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Physical Activity and Somatotypes among Ao Naga Boys

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ABSTRACT The study reports physical activity levels and somatotypes among Ao Naga boys aged 8 to 15 years from Mokokchung town, Nagaland. A structured schedule was used to access the different physical activity levels among the subjects. The age-wise comparison was tested using t-test. The result revealed that during these seven years there was an overall increase of 0.1 units in endomorphy, 0.8 units in ectomorphy, and a decrease of 0.3 units in mesomorphy, but significant difference between age groups 8 and 15 years was seen only in ectomorphy component. The somatoplots of mean somatotypes fell in the ectomorphic mesomorph at ages 8 and 9 years, and from 10 years onwards the somatoplots were distributed in the mesomorph-ectomorph sectors of the somatochart. The comparison of somatotype components within physical activity level was test by t-test. Also, to assess the relation between physical activity level and somatotypes at various ages, the age range was divided into two age intervals as follows: pre puberty (ages 8-10 years), and puberty (ages 11-15 years).The mean endomorphy was found to be significantly higher among the inactive boys and lower among the active ones in both pre puberty and puberty boys. Mean ectomorphy was also found to be significantly higher among the active pubertal boys. Furthermore, mean somatotypes components also showed significant differences due to walking hours to and from home to school and sedentary behaviour among puberty boys.

INTRODUCTION

Somatotyping can be best thought as a numerical shorthand method of describing the present morphological conformation in terms of body shape and composition independent of body size (Heath and Carter 1967; Carter 1975). It is possible to rate and compare somatotype at all ages and for both sexes with the Heath-Carter method because a single set of criteria is used (Carter 1980). Heath and Carter have dealt with somatotype distributions of different populations, including heritibality of somatotypes, changes of somatotype in growth and aging, somatotypes in sports and physical performance and medical, behavioural, occupational and other variables associated with somatotype. It can, furthermore, be used to record changes in physique and to estimate gross biological differences and similarities among human beings. Somatotypes vary between population groups as well as during growth in the same population (Singh and Sidhu 1980; Kaul et al. 1996). Apart from genetic factors, numerous other factors that affect somatotype of an individual are age (Carter and Parizkova 1978; Gakhar and Malik 2002; Bhasin and Jain 2007; Kaur 2009), sex (De Garay et al. 1974; Heath et al. 1961; Prakash and Malik 1989; Kalichman and Kobliansky 2006), high altitude (Malik 1987), nutrition (Sheldon 1954; Malik et al. 1986; Chakrabarty et al. 2008), physical activity (Carter and Rahe 1975; Chandel and Malik 2012; Ozener 2008), occupation (Singh and Singh 2006), socio-economic differences (Rahmawati et al. 2004; Singh 2011).

Physical activity can be defined as: "Any bodily movement produced by skeletal muscles and resulting in energy expenditure," (Bouchard et al. 1990). It is a behaviour that occurs within the context of the specific culture within which children and adolescents are reared. However, it is behaviour with important biological implications. Numerous biological, socio-economic, psychological, societal, cultural factors and physical environment may influence activity behaviour in children and adolescents (Malina et al. 2004a). Physical activity can be an important factor in the regulation of body weight and specifically fatness (Malina et al. 2004b). Some studies show the influence of physical activity on somatotypes (Badenhorst et al. 2003; Carter and Rahe 1975; Ozener 2008) whereas some other

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studies shows that regular physical activity does not appear to have a significant effect on somatotype during growth (Parizkova 1970, 1977). It has been proposed by some health promotion experts that physical activity in childhood may also have direct influences on adult health based on several theories of the relation between physical activity during childhood and physical activity during adulthood (Aaron et al. 2005). Interventions to promote physical activity or prevent the decline in physical activity must be initiated in the early adolescent years and that repeated interventions may be necessary to maintain adequate levels of physical activity (Aaron et al. 2005) as it is this age group that suffers most from adoption of western lifestyle characterized by heavy reliance on fast food rich in fat, low activity triggered by the wide-spread use of satellite dishes and computers, and the overall sedentary life-style all of which are key factors affecting nutritional habits and obesity levels (Hwalla et al. 2005).

In the north-eastern part of India very few studies have been done on the somatotype of children. Gaur et al. (1999) somatotyped the urban Meiteis ranging in age from 6 to 13 years with a view to assess the gender and age differences. Singh (2011) somatotyped the Meitei boys of Manipur aged between 12 and 18 years in the affluent and non- affluent families. Dkhar (2005) reported on the somatotype of Pnar boys with ages ranging from 11 and 18 years. Longkumer (2013) reported on the physical growth and nutritional status among the same population. However no report has been found on the somatotypes of the Ao Naga children, so the analysis of the present data focuses on the relation between physical activity levels and somatotype components namely endomorphy, mesomorphy and ectomorphy among the Ao Naga boys with ages ranging from 8-15 years.

MATERIAL AND METHODS

The present study was conducted among the Ao Naga boys in Mokokchung district of Nagaland, North-East India. Mokokchung is the home of the Ao Naga tribe and it became a full- fledged district in 1957. The Ao's speak the Tibeto- Burman language and follow the patrilineal system of society. Like any other Naga community, they are also engaged in various government and private services especially in urban area. Mokokchung has the highest literacy rate in the state with an average of 84.27%: male literacy is 86.14%, and female literacy is 82.2%. Mokokchung district has three subdivisions, namely Tuli, Mangkolemba and Changtongya. Mokokchung Town is the district headquarters and the metropolitan agglomeration has a total population of 60,161 (Census of India 2001).

A cross-sectional investigation on 289 boys aged 8 to 15 years was carried out in Mokokchung town. Data collection started from January 2010 till Feb 2011. No statistical sampling of households and individuals was done for the purpose of collection of data, instead an attempt has been made to include all those children who were willing to co-operate for the purpose of the present study. Anthropometric somatotyping was done using ten conventional anthropometric measurements such as height, weight, triceps skin fold, sub-scapular skin fold, supra-iliac skin fold, calf skin fold, bone diameters of humerus and femur, and circumference of the arm and calf (Carter 1980; Heath and Carter 1967). Standard techniques of taking the anthropometric measurements were followed as described in Weiner and Lourie (1981). For taking skinfold measurement, Harpenden skinfold calliper was used. The somatotype components namely endomorphy, mesomorphy, and ectomorphy were estimated employing Heath and Carter Method (1967). In order to assess the relation between physical activity level and somatotypes at various ages, the age range was divided into two age intervals as follows: pre puberty (ages 8-10 years), and puberty (ages 11-15 years). Data on physical activity was collected using structured schedule taking into consideration the number of hours per day the children spent in watching television or videos or sitting in front of the computer, whether or not they were active in household chores, moderate to vigorous unorganised games and sports, and walking hours to and from home to school. No qualified athlete or sportsperson was included in sample under study.

After computing the age-wise statistics for somatotype, the age-wise comparison was tested using t-test. The comparison of somatotype components within the physical activity level was tested by t-test. A significant level at 0.05 was used for all analyses employing MS office excel and SPSS 17 for windows software.

RESULTS

The age wise statistics for somatotype components showed that only minor changes were evident in the three somatotype components with age (Table 1). The mean somatotypes were found to be 1.8-4.1-3.1 and 1.9-3.8-3.9 at ages 8 and 15 years respectively. During these seven years there was an overall increase of 0.1 unit in endomorphy and 0.8 units in ectomorphy, and an overall decrease of 0.3 units in mesomorphy. The younger boys had greater mesomorphic components than the older boys. It was noticed that the somatoplots of mean somatotypes fell in the ectomorphic mesomorph at ages 8 and 9 years, and from 10 years onwards the somatoplots were distributed in the mesomorph-ectomorph sectors of the somatochart (Fig. 1).

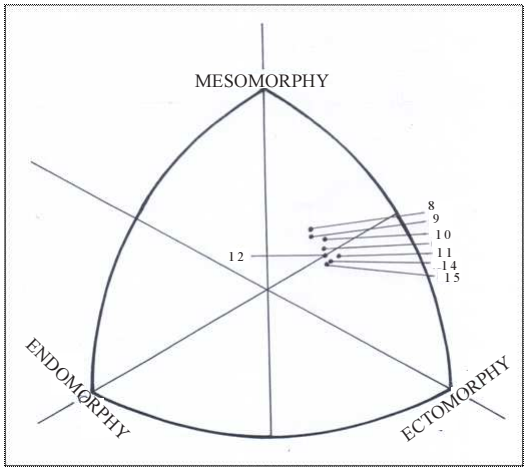

Fig. 1. Somatotype categories according to mean at each age group

Table 2 reveals the age wise comparison for somatotype components employing student's t-test. It was found that there were no statistically significant differences in mean somatotype components at all age groups under study. However, ectomorphy showed a significant difference with an overall increase of 0.8 units during these seven years (8 to 15 years).

Table 2: Age wise comparison (t-value) for somatotype components in Ao Naga boys

Age group comparison	*Somatotype*		
	Endo-morphy	*Meso-morphy*	*Ecto-morphy*
8-9 years	0.51	0.30	0.54
9-10 years	0.09	0.66	1.50
10-11 years	1.24	1.74	0.46
11-12 years	1.52	0.25	0.38
12-13 years	0.39	0.07	0.66
13-14 years	1.67	0.23	0.12
14-15 years	1.69	0.08	0.07
8-15 years	0.71	1.34	3.16*

Significant at 5% probability level

Table 3 shows the descriptive statistics of somatotype components according to physical activity level in Ao Naga boys. It was seen that, among pre-puberty boys, 84.91% watched television or videos or sat in front of the computer for less than or equal to 2 hours daily and 15.09%

Table 1: Age wise statistics of somatotype components of the Ao Naga boys

Age (in years)	*N*	*Statistics*	*Somatotype components*		
			Endomorphy	*Mesomorphy*	*Ectomorphy*
8	35	Mean	1.76	4.14	3.06
		Sd	0.63	0.87	0.88
9	35	Mean	1.87	4.08	3.19
		Sd	1.22	0.67	1.16
10	36	Mean	1.85	4.18	3.60
		Sd	0.77	0.63	1.14
11	36	Mean	2.08	3.91	3.72
		Sd	0.81	0.71	1.04
12	38	Mean	1.84	3.86	3.82
		Sd	0.52	0.97	1.17
13	36	Mean	1.91	3.84	4.00
		Sd	0.88	0.71	1.18
14	38	Mean	1.63	3.80	3.97
		Sd	0.50	0.96	1.29
15	35	Mean	1.87	3.82	3.94
		Sd	0.69	1.11	1.40

Table 3: Descriptive statistics of somatotype components according to physical activity level in Ao Naga boys

Age group (years)	*Physical activity*	*N*	*%*	*Endomorphy*		*Mesomorphy*		*Ectomorphy*	
				Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*
Pre-puberty (8-10)	Watching TV/video, sitting in front of the computerd								
	≤2hrs.	90	84.91	1.77	0.86	4.11	0.71	3.29	1.04
	>2 hrs.	16	15.09	2.12	1.11	4.27	0.83	3.28	1.38
	t-test			1.19		0.75	0.04		
	Household chores								
	No	66	62.26	1.84	0.98	4.12	0.67	3.25	1.09
	Yes	40	37.74	1.81	0.78	4.15	0.83	3.36	1.10
	t-test			0.20		0.14		0.53	
	Moderate to vigorous unorganised games and sports*								
	Inactive	46	43.40	2.10	1.16	4.25	0.65	3.15	1.15
	Active	60	56.60	1.62	0.57	4.04	0.78	3.40	1.04
	t-test			2.61*		1.53		1.13	
	Walking hours to and from home to schoold								
	≤15 minutes	51	48.11	1.78	1.05	4.10	0.73	3.35	1.11
	>15minutes	55	51.89	1.87	0.76	4.16	0.74	3.23	1.08
	t-test			0.55		0.44		0.53	
Puberty (11-15)	Watching TV/video, sitting in front of the computer								
	≤2hrs.	141	77.05	1.81	0.59	3.76	0.86	3.96	1.14
	>2 hrs.	42	22.95	2.05	0.97	4.12	0.96	3.66	1.42
	t-test			1.57		2.13*		1.26	
	Household chores								
	No	65	35.52	1.95	0.71	3.95	0.88	3.86	1.22
	Yes	118	64.48	1.82	0.70	3.78	0.90	3.91	1.21
	t-test			1.18		1.20		0.25	
	Moderate to vigorous unorganised games and sports*								
	Inactive	87	47.54	2.05	0.79	3.94	0.76	3.63	1.15
	Active	96	52.46	1.70	0.56	3.75	1.00	4.13	1.23
	t-test			3.42*		1.48		2.83*	
	Walking hours to and from home to school*								
	≤15 minutes	95	51.91	1.98	0.75	3.97	0.92	3.74	1.16
	>15minutes	88	48.09	1.74	0.62	3.71	0.86	4.05	1.25
	t-test			2.35*		1.98*		1.77	

Significant at 5% probability level

for more than 2 hours daily. 62.26% of the pre-pubertal boys never did house hold chores and 37.74% were actively involved. Also, 43.40% of the boys were inactive in moderate to vigorous unorganised games and sports daily whereas, 56.60% were actively involved. Furthermore, 48.11% and 51.89% of the boys walked to and from home to school for less than or equal to 15 minutes and more than 15 minutes respectively on a daily basis. However, a statistically significant difference was found only for endomorphy component due to moderate to vigorous unorganised games and sports (t-test=2.61, $p<0.05$), where, mean endomorphy was significantly higher among inactive boys than the active boys.

Table 3 further shows that, among pubertal boys, 77.05% of the boys watched television or videos or sat in front of the computer for less than or equal to 2 hours daily and 22.95% for more than 2 hours daily. 35.52% of the pubertal boys never did house hold chores and 64.48% were actively involved. Also, 47.54% of the boys were inactive in moderate to vigorous unorganised games and sports daily whereas, 52.46% were actively involved. Furthermore, 51.91% and 48.09% of the boys walked to and from home to

school for less than or equal to 15 minutes and more than 15 minutes respectively on a daily basis. And a statistically significant difference was found for mesomorphy component due to watching television or videos or sitting in front of the computer (t-test=2.13, $p<0.05$), endomorphy (t-test=3.42, $p<0.05$) due to moderate to vigorous games and sports and ectomorphy (t-test=2.83, $p<0.05$) components due to moderate to vigorous unorganised games and sports, and endomorphy (t-test=2.35, $p<0.05$) and mesomorphy (t-test=1.98, $p<0.05$) components due to walking hours to and from home to school. It was noticed that, mean mesomorphy was found to be significantly higher among those who watched television or videos or sat in front of the computer for more number of hours daily, mean endomorphy and ectomorphy significantly higher and lower respectively among the inactive boys, and mean endomorphy and mesomorphy higher among those who walked lesser number of hours from home to school daily.

DISCUSSION

In the present study, the changes in somatotype components according to age were less marked for endomorphy and mesomorphy component. Ectomorphy component showed a significant difference during the seven years age group from 8 to 15 years, which evidently supported the general belief that that as age progressed there was a change in the somatotype components (Handa 1995; Dkhar 2005). It was noticed that mean mesomorphy was higher among younger age groups in the present study. Gakhar and Malik (2002) in their study among the Jat boys and girls also found a similar result where they mentioned that the higher mesomorphic component among young age groups could be partly because of the fact that mesomorphy was adjusted for height.

Most of the physical activities and sedentary behaviour involved in this study were found to occur after school hours. Television viewing and computer games are sedentary pursuits, which, for many children and adolescents, occupy a major portion of afterschool time (Malina et al. 2004a). In the present study, the percentage of boys who spent more than 2 hours daily in this sedentary pursuit was found to be higher among the higher age groups which could also explain the decrease in physical activity level among higher age groups. Dietz and Gortmaker (1985) mentioned in their article that children not only watched a considerable amount of time watching television during weekends, but also during school days. The amount of time children spent in this sedentary behaviour is of considerable concern obviously because television influences physical activities. Olivares et al. (2004) also mentioned that the more time children spent in physical activity, the less time they devoted to television watching. In the present study, both mean endomorphy and mesomorphy was found to higher among those who spent more number of hours daily in this sedentary pursuit. A good deal of the variation in body composition associated with regular physical activity or inactivity is associated with fatness, which fluctuates inversely with the activity stimulus. Fatness tends to decrease during periods of regular activity and increase during periods of inactivity (Malina et al. 2004b). In the present study, the percentage of active boys decreased from 56.60% among pre-pubertal boys to 52.46% among pubertal boys, and among both pre pubertal and pubertal boys, inactive boys had significantly higher mean endomorphy and lower mean ectomorphy than the active boys. A study by Malina (1990) explained the possible reasons for the decline in activity level among adolescents where he suggested that, the adolescent decline in physical activity that occurred after growth spurt was probably related to the social demands of adolescence, changing interests and the transition from school to work or school to college. Also, the present study proved the notion that regular physical activity is an important factor in the regulation of body weight and specifically fatness (Malina et al. 2004b). Toth (2007) also studied the effect of habitual activity on body build and composition in a sample of pre-pubertal, pubertal, and post-pubertal children and reported that a marked difference between the activity level subgroups was only found in endomorphy, where, the inactive boys and girls had significantly higher endomorphy than the active ones. Furthermore, walking hours to and from home to school in the present study was also found to have a significant relation with mean somatotype components among pubertal boys, where, those who walked more each day to and from home to school was found to have significantly lower mean endomorphy and mesomorphy. Studies have revealed that walking is a good form of exercise and that people who walk, jog, or run

regularly are generally leaner without the need to be preoccupied with food intake. It was also mentioned during World Health Day (2002), under the theme 'Move for Health' that one should walk most days irrespective of time of years, at least 20 minutes one way and 20 minutes return (Wahlqvist, 2005).

CONCLUSION

Ectomorphy component showed changes during the seven years age group (8 to 15 years) among the Ao Naga boys and the comparison of mean somatotypes within physical activity level showed that there was a significant relation between them at both the age groups, more so among pubertal boys. Therefore it is important to know that in this globalized world with the advancement of science and technology, and with the ever changing life style with a more sedentary living and decline in physical activity, one should be aware of the different health related problems caused due to the lack of physical activities, among several other factors.

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