SOMATOTYPE OF NIGERIAN MALE YOUTH HANDBALL PLAYERS IN DIFFERENT PLAYING POSITIONS

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Abstract

The purpose of this study was to determine the somatotype components common to Nigerian junior male handball players and analyse differences in these components according to the players' playing positions. 106 Nigerian junior male players, with average age of 17.2 years grouped according to playing positions of Goalkeeper (n=17); inside back (n=34); centre back (n=14); pivot (n=15) and wing (n=26) made up the sample for the study. The results revealed that Nigerian junior handball players were predominantly mesomorphic ectomorphs. From the perspectives of the playing position, the pivot and the centre back players were differently classified as ectomorphic mesomorph and mesomorph ectomorphs respectively. The goalkeeper, inside back and wing players were classified as mesomorphic ectomorphs. The ectomorphy component was significantly higher than the mesomorphy and endomorphy components with the inside back and wing players having significantly higher ectomorphy ratings than the pivot players.

Keywords: Somatotype, somatic parameters, somatochart, somatoplot, skinfolds, playing positions, male youth, handball players, team handball

Introduction

Most team sports are being played by people of varied heights, weights and body sizes. They require a high level of physical, technical, tactical and mental abilities as prerequisites for successful participation in such sports (Acsinte and Alexandru, 2007; Mohammed et al, 2009; Sibila and Pori, 2009; Taborsky, 2011). In all these abilities, physical ability of players has been shown to be an important predictor of top performance in many sports including team-handball (Cavala et al, 2008). Team – handball is a complex, vigorous, intermittent body contact sport that requires the modern player to possess special physical abilities, among other factors, to achieve optimal performance in executing skills involving strength in jumping, and throwing, as well as speed, coordination and agility. Such physical abilities are, most often, determined by the athlete's overall somatic profile expressed as somatotype or body physique. This represents one of the most important biological factors underlying the effective execution of specific game skills and team tactics (Urban and Kandruc, 2011).

Success in participation in any sport may therefore be linked to the somatotype (physique) best suited or best developed for the physical requirements of the activity (Carter and Heath, 1990). This viewpoint seems to agree with the principle of morphological optimization described by Norton and Olds (1996) as a process whereby the physical demands of a sport lead to the selection of body types (structure and composition) best suited to that sport. The implication of this in practice, according to Zapartidis et al, (2009) and Taborsky (2007), is that athletes' suitability to compete in a particular sport, and at a particular level, among other predictors of success, may depend on the possession of appropriate somatotype and other anthropometric characteristics. Large scale anthropometric investigations including those on somatotype characteristics of handball players have been reported in the literature (Acsinte and Alexandru, 2007; Sibila and Pori, 2009; Urban, Kandruc and Taborsky, 2011). Marthur et al, (1985) in an earlier study on the somatotypes of Nigerian athletes of several sports, reported a predominantly ectomesomorphic somatotype for badminton, basketball, handball and soccer players; while judokas and hockey players were endomesomorphs.

Several somatotype components are usually considered as unique at the various playing positions in team sports. For instance, players in team – handball have been shown to generally perform different match play tasks during a game depending on their playing positions (Sibila et al, 2004, Gabbett, 2005; Acsinte and Alexandru, 2007). It is, therefore, reasonable to suggest that a wide range of anthropometric qualities, including somatotype characteristics, may actually play out and complicate the definition of the ideal somatotype profile required of players at different playing positions. Differences in somatotype characteristics between individual playing positions in team-handball and other sports are well documented (Duncan et al, 2005; Sanchez-Munoz et al, 2007). Little or less than satisfactory somatotypes information and data on elite and young Nigerian male handball players in relation to playing positions exist. It seems necessary, therefore, to examine the somatotype compositions of junior male handball players in Nigeria so as to fill the existing gap in literature. Specifically, this study aims at: establishing the somatotype components common to junior male handball players; and analyse differences in these components in relation to playing positions.

Methods

Sample

The study sample consisted of 106 junior male handball players, aged between 14 and 18 years. These players were purposively selected from 7 out of the 15 state under 18 (U18) male handball teams that competed at the 2012 Nigerian U-18 Handball championships. The selected players were classified into specific playing positions they regularly play in their respective teams. These include: goalkeeper (17); inside back (34); centre back (14); pivot (15); and wing (26).

Procedure

The researchers and two trained assistants carried out all measurements. The researchers took part in the International Society for the Advancement of Kinanthropometry (ISAK) level 2 training course in 2003 and assisted Professors J. Hans Ridder and Lateef O. Amusa in conducting the 2003 Nigeria All African Games Research Project (NAAGRRP) in Abuja, Nigeria. Prior to testing, the ethical research policy of the University of Benin, Benin City, Nigeria was secured and the players signed a written informed consent to participate in the study. For consistency, all measurements were taken at the right hand side of the body by the same investigator. Participants were required to appear in minimum clothing and thereafter "landmarked".

To determine the players somatotype ratings, the following somatic parameters were measured: body height, measured on a stadiometer (GPM, Serifex, Inc., East Rutherford, New Jersey) to the nearest 0.5cm; body mass, measured on OMRON BF 400 (OMRON Health Care Europe, B. V., Netherlands) recorded to the nearest 0.1kg; skinfold thicknesses taken at the triceps, subscapular, supraspinale and medial calf to the nearest 0.1 millimetres with the Harpenden skinfold calipers recommended by ISAK as the criterion instrument for the measurement of skinfolds. In addition, the biepicondylar breadth of the humerus and femur were measured with the Campbell 10 (18cm) small sliding bone caliper. Readings were taken to the nearest 0.01cm.

A minimum of two measurements were taken and the mean established as the criterion measure provided the difference between the two readings was not greater than 0.33 following the ISAK protocol. A third reading was taken in a few cases where the difference between the two readings was too wide and as such the median value was recorded. The reliability coefficients to determine tester competence have been previously established using the test-retest method. Sufficiently high tester reliability coefficients (r) for all measurements were between 0.95 and 0.98.

Analysis of Data

The data were analysed using basic descriptive statistics (mean, standard deviation). The Heath-Carter (1990) somatotype method was used to determine the players' somatotype ratings expressed as a three-number rating of endomorphy (adiposity), mesomorphy (muscularity) and ectomorphy (linearity). A software developed by M. E. R. Goulding Software Development (2001) for calculating and analysing somatotype was used to take the drudgery out of the Heath and Carter calculations. The players' somatotypes were further described using the 13 somatotype categories based on areas of the somatochart and the verbal "anchor points" devised by Carter and Heath (1990). The somatochart was plotted in Corel draw X5.

Differences in somatotype components among the playing positions were established using a one-way Analysis of Variance (ANOVA). The statistical significance of the difference was established at a 5 per cent risk level. Where a significant main effect was established, the Scheffé post hoc comparisons were performed to determine which groups were significantly different.

Results

Table 1: Differences in somatotype characteristics of Nigerian junior male handball players according to playing positions (Mean ± SD).

	All Players	Playing Positions					ANOVA	
		GK	IB	CB	PV	WG		
Somatotype	N = 106	n = 17	n = 34	n = 14	n = 15	n = 26	F	Sig
Endomorphy	2.0±0.5	2.0±0.4	2.1±0.6	2.4±0.3	2.1±0.5	1.8±0.5	2.30	0.06
Mesomorphy	3.1±1.0	3.0±0.9	3.0±1.2	3.4±0.8	3.5±1.1	3.0±0.8	1.49	0.21
Ectomorphy	3.6±1.1	3.6±0.9	3.8±1.4**	3.3±0.9	2.9±0.8^{**+}	3.8±0.9^{+}	2.51	0.04*
Descriptive Category	Meso-morphic **ectomorph**	Meso-morphic **ectomorph**	Meso-morphic **ectomorph**	Meso-morphic **ectomorph**	Ecto-morphic **mesomorph**	Meso-morphic **ectomorph**		

Keys: * = Significant at 0.05; GK = Goalkeeper; IB = Inside back; CB = Centre back; PV = Pivot; WG = Wing; ** = significantly different from PV (p<0.05); $^{+}$ = significantly different from PV (p<0.05)

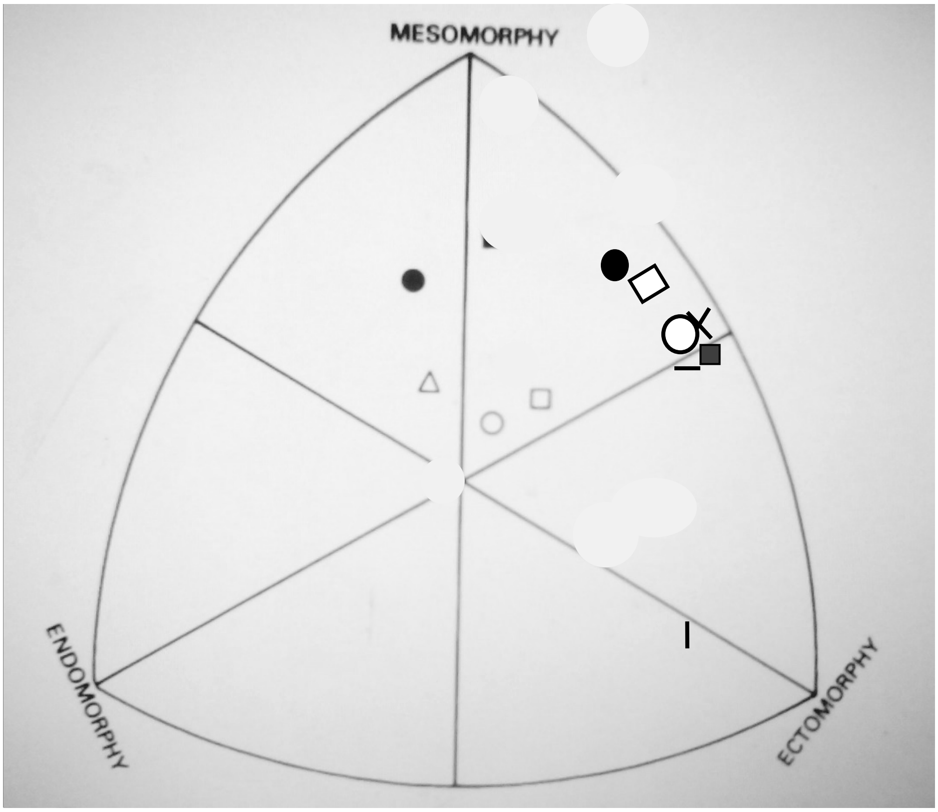

Figure 1: Mean Somatotype distributions of Nigerian junior male handball players.
● PV (n=15,ectomorphic-mesomorph); □ CB (n=14, mesomorph-ectomorph); ✕GK (n=17, mesomorphic-ectomorph); ■ WG (n=26, mesomorphic-ectomorph); ○ IB (n=34, mesomorphic-ectomorph); + All players (N=106, mesomorphic-ectomorph)

The mean (SD) somatotype values of all junior male players (Table 1) could be defined as **mesormophic ectomorph** (2.0±0.5 – 3.1±1.0 – 3.6±1.1). This aptly indicates a dominance of ectomorphy over mesomorphy with endomorphy being less than mesomorphy. From the perspective of the playing positions as shown in Table 1 and graphically captured on the somatochart (Figure 1), the somatotype classifications for goalkeeper (GK) position (2.00 – 3.02 – 3.60), players in the inside back (IB) position (2.06 – 2.96 – 3.84), as well as players in the wing (WG) position (1.84 - 3.04 – 3.83) indicate similar mesomorphic **ectomorph** somatotype; as well as for all the players. However, players in the centre back (CB) position showed a **mesomorph – ectomorph** somatotype (2.07 – 3.36 – 3.29) where mesomorphy and ectomorphy components are equal and endomorphy is lower. Players in the pivot (PV) position were described as ectomorphic –

mesomorph (2.13 – 3.50 – 2.90). This is because there is a dominance of mesomorphy component with ectomorphy greater than endomorphy.

The evaluation of individual somatotype components, according to playing positions, showed that the highest mean (±SD) endomorphy rating was observed in pivot (PV) players (2.13±0.5) while the lowest was recorded in the WG position (1.86±0.5). Players in the PV position also had the highest mean (±SD) mesomorphy rating (3.50±1.1) while the lowest rating was recorded by IB players (2.96±1.2). Ectomorphy ratings of 3.84 (±1.4), 3.83(±0.9), 3.60(±0.9) and 3.29(±1.0) were recorded for the players in the IB, WG, GK and CB positions respectively. The players occupying the PV position were found to have the lowest ectomorphy rating (2.9±0.8).

The results of inferential statistics testing the hypothesis of no significant difference in somatotype components among playing positions are also depicted in Table 1. The results indicate that the ectomorphy component was significantly influenced by playing positions ($F_{4, 101} = 2.51$; $p = 0.04$). Scheffé post hoc tests (Table 1) indicated that the players in the PV position were significantly less ectomorphic than players in the IB ($p<0.05$) and WG ($p<0.05$) positions. The endomorphy component almost showed a statistically significant, albeit, trivial difference ($F_{4, 101} = 2.30$; $p = 0.06$). The differences observed in the mesomorphic component were statistically insignificant ($F_{4, 101} = 1.49$; $p = 0.21$).

Discussion

The derived somatotype of junior male handball players in this study was defined as mesomorphic **ectomorph.** This means that the players tended to show a greater ectomorphic component relative to a lower mesomorphic component and a much lower endomorphy component. The results of the present study are not in agreement with those of Urban, Kandruc & Taborsky (2011) that reported a balanced mesomorph somatotype (2.0 – 4.8 – 2.3) as the prototype for top of ranking Slovakian national handball team players aged, on the average, 18.3 years. Grasgruber and Cacer (2008) as cited in, Urban and Kandruc, (2011) have suggested that contemporary male handball players should be characterised by balanced somatotypes, preferably with a 2.5 – 5.0 – 3.0 ratings. Marthur et al, (1985) had earlier reported that elite Nigerian male handball players, with an average age of 24.2 years were predominantly ectomorphic **mesomorphs** (1.9 – 4.9 – 3.2). Again, this result is not in line with that reported in this study, perhaps for the obvious reason that the sample of the present study are made up of junior players whose level of training and skill development are still at the developmental stages.

The descriptive phrases or verbal “anchor points” characterising the individual somatotype components of all players as a group and of players in different playing positions as presented by Carter and Heath (1990) showed that this group of players possess endomorphic component indicative of slow relative fatness, with little subcutaneous fat and visible muscle and bone outline. The mesomorphic values obtained are indicative of moderate relative musculoskeletal development, increased muscle bulk and thicker bones and joints. The ectomorphic components, on the other hand, were generally indicative of moderate relative linearity, less bulk per unit of height and a more stretched out physique. Differences in ectomorphic components were in favour of players in the IB and WG positions as against players in the PV positions. Urban et al, (2011) had reported differences in mean ectomorphy values for players in all playing positions in top level handball teams with an average age of 19.6 years. They observed, however, the greatest difference in favour of players in the GK position. It is conjectured, however, that the presence of a high ectomorphic body type component in players at this level may be considered advantageous because of the nature of the game that requires speed of movement and agility.

Differences in endomorphic and mesomorphic components were found to be statistically insignificant. Urban et al, (2011) are of the opinion that these components may, to a large extent, be influenced by training. It is possible that position specific training may not have occurred in the case of this large sample of junior male handball players. Alternatively, the physiological demands of match play may have been similar among individual players in this sample. Contemporary goalkeepers, inside back, centre back and wing players have generally been classified as balanced mesomorphs. These are known to be endowed with muscular physique, speed dynamics and coordination of movement (Urban et al, 2011). On the contrary, the somatotype scores of goalkeepers, inside back, and wing players in the present study were reported as mesomorphic **ectomorphs.** Overall, it should be noted that this study confirms that the Nigerian junior male handball players are endowed with linear physique, perhaps with corresponding low body fat. This kind of body physique cannot really be much influenced by training and other factors (Urban et al, 2011). Players in the PV and CB positions, however, showed a relatively more muscular somatotype relative to body height. This may be a better reflection of current body type necessary for dynamic handball players.

Conclusion

The findings of this study lead to the following conclusions. All Nigeria junior handball players as a group were characterised as mesomorphic **ectomorphs.** From the perspective of playing position, the Nigerian junior male handball players were characterised into 3 somatotype groups namely: the mesomorphic **ectomorphs; mesomorph – ectomorph**; and the ectomorphic mesomorphs. Specifically, players in the GK, IB, and

WG positions were characterised as mesomorphic **ectomorphs**. Players in the CB position on the other hand were classified as **mesomorph – ectomorph**, while PV players were characterised as ectomorphic **mesomorphs**. The IB and WG players were significantly differentiated from the PV players on the ectomorphy component. To a large extent, the PV position significantly differentiated its body physique from the other positions. No significant differences were recorded for the endomorphic and mesomorphic components among players in the playing positions. Overall, it was concluded that playing position affected mainly the ectomorphy somatotype component.

These results are clearly important for handball theory and practice, particularly at the age group level. Sports scientists, researchers, coaches, strength and conditioning professionals need to be aware of the specific positional requirements in handball in terms of body types particularly at the age - grade level. Significant body type requirement necessary for efficient execution of handball skills should constitute fundamental bench-marks for talent identification, training, and development as well as performance modifiers. Further, large scale profile studies on the above studied variables along with other body composition, physiological and fitness variables may be required. This could help to obtain a comprehensive normative data that could be an addition to the international literature for global comparison.

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