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Research article

ANTHROPOMETRIC MEASURES AND BIRTH DATE DISTRIBUTION OF STUDENT ATHLETES IN SELECTED MALAYSIAN STATE SPORTS SCHOOLS

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Abstract

Journal of Sports Science and Physical Education 3(1): 17–24, 2015 - Anthropometric measurements are widely used to determine body composition, size and weight, and proportions of the human body, especially in children. Our aim was to identify common physical characteristics of student athletes in selected Malaysia states sports schools. The ensuing analysis aimed to provide these states sports school athletes with a competitive advantage. Participants (n=317) were from student-athletes, aged between 13-14y and 15-16y staying in their school's dormitory. These student-athletes comprise of 181 males (13-14y, n=138; 15-16y, n=43) and 136 females (13-14y, n=84; 15-16y, n=52). All subjects were measured on 26 anthropometric dimensions using measurements of four skin folds, six direct lengths, seven segment girths, six segment breadths, plus body mass, stretch stature and sitting height. The results showed significantly differences ($p<0.05$) in acromiale and mid-stylion dactlion length, biacromial breath, tranverse chest, anterior-posterior chest dept, humerus breadth and sitting height between 13-14y and 15-16y males from East Malaysia. Significant differences ($p<0.05$) existed between 13-14y and 15-16y West Malaysia males in ankle girth, radiale stylion length, biilliocristale breadth, humerus breadth, stature, sitting height and arm span. For female subjects, significant differences were only found in West Malaysia 13-14y and 15-16y for head girth, radiostylion length, humerus breadth, sitting height, and sum of skinfolds. Male subjects from West Malaysia as a whole were significantly larger in all the girth measures, longer forearm length, wider arm span and higher sitting height when compared to their counterparts from East Malaysia ($p<0.05$). However, the West Malaysia female subjects 13-14y, were only significantly different in arm and forearm length, wrist, ankle girth and sitting height than their counterparts from East Malaysia. The 15-16y West Malaysia female subjects were significantly different ($p<0.05$) in arm, wrist, calf and ankle girth, humerus breadth and sitting height. In term of birth date distributions, there was significant difference between the number of athletes born across the four quartiles (male: $\chi 2=33.7$, $p<0.05$; female $\chi 2=13.3$, $p<0.05$). To conclude, West Malaysia state school male athletes appear to possess larger girths, longer limbs, higher sitting height, and are much taller. The West Malaysia female athletes only showed greater girths, higher sitting height and wider humerus across the breadth in comparison to East Malaysia

female athletes. There was a significant different between the number of athletes born across the four quartiles among the female and male athletes.

Keywords: *anthropometric, student athletes, girth, segment lengths*

Introduction

Nowadays, anthropometric measurements are regarded as important indicators of an individual's body composition, size and weight, and body proportions, especially in student athletes. Anthropometric characteristics of athletes determine the success in particular sports events in various ways. The knowledge of these characteristics is necessary to establish their importance for the success in competitive sport. Moreover, athletic coaches should aware of the athlete's morphological (anthropometric) aspects, if they want to improve the performance level of an athlete. Our aim was to identify common physical characteristics of student athletes in selected Malaysia states sports schools. The ensuing analysis aimed to provide these states sports school athletes with a competitive advantage. The research is on the influence of these characteristics in sports and games are of particular complexity, because the success in the game depends, among other things, on how the individual body characteristics fit into their choice of sports. Great physiological demands necessarily influence the anthropological characteristics (Duncan, et al., 2008). Until today, only a comparatively small number of variables such as height, weight (Tsunawake, 2003), proximal, mean and distal thigh circumferences (Hakkinen, 1993), and skinfolds to determine the total mass of adipose tissue (Thissen & Mayhew, 1991; Smith, et al., 1992; Hakkinen, 1993) have been studied. There is no clarity about the significance of other anthropometric characteristics and anthropometrics structure of the body, as a whole, for successful sports performance. Therefore, there is a need for more detailed research involving the anthropometrical characteristics in sports performance especially student athletes in selected Malaysia states sports schools.

Method

Participants

Participants (n=317) were from student athletes aged between 13-14y and 15-16y staying in their school's dormitory. These student-athletes comprise of 181 males (13-14y, n=138; 15-16y, n=43) and 136 females (13-14y, n=84; 15-16y, n=52).

Experimental overview

All participants and coaches were briefed on the purpose, requirements, and risks of involvement. Written consent was obtained in accordance with the requirements of the human ethics committee of the Sultan Idris Education University prior to measurement.

All the participants were measured on a succession of 26 anthropometric dimensions. The procedures followed those previously reported in this journal (Ong et al., 2005) for the collection of the Sydney 2000 data. However, for clarity, after land marking by a criterion anthropometrist, each triathlete was directed to one of five stations for the measurement of four skinfolds, six direct lengths, seven segment girths, six segment breadths plus body mass, stretch stature and sitting height.

All variables were measured on the right side of the body and measured a second time. If a difference greater than 0.2 mm for skinfolds or 0.5 cm for other variables was recorded, a third measure was taken. The final score used in the analysis was the mean of the two scores or the median of three. The standard procedures for each measurement, as supported by the International Society for the Advancement

of Kinanthropometry (ISAK) and reported Norton and Olds (1996) were followed at all times. All measurements were made by trained anthropometrists whose technical errors of measurement were within the target values recommended by Carter and Ackland (1994) for the Kinathropometery in Aquatic Sports Project.

Data Analysis

Data were entered onto a spreadsheet from which means and standard deviations for each characteristic were calculated. Comparisons were made between the West and the East Malaysia school athletes competitors based on gender and two age groups (13-14y and 15-16y). All statistical analysis was conducted using SPSS Statistics 18 (2009) where alpha was set at $p<0.05$.

Results

Results as in Table 1 indicates, there were significant difference in anthropometrical characteristics between 15-16 with 13-14 years. Based on mean score morphological characteristics, 15-16 years old boys illustrated more superior in term acromiale, aid-stylion, dactlion length, biocromial breadth, tranverse chest, humerus and sitting height compared to 13-14 years old except anterior-posterior chest in East Malaysia.

Results in table 2 indicate there were significant differences in anthropometrical characteristics between 15-16 and 13-14 years. Based on mean score anthropometrical characteristics, 15-16 years old boys illustrate more superior in term ankle girth, radiale stylion, biocromial breadth, humerus , stature and arms pan compared to 13-14 years old except sitting height in West Malaysia.

Table 1: Anthropometrical characteristics age differences between 15-16 and 13-14 years old boys in East Malaysian States

Anthropometrical Characteristics	*Age Group (yr)*	*Mean (cm)*	*SD (cm)*	P value
Acroradi	15-16	28.87	1.27	0.012
	13-14	27.77	2.06	
Midsdact	15-16	20.14	7.63	0.014
	13-14	17.84	1.11	
Biocbreadth	15-16	37.42	1.99	0.024
	13-14	32.96	3.01	
Tranchest	15-16	27.40	1.35	0.018
	13-14	21.05	7.89	
Apchest	15-16	17.70	1.87	0.01
	13-14	20.37	4.33	
Humerus	15-16	7.36	1.27	0.001
	13-14	6.01	0.55	
Siting height	15-16	86.78	1.87	0.001
	13-14	80.96	4.82	

Table 2: Anthropometrical characteristics age differences between 15-16 and 13-14 years old boys in West Malaysia States

Anthropometrical Characteristics	*Age Group*	*Mean*	*SD*	P value (0.05)
Anklegirth	15-16	23.35	2.02	0.027
	13-14	22.89	6.92	
Radstylioni	15-16	25.17	0.80	0.009
	13-14	24.71	2.69	
Biocbreadth	15-16	31.25	8.89	0.005
	13-14	26.19	4.86	
Humerus	15-16	6.13	0.51	0.019
	13-14	6.08	1.00	
Stature	15-16	167.68	6.08	0.036
	13-14	159.30	8.37	
Sitting height	15-16	88.75	3.79	0.001
	13-14	90.75	16.72	
Armspan	15-16	174.94	5.82	0.006
	13-14	166.51	10.06	

Results in Table 3 indicates, there were no significant difference in anthropometrical characteristics between 15-16 with 13-14 years girls in East Malaysia in terms of head girth, arm girth relax, arm girth flex, forearm girth, wrist girth, calf girth, ankle girth, acromiale, radiale-stylion, mid-stylion, dactlion length, trochanterion-tibiale laterale, tibiale laterale. Moreover, there were no recorded differences in foot length, biacromial breadth, biilliocristale breadth, tranverse chest, anterior-posterior chest dept, humerus breadth, femur breadth, stature, sitting height, arm span and sum of skinfold. Based on mean score morphological characteristics, 15-16 years old girls illustrated superior radiale stylion length, humerus breadth, sitting height, compared to 13-14 years old girls. Whereas, 13-14 years old girls indicated superior head girth and sum of skinfold compared 15-16 years girls.

Results as in Table 4 indicate there were significant differences in anthropometrical characteristics between 15-16 and 13-14 years. Based on mean score anthropometrical characteristics 15-16 years old girls, illustrate more superior in terms of radiale stylion length, humerus breadth, sitting height, compared to 13-14 years old girls. Whereas 13-14 years old girls indicated more superior in terms of head girth and sum of skinfold compared 15-16 years girls.

Table 3: Anthropometrical characteristics age differences between 15-16 and 13-14 years old girl in West Malaysia States

Anthropometrical Characteristics	Age Group	Mean	SD	P value (0.05)
Headgirth	15-16	47.59	9.82	0.004
	13-14	50.94	5.77	
Radstylioni	15-16	23.76	1.74	0.001
	13-14	23.75	0.984	
Humerus	15-16	8.07	8.15	0.019
	13-14	6.32	3.20	
Siting height	15-16	88.37	25.07	0.021
	13-14	44.48	8.64	
Sum of skin fold	15-16	49.54	14.61	0.016
	13-14	90.75	16.72	

Table 4: Anthropometrical characteristics age differences between 15-16 and 13-14 years old girl in West Malaysia States

Anthropometrical Characteristics	Age Group	Mean	SD	P value (0.05)
Headgirth	15-16	47.59	9.82	0.004
	13-14	50.94	5.77	
Radstylioni	15-16	23.76	1.74	0.001
	13-14	23.75	0.984	
Humerus	15-16	8.07	8.15	0.019
	13-14	6.32	3.20	
Siting height	15-16	88.37	25.07	0.021
	13-14	44.48	8.64	
Sum of skin fold	15-16	49.54	14.61	0.016
	13-14	90.75	16.72	

Figure 1 shows the frequency of birth dates among the male athletes (n= 144) in each of the four quartiles. There was a significant difference between the number of athletes born across the four quartiles, χ^2 = 33.7, $p < 0.05$. The percentage of birth dates in the first, second, third, and fourth quartiles were 43%, 28%, 19% and 10%, respectively.

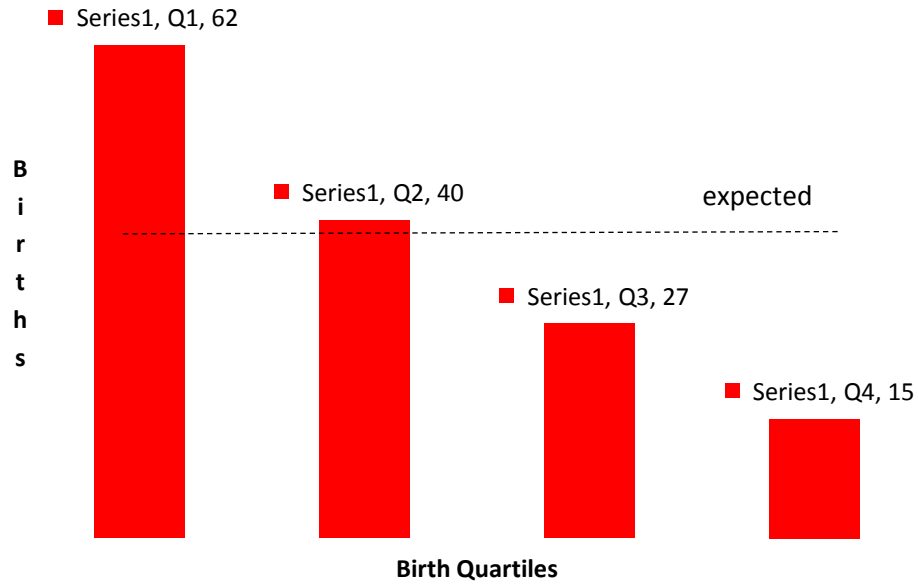

Figure 1: Distribution of male athletes by birth quartiles

Figure 2 shows the distribution of female athletes (n= 136) according to birth quartiles. Significant differences were found among the distribution of birth quartiles. χ^2 = 13.3, $p < 0.05$. The percentage of birth dates in the first, second, third, and fourth quartiles were 36%, 26%, 24% and 14%, respectively.

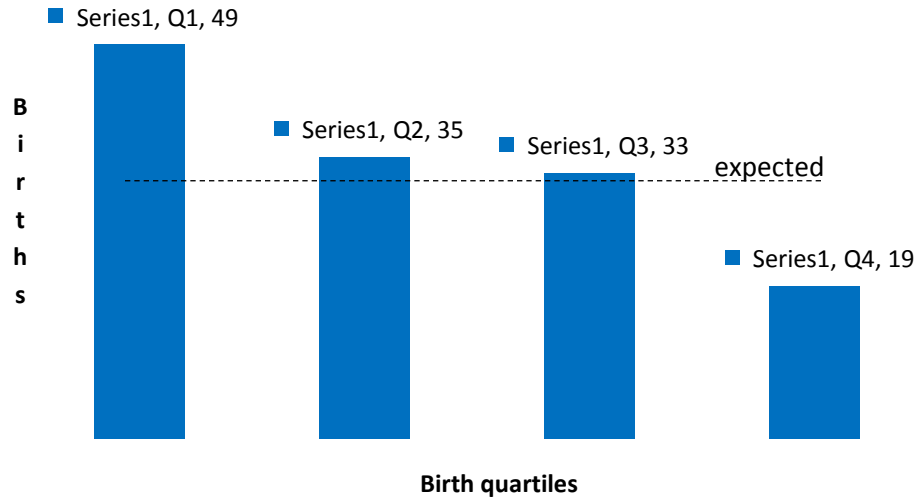

Figure 2: Distribution of female athletes by birth quartiles

Discussion

The results showed significantly differences ($p<0.05$) in acromiale and mid-stylion dactlion length, biacromial breath, tranverse chest, anterior-posterior chest dept, humerus breadth and sitting height between 13-14y and 15-16y males from East Malaysia. Significant differences ($p<0.05$) existed between 13-14y and 15-16y West Malaysia males in ankle girth, radiale stylion length, biilliocristale breadth, humerus breadth, stature, sitting height and arm span. For female subjects, significant differences were only found in West Malaysia 13-14y and 15-16y for head girth, radiostylion length, humerus breadth, sitting height, and sum of skinfolds. Male subjects from West Malaysia as a whole were significantly larger in all the girth measures, longer forearm length, wider arm span and higher sitting height when compared to their counterparts from East Malaysia ($p<0.05$). However, the West Malaysia female subjects 13-14y, were only significantly different in arm and forearm length, wrist, ankle girth and sitting height than their counterparts from East Malaysia. The 15-16y West Malaysia female subjects were significantly different ($p<0.05$) in arm, wrist, calf and ankle girth, humerus breadth and sitting height. To conclude, West Malaysia state school male athletes appear to possess larger girths, longer limbs, higher sitting height, and are much taller. The West Malaysia female athletes only showed greater girths, higher sitting height and wider humerus breadth in comparison to East Malaysia female athletes.

Results (Figure 1 and Figure 2) indicated that significantly more athletes selected to the Malaysia state sport school were born between January and March (the early part of the selection year). The results suggest that the athletes were selected more for their physical precocity rather than their skill. These athletes were more likely to be identified as talented (Helsen, Hodges, van Winckle & Starkes, 2000). The advantage of being born early in the selection year may relate to physical precocity; that is, players have up to a 12-month advantage in physical maturation over their peers born at the end of the selection year.. Players with a greater relative age are more likely to be identified as ‘‘talented’’ because of the likely physical advantages they have over their ‘‘younger’’ peers (Helsen, van Winkle & William, 2005).

The profiling of school student athletes allows for the estimation of the athlete on a regular basis, usually corresponding with a particular training phase which assists in monitoring status, identifying areas that may need corrective work, and developing and scheduling training programs which are specifically for the individual. Though many of the variables presented in this paper cannot be altered with training, those which relate to adiposity, body mass, and segment girths and breadths may be modified over time. These are the variables (together with other physiological parameters if any) which are of most value in providing guide line in selecting and preparing of school student athletes.

Parameters such as the segment lengths and breadths, which are less easily modified, tend to be more useful for comparing younger school athletes from development squads and support coaches to develop suitable techniques which are tailored to outfit individual proportions. As human proportions appear to remain stable from late adolescence, and even from early adolescence for the upper limb variables (Ackland & Bloomfield, 1996), these structural variables may be crucial for talent identification and development purposes.

As for the birth date distribution analyses of Malaysia state sports schools athletes, the results indicated that more athletes selected to the state sports schools

were born between January and March. The selection of these student athletes for the Malaysian state sports schools should benefit all same age group as those being born early in the selection year may relate to physical precocity which means they have up to a 12-month advantage in physical maturation over their peers born at the end of the selection year. Therefore, further analyses could be conducted on the correlation between the samples' birth-date distribution and anthropometric measurements.

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