Physique and Physical Fitness of Rural South African Primary School Netball Players and Non-netball Players: Ellisras Longitudinal Study
南非鄉鎮投球選手的體格

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Abstract

The aim of this study was to investigate physique and fitness level of primary school netball players and non-net ball players. A total of 426 primary school children (138 netball players and 288 non-netball players) who are part of the Ellisras Longitudinal Study participated in the study. Height, weight, skinfolds measurements (triceps, subscapular, supraspinale and medial calf) girth measurements (arm flexed and tensed and calf girth) and width measurements (femur and humerus) were measured according to the protocol of the International Society for the Advancement of Kinanthropometry (ISAK). The Heath-Carter method of somatotyping was used to determine the somatotype level of all the players. Fitness level of each subjects was obtained through the Eurofit (1988) and the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) (1980). Netball players dominated the mosomorphic ectomorph (25.9%) and Balance ectomorph (19.6%) while the non-netball players dominated the ectomorphic mesomorph (22.9%) and mesomorphic ectomorph (21.2%) category. The netball players performed significantly well in shuttle run (22.2 sd 1.6) and 22.7 sd 2.2) and 50m (9.5s sd 1.2 and 9.9 1.0) sprint as compared to non-netball players. Further research in the somatotype and fitness level of netball players in their different playing position and the Physical Education program of rural South African schools will yield valuable information for physical education teachers in assigning the players to the right position at an early age.

Key words: Somatotype, fitness level, Net ball, girls primary school, South Africa

摘 要

本文旨在探討南非鄉鎮地區兒童參與投球活動的體格和體能. 樣本來自426名小學生, 分為投球組及非投球組. 整體而言, 投球組的兒童體質及體適能狀況較卓越.

Introduction

Netball is the game played competitively and mostly by girls. There are seven individual positions in the team structured to provide playing units consisting of goal defenders, centre court players and goal attackers. Although there is a degree of flexibility between positions as a rule, players tend to specialise preferred playing positions being dependent upon factors such as skill, physique and fitness characteristics (Hopper et al, 1995).

In many sports, physical body type profiling has often been used to identify potential talent and suitability of athletes for certain sports and specific events. Sheldon was one of the original researchers who developed the idea of assessing and relating somatotype to certain Olympic sports (Carter & Heath, 1990). In theory we expect to find that the most successful athletes have physical structure best suited to their particular sports, and that differences in physique will emphasize the important aspects of physique such as somatotype (Carter & Heath, 1990). Tanner (1964) alluded that without the required physique an athlete is unlikely to reach a high level of success. Since these early studies, anthropometric measurements and somatotype evaluations have become important in the assessment of identification for various sporting requirements for male oriented sports. Limited investigations into female body types have been confined to team sports such as hockey and netball. Hopper et al (1995) reported that mesomorphy was the dominant somatotype component in hockey and netball players of high competitive level. Withers et al. (1987) reported the somatotype of netball players to be in the central category. Little is known about the physique and fitness level of amateur netball players in the world. The purpose of this study therefore was to examine the physical fitness and somatotype of the netball players and non-netball players of Ellisras rural areas of South Africa.

Methods

Subjects

The sample was part of the Ellisras Longitudinal Study (Monyeki et al., 2002). A cross-sectional sample of 426 (138 netball players and 288 non-netball players) who participated only in both anthropometirc measurement session of May 2002 and Physical fitness test of June/ July 2002 were used in this report. Details of selection of Ellisras Longitudinal Study subjects have been reported elsewhere (Monyeki et al. 2002).

Anthropometric Measurements

All children within the selected age group underwent measurements of height, weight, body circumferences (calf, arm flexed and tensed), breadths (bi-epicondylar humerus and femur) and skinfolds (triceps right, subscapular, supraspinal, calf) according to standard procedures suggested by the International Society for the Advancement of Kinanthropometry (ISAK) (Norton & Olds, 1996). A Martin anthropometer was used to measure height to the last complete 0.1cm, a Schoenle electronic scale to measure weight to the last complete 0.1kg, a steel tape was used for circumference measurements complete to 0.1cm, a spreading calliper for breadth measurements taken to the last 0.1cm, and slim guide skinfold callipers with inter-jaw pressure of $10g/mm^2$ surface jaw face area for skinfolds measurements to the last completed 0.2mm. Both the intra tester and inter tester technical error of measurements for the study was at the international accepted limits and was reported in details in Monyeki et al. (2002).

All the subjects were somatotyped using the Heath-Carter anthropometric somatotype method (Carter & Heath, 1990). This method was reported to be applicable for the description of variation in the human species regardless of age, sex or different attribute of climate, diet, genetics, race, health or physical activity (Heath & Carter, 1971; Carter & Heath, 1990). The sum of the three skinfold was adjusted for body size by multiplying it with 170.18/ height (in cm) before determining the endomorphy ratings (Carter & Heath, 1990).

Measurement of Physical Fitness

The physical fitness tests included bent arm hang, standing long jump, sit ups, sit and reach, shuttle run, plate tapping and flamingo balance from EUROFIT (1988), and 1600m run and 50m sprinting from AAHPERD (1980). The physical fitness test items were classified in the following categories: three items test strength: standing long jump (cm): the best out of three trial was recorded as a score; bent arm hang (sec.): a child has to hang as long as possible with a chin above the bar and sit ups; three items test measure running capability: were shuttle run (sec.): time covered to complete 10x5m run recoded as score, 50 meter run (sec.): sprinting from standing start and time run recorded as score and 1600 meter run (sec.): endurance run, time to run four rounds of 400 meters recorded as score; one (flamingo balance (sec.)) measures balance: standing on one leg as long as possible and one (sit and reach (cm)) measures flexibility: a child has to push a bar forward with fingers of both hands together while sitting with legs stretched. Plate tapping (sec.) measures speed of the arm: tap a plate 25 times with one hand interchangeably on the left and right side of the other hand. The test-retest reliability of the measurements were high (Monyeki et al., 2001).

Statistical Analysis

The anthropometric somatotype with a stature correction for endomorphy was calculated using the equation recommended by Carter and Heath (1990). Descriptive statistics included means and standard deviations for absolute body size somatotype components, and physical fitness were presented. T-test was used to test the difference between the netball players and non-netball players. Frequency and percentage frequency for the somatotype categories were calculated. Peasant correlation coefficient were used to determine the relationship between somatic characteristics and physical fitness. Statistical significant was set at $p<0.05$ at all times.

Results and Discussions

Mean and standard deviation for somatotype and absolute body size of netball players and non-netball players from Elisras rural area are presented in Table 1. Netball players were significantly taller and heavier than the non-netball players. It is not easy to compare the present sample with other sample since our sample comprises of children who are in the primary school and few studies on women sports are for high competitive level of netball players. However, the findings of this study might be able to give us a specific trend similar to the report by Tanner (1964) in which it was indicated that without the required physique one will not be able to attained the required level of competition. These findings were similar to the one by Ball et al. (1994) wherein, distinction between playing positions of netball players` absolute body size was reported.

The somatotype of the netball players (3.4 SD 1.8) exhibit a significantly low mesomorphy ratings than the non- netball player (4.6 SD 2.0) (Table 1). There was no significant difference in the endomorphy and ectomorphy ratings even though netball players had slightly high ectomorphy ratings (4.7 SD 1.1 vs 4.6 SD 1.1) while non-netball players had slightly high endomorphy ratings as expected in this sample (2.6 SD 1.0 vs 2.7 SD 1.1). Table 2 presented the frequency and percentage frequency of somatotype categories. Netball players dominated the mosomorphic ectomorph (25.9%) and Balance ectomorph (19.6%) while the non-netball players dominated the ectomorphic mesomorph (22.9% and mesomorphic ectomorph (21.2%) category. It was reported by Hopper (1997) that netball players had increased linearity measures, similar trend was noticed in the present study which gives an advantage rebounding and attempted goals, leaping to catch ball or making a defensive attempts. The fact that non-netball players and netball players in general have high mesomorphy ratings may be explain in the light of house husbandry (they collect woods in the bush, put them on their heads, some collect water using wheelbarrows for a long longer distances every time after school in addition to seeing to it that they cook every day).

Table 3 presented the mean and standard deviation of physical fitness variables. The netball players performed significantly well in shuttle run (22.2 SD 1.6) and 22.7 SD 2.2) and 50m (9.5s SD 1.2 and 9.9 SD 1.0) sprint as compared to non-netball players. Furthermore, netball players were more faster than the non-netball players. This significant difference may be attributed to the nature of netball game since it requires more speed to perform well.

Table 1. Descriptive Statistics for Somatotype and Absolute Body Size of Netball Players and Non-netball Players from Ellisras Rural Area.

	Netball players N=138 Mean (SD)	Non-netball players N= 288 Mean (SD)	t- value
Age	11.3* (1.6)	10.3* (1.9)	-6.05
Height	143.4* (10.1)	136.2* (10.4)	-6.79
Weight	42.0* (7.1)	27.5* (6.3)	-6.27
Endomorphy	2.6 (1.0)	2.7 (1.1)	0.91
Mesomorphy	3.4* (1.8)	4.6* (2.0)	6.00
Ectomorphy	4.7 (1.1)	4.6 (1.1)	-0.52

*significant level, $p<0.05$

Table 2. Frequency and Percentage Frequency of Somatotype Category of both Netball Players and Non-netball Players of Ellisras Rural Area.

	Netball players N= 138 %	N	Non-netball players N=288 %	n
Balanced endomorphy	0.7	1	0.3	1
Mesomorphic endomorp	0.7	1	1.0	3
Mesomorph endomorph	-	-	0.7	2
Endomorphic mesomorph	-	-	6.3	18
Balanced mesomorphy	3.5	5	7.3	21
Ectomorphic mesomorph	9.8	14	22.9	66
Mesomorph ectomorph	13.3	19	14.9	43
Mesomorphic ectomorph	25.9	37	21.2	61
Balanced ectomorphic	19.6	25	10.4	30
Endomorphic ectomorph	16.1	23	10.1	29
Endomorph ectomorph	0.7	1	0.7	2
Ectomorphic endomorph	-	-	0.7	2
Central	2.1	3	3.5	10
Total	**100**	**138**	**100**	**288**

Table 3. Descriptive Statistics for Physical Fitness of Ellisras Rural Netball Players and Non-netball Players.

	Netball players Mean (SD)	Non-netball players Mean (SD)	t-value
Shuttle run	22.2* (1.6)	22.7* (2.2)	3.03
Flamingo	9.8 (4.5)	10.4 (5.4)	1.22
Long jump	131.9* (17.1)	123.4* (18.0)	-4.75
Bent arm	5.2 (5.1)	4.3 (7.0)	-1.40
Plate taping	18.1* (3.4)	20.0* (3.8)	5.20
1.600m run	514.5 (59.1)	518.3 (61.0)	0.61
50m sprint	9.5* (1.2)	9.9* (1.0)	3.06
Hand grip right	15.2* (5.9)	11.1* (5.4)	-7.01
Hand grip left	14.1* (5.7)	10.0* (5.2)	-7.12
Catch	7.8* (2.5)	6.7* (2.9)	-4.29
Clap	19.6* (5.4)	17.7* (5.5)	-3.39
Sit ups	15.1 (7.0)	14.2 (7.5)	-1.17
Sit and reach	16.7 (5.2)	16.8 (4.9)	0.21

* significant level, $p<0.05$

Table 4. Correlation Coefficient for Motor Skill Variables and Somatotype Variables for both Netball Players and Non-netBall Players.

	NetBall players N= 138			Non netball players N= 288		
	Endo	Meso	Ecto	Endo	Meso	Ecto
Shuttle run	0.08	0.20*	0.01	-0.02	0.16*	-0.02
Flamingo	-0.09	-0.06	-0.03	-0.04	0.02	-0.06
Long jump	-0.15	-0.38**	0.05	-0.12**	-0.23**	0.16**
Bent arm Hang	-0.06	-0.01	0.21*	-0.14*	0.01	-0.19**
Plate Taping	0.20*	0.28**	0.02	0.11	0.33**	-0.12
1.600m run	-0.01	-0.05	-0.17	0.18**	0.10	-0.21**
50m sprint	-0.05	-0.13	0.08	0.15*	0.22*	0.13*
Hand grip Right	-0.08	-0.45**	-0.20*	-0.15*	-0.59*	0.06
Hand grip left	-0.10	-0.44**	-0.18*	-0.15*	-0.60	0.07
Catch	-0.01	-0.25**	-0.12	-0.12	-0.32**	0.02
Clap	-0.06	-0.01	-0.05	-0.03	0.19**	-0.01
Sit ups	-0.07	-0.03	0.05	0.04	-0.03	-0.28**
Sit and reach	-0.02	-0.10	-0.12	0.08	-0.10	-0.11

*significant level, $p<0.05$

The Peasant correlation coefficient for physical fitness variables and somatotype are presented in table 4. For both netball players and non-netball players shuttle run was significantly associated with mesomorphy. A highly significant negative correlation between long jump and mesomorphy was observed among the netball players. While for non-netball players, a significant negative association between long jump and mesomorphy, endomorph and ectomorphy, was noticed. For both netball players and non-netball players catch is significantly associated with mesomorphy. With regard to running tests (shuttle run and 50m run) the significant relationship with somatotype components indicate better performance in these fitness items. This is consistent with what was reported previously by Slaughter et al. (1980) and Hebbelinck and Postma (1963).

Conclusions

Netball players were taller and heavier than non-netball players. The netball players of Ellisras rural area were found to be more on mesomorphic ectomorph while non-netball players were on ectomorphic endomorph category. Mesomorphy relates well with most physical fitness items in the present sample of netball players. Further research in the somatotype and fitness level of netball players in their different playing positions and the Physical Education program of rural South African schools will yield valuable information to physical education teachers in assigning the players to the right position at an early stage.

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