102.47 ± 1.84			
Wrist girth	Judo	10	19.44 ± 2.24			
	Taekwondo	10	19.21 ± 1.043			
	Javelin	9	21.39 ± 1.46		12.81	.000*
	Shot put	7	22.91 ± 0.56			
Mid-thigh	Judo	10	55.41 ± 5.06			
	Taekwondo	10	53.05 ± 3.72			
	Javelin	9	59.69 ± 4.28		7.84	.000*
	Shot put	7	61.21 ± 0.70			

Palm length	Judo	10	21.52 ± 1.54		
	Taekwondo	10	21.79 ± 1.04		
	Javelin	9	23.22 ± 1.60	5.75	.000*
	Shot put	7	23.77 ± 0.93		
Thigh	Judo	10	51.82 ± 9.42		
	Taekwondo	10	49.76 ± 9.49	10.69	.000*
	Javelin	9	63.49 ± 2.15		
	Shot put	7	64.19 ± 1.76		

P≤0.05 Df=34

The ANOVA statistics for anthropometric variables shows the calculated F value of 7.01, 3.57, 6.49, 6.19, 12.31, 11.91, 3.98, 1.36, 1.22, 8.34, 0.89, 2.81, 7.84, 5.75 and 10.69 respectively which was significant at 0.05 alpha levels. This led to the rejection of the hypothesis 2 that there was no significant difference between combat sport and athlete field throwers of Nigerian National power athlete.

Table 4: Scheffee post hoe for Body circumference (cm) of the power athletes

Contracted(cm)	Taekwondo	10	37.1000	
	Judo	10	38.9900	
	Javelin	9	43.0556	
	Shot put	7		45.8857
			0.058	**0.605**
Relaxed (cm)	Judo	10	76.4000	
	Taekwondo	10	79.1500	
	Javelin	9	81.8889	
	Shot put	7		83.7429
			0.172	**0.311**
Waist (cm)	Taekwondo	10	92. 5100	
	Judo	10	43.7500	
	Javelin	9	98.3444	

	Shot put	7		102.4714	
			0.150	**0.428**	
Hips (cm)	Taekwondo	10	92. 5100		
	Judo	10	93.7500		
	Javelin	9	97.7625		
	Shot put	7		102.4714	
			0.237	**0.327**	
Wrist (cm)	Taekwondo	10	19.2100		
	Judo	10	19.4400		
	Javelin	9		21.3889	
	Shot put	7			22.91
			0.990	**0.061**	**0.194**
Contracted(cm)	Taekwondo	10	37.1000		
	Judo	10	38.9900		
	Javelin	9	43.0556		
	Shot put	7		45.8857	
			0.058	**0.605**	
Relaxed (cm)	Judo	10	76.4000		
	Taekwondo	10	79.1500		
	Javelin	9	81.8889		
	Shot put	7		83.7429	
			0.172	**0.311**	
Waist (cm)	Taekwondo	10	92. 5100		
	Judo	10	43.7500		
	Javelin	9	98.3444		
	Shot put	7		102.4714	

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Hips (cm)	Taekwondo	10	92. 5100		
	Judo	10	93.7500		
	Javelin	9	97.7625		
	Shot put	7		102.4714	
			0.237	**0.327**	
Wrist (cm)	Taekwondo	10	19.2100		
	Judo	10	19.4400		
	Javelin	9		21.3889	
	Shot put	7			22.91
			0.990	**0.061**	**0.194**
Mid thigh	Taekwondo	10	53.0600		
	Judo	10	56.4100		
	Javelin	9		59.6889	
	Shot put	7			61.2143
			0.672	**0.186**	**0.884**
Thigh	Taekwondo	10	48.1600		
	Judo	10	51.8200		
	Javelin	9		63.4889	
	Shot put	7		64.1857	
			0.881	**0.998**	
Palm length	Judo	10	21.5200		
	Taekwondo	10	21.7900		
	Javelin	9	23.2222		
	Shot put	7		23.7714	
			0.086	**0.861**	

From table 4, it was found amongst others in Scheffe post hoc that shot putters are significantly different from others in contracted, relaxed waist, hip and palm length, while Judo,

Taekwondo and Javelin are closely related in terms of this variables. There is no significant difference in the wrist and mid-thigh girth of Judokas and taekwondo (combat) while a significant difference was seen in javelin and shot putters (throwers).

Table 5: Mean, SDs and ANOVA results for Physiological Characteristics of power athlete

Variable	Group	N	Mean±SD	DF	F	Sig
Speed	Judo	10	5.94 ± 0.72997			
	Taekwondo	10	5.83 ± 0.377			
	Javelin	9	5.28 ± 0.22	34	3.50	.027*
	Shot put	7	5.73 ± 0.383			
LEP	Judo	10	273.88 ± 32.44			
	Taekwondo	10	261.60 ± 14.81			
	Javelin	9	290. 89 ± 9.89	34	3.37	.037*
	Shot put	7	272.86 ± 11.13			
RHR	Judo	10	75.70 ± 7.30			
	Taekwondo	10	78.40 ± 5.44			
	Javelin	9	77.44 ± 8.02	34	0.765	.522
	Shot put	7	80.87 ± 7.49			
Push up	Judo	10	65.00 ± 8.86			
	Taekwondo	10	69.00 ± 5.79			
	Javelin	9	76.00 ± 10.03	34	2.892	.050*
	Shot put	7	72.57 ± 9.11			
Sit up	Judo	10	70.90 ± 15.42			
	Taekwondo	10	81.10 ± 10.03			
	Javelin	9	98.22 ± 21.4	34	3.296	.033*
	Shot put	7	94.86 ± 16.71			

Power test	Judo	10	94.50 ± 25.21			
	Taekwondo	10	99.67 ± 15.40			
	Javelin	9	91.29 ± 10.45	34	3.280	.033*
	Shot put	7	97.83 ± 1.98			
Anaerobic	Judo	10	3.47± 9.723			
	Taekwondo	10	3.60 ± 0.819		6.665	.001*
	Javelin	9	2.46 ± 0.313	34		
	Shot put	7	3.096 ± 1.208			

$P \leq 0.05$ df=34

The ANOVA statistics for physiological variables shows the calculated F-value of 3.50, 3.37, 0.77, 2.71, 2.89, 3.30, 3.28 and 6.67 which was significant at alpha level of 0.05. This led to the acceptance of the hypothesis that there is no significant difference between the leg explosive power and muscular power such as push up, sit up of judo, taekwondo, javelin and shot put of Nigerian power athlete. Meaning there is no significant difference between the physiological variables except in anaerobic power where significant different exist

From table 6, the taekwondo are significantly different to others in speed and leg explosive power. There was no significant difference in the resting heart rate, blood pressure, push up, sit up and power test among the four groups. Javelin throwers are significantly different to others in anaerobic respectively.

Table 6: Physiological Characteristics

Speed	Javelin	9	5.28000	
	Shot put	7	5.7314	
	Taekwondo	10	5.8220	
	Judo	10	5.8410	
			0.530	
Leg explosive power	Taekwondo	10	261.60	
	Shot put	7	272.88	
	Judo	10	273.88	
	Javelin	9		290.88
			0.051	**0.605**

Resting heat rate	Judo	10	75.7000.	
	Javelin	9	77.4444	
	Taekwondo	10	78.4000	
	Shot put	7	80.8714	
			0.510	
Push up	Judo	10	65.0000	
	Taekwondo	10	69.0000	
	Shot put	7	72.5714	
	Javelin	9	76.0000	
			0.080	
Sit up	Judo	10	78.7000.	
	Taekwondo	10	81.1000	
	Shot put	7	94.8571	
	Javelin	9	98.2222	
			0.118	
Power test	Judo	10	74.5000	
	Taekwondo	10	83.2000	
	Shot put	7	91.2857	
	Javelin	9	99.6667	
			0.056	
Anaerobic power	Javelin	9	2.4589	
	Shot put	7	3.0957	
	Judo	10		3.4740
	Taekwondo	10		3.6000
			0.204	**0.399**

It was found amongst others in Scheffe post hoc that javelin is significantly different from others in leg explosive power while in anaerobic power Javelin and Shot-put are closely

related and Judo and taekwondo are also close. Other parameters such as speed, RHR, BP, pushup, sit up and power test are all closely related.

Discussion of Findings

Age has been confirmed to be an important issue in all human Endeavors'especially where certain level of performance is expected (Ajayi-Vincent, 2003). Devries (1980) and Ajayi-vincent(2003) expressed that age either increases or decreases performance and also that physical performance improve rapidly from early childhood to a maximum somewhere between the late teens and about age thirty. This is when functional capacities declines in performance are independent of the level of activity of the athletes particularly beyond thirty years of age, meaning that at any given age, a trained athlete like the field athletes would demonstrate a superior level of performance to the untrained.

Differences in weight of successful athletes have been documented to be a normal phenomenon which this study has demonstrated between combat athletes and the athletic throwers. (Wilmore, 1983;Ajayi-Vincent, 2003).

Scheffe post hoc result demonstrated distinct differences between Judokas, Taekwondo group and the Javelin, Shot putters group. This buttressed the opinion that the athlete who have acquire the optimal physiques for a particular event, like the athletes being studied . are more likely to succeed than those who lack the general characteristics (Carter, 1984). Therefore, the significant differences in age, weight of the power athletes shows uniqueness of the pre-requisite for their sports. Hypothesis 1 (see table 1) which was rejected that there is no significant difference between physical characteristics of age (4.93>.006) and weight (22.18>.000) but not in height. This implies that age and weight demonstrated significant differences among this group of athletes but they have relative height. The result from table 1 indicated that shot putters are the heaviest tallest and the oldest while judokas are the youngest among the groups. Judokas, taekwondo, javelin and shot putters are closely related in height but with clear difference in weight-

This significant difference in weight reveals that judo (71.51) and taekwondo (68.68) had almost the same weight lesser than that of javelin (88.22) and shot putters (91.43). This shows that combat sport athlete such as judo and taekwondo are closely related in terms of weight while field throwers such as javelin and shot putters are also closely related in weight with similar values. This might be due to the implement thrown and body type. This findings was compared to that of Thorland et al. (1981) who found that throwers were taller, heavier, fatter and of unique somatotype when compared to all or most competitors. This implies that throwers who are taller and heavier have an advantage over shorter throwers in optimizing their performance.

Hypothesis two which stated that there is no significant difference between the body circumferences of national combat sports athletes and athletic field throwers of Nigeria was rejected (table 3). Significant differences were found among contracted arm girth (7.01>0.001), relaxed arm girth (2.57>.025), waist girth (6.49>.001), hip girth (6.19>.002), wrist girth (12.81>.000), mid-thigh girth (7.84>.000) and thigh girth (10.69>.000). Maud & Foster, (1995) explained that there are some differences in body structure and composition of sport persons involved in individual and team sports. Not only this the task in studied events are specific, hence the differences in body circumferences.

The entire body circumference variable revealed that there is significant difference in contracted arm girth, relaxed arm girth, waist girth, hip girth, wrist girth, mid-thigh and thigh girth which led to the rejection of hypothesis two that says there is no significant difference between the body circumference of combat sports and athletic field thrower of Nigerian national power athletes. However, there is a difference in girths proportionality as a result of specificity of training in relation to sport.

Therefore, it was found that shot putters are better in contracted relaxed, waist girth, hip girth, wrist, palm length, thigh and mid-thigh girth. The significant found in the variables might be due to some difference in body structure and body composition of sport persons involved in the game. Therefore, there is need to plan training programs in relation to each skills, technique and body build.

Conclusion

Anthropometric and physiological characteristics are important tools in improving sport performance among athletes. Application of scientific method and selection of sports which are most suitable to an individual have been primarily responsible for different record breaking performance in different sports discipline. Studies conducted so far had shown that certain Anthropometrical, physiological and physical characteristics pre dispose one to a particular sport than to the other sports. For example, Judokas have been shown to be thinner and shorter, javelin throwers and shot-putters have been shown to be taller and heavier.

This study was mainly conducted to compare, find the differences and predict the anthropometric, physiological, cardio respiratory and the body composition which are peculiar to Nigerian national athlete such as Judokas, Taekwondo, javelin and shot-putters. The subject were 36 in number that is 10 from judo, 10 from Taekwondo, 9 from Javelin, and 7 from shot putters were selected using stratified random sampling techniques, the athlete were first grouped in 4 stratum such as judo, Taekwondo, javelin and shot-put. Some variables of physical characteristics were taken which include age, height and weight. It was discovered that javelin thrower were taller than judo, Taekwondo and shot-put. The shot-putters were the heaviest and oldest while the judokas was the shortest among their counterpart.

Recommendations

In view of the findings, this study made the following recommendations.

1. The trainers and coaches should consider the anthropometric; physiological and cardio-respiratory fitness and body composition required for each game in terms of selection of athlete and good body control should be used as pre-requisite to enhance a good performance.
2. Age should be considered in selection of athlete as it affects ones level of maturation in every area of human undertakings
3. Research is needed to find out whether there are sex differences in the different characteristics peculiar to specific sports.

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