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A Comparative Study of Age Changes in Somatotypes of Brahmin and Rajput Boys of Sundarnagar, Himachal Pradesh

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INTRODUCTION

Human populations consist of individuals who differ widely in body shape and size. Somatotypes are morph-phenotypic ranges along continua of variation, which possess constantly recognisable characteristics and are the functional end products of the whole genetic and developmental complex. The somatotype and its physiological correlates represent a first descriptive step in recognising genetic pleiotropism and polygenic interaction.

The somatotype identifies a person as belonging to a biological group or family which appears to be worldwide in distribution and cut across all of the more or less uncertain boundaries by means of which men have attempted to divide themselves according to race, colouring, head dimension, physiology, blood type, geographic birth and so on. The somatotype does not replace these common and conventional identifications but cut across them, binding and relating them. By providing a universal frame of reference it attempts to lay a foundation for adding meaning and usefulness to human description in general, thereby serving the function of a general human taxonomy (Sheldon, 1954).

The somatotype is a rating of the present morphological conformation, which is the observable, external view of bodily structure. It is a size-dissociated descriptor of shape and relative composition of the body (Carter, 1983). It is expressed in three numeral ratings, representing three components: Endomorphy (the first component) refers to relative fatness; Mesomo-rphy (the second component) refers to musculo-skeletal development relative to height; and Ectomorphy (the third component) refers to relative linearity (Heath and Carter, 1969). One can make a number of anthropometric measurements on an individual and compare each of these with a range of values collected from a "standard" group of the same age and sex, but this approach does not readily help visualization of the body shape (Harrison et al., 1977). Somatotype on the other hand, gives information on individual physical constitution in an easily comprehensible form compared to an array of anthropometric measurements presented as such (Roy, 1990). Because of its uniqueness it has been used for studying population variation and / or age and sex variations. Several factors such as age, sex, nutrition, physical performance and environment affect the somatotype of an individual. Somatotypes vary between population groups as well as during growth in the same population (Singh and Sidhu, 1980; Malik et al., 1986; Kaul et al., 1996). Heath and Carter (1969) suggested modification of an extended and readjusted universal rating scale, applicable to both sex at all ages and constructed table to obtain reliable anthropometric somatotype rating. Anthropometric somatotyping was basically the modification and developed version of Sheldon's technique.

However, anthropometric somatotype studies have been used for various purposes during the last two decades. The most extensive use of somatotyping has been made in evaluating the relationship between physique and physical performance of athletes at various competitive levels in a variety of sports (Carter, 1970; Parizkova, 1970; de Gary et al., 1974; Ross et al., 1977; Withers et al., 1987). Using Heath and Carter's method, numerous studies on anthropometric somatotype were conducted so far. For instance, Canadian women were more endomorphic and less mesomorphic than men with both sexes similar in terms of ectomorphy, (Carter et al., 1982). Jat girls were more endomorphic and less ectomorphic than Jat boys, with advancement in age, (Gakhar and Malik, 2002). The majority of the adult males of Northeastern India were found to be lean, (Khongsdier, 2001). The Hadza males were among the leanest Africans with large muscle mass, (Hiernaux and Hartono, 1980). The Santhals of West Bengal were highly ectomorphic and less endomorphic, (Malik and Prakash, 1989). Besides, somatotype studies were also conducted on Bods of the Western Himalayas (Malik and Singh, 1978; Malik, 1987; Pandey and Malik, 1990); Garhwali males (Gaur and Singh, 1997); Brahmins Dogras (Singh and

Bhasin, 1990); Rajputs and Brahmins of Chamba, Himachal Pradesh (Singh and Singh, 1991).

The present study aims to investigate the age changes in anthropometric somatotype among the Brahmin and Rajput boys of Himachal Pradesh in the age range of 10-20 years.

MATERIALS AND METHODS

In order to collect various anthropometric measurements of males of Sundarnagar, Himachal Pradesh, a cross-sectional sample of two hundreds and ninety-six (296) Brahmins and Rajputs boys (Brahmins=141; Rajputs=155) in the age range of 10 to 20 years was selected for the present study. Data were collected from six government-run schools in Sundarnagar tehsil of Himachal Pradesh, during the month of November 2000. All the subjects were genetically un-related to each other. Age and castewise distribution of the sample is depicted in Table 1.

Table 1: Distribution of the sample, by age and caste

Age range	*Age group*	*Brahmins*	*Rajputs*	*Total*
9.500-10.500	10±	15	15	30
10.500-11.500	11±	15	15	30
11.500-12.500	12±	13	16	29
12.500-13.500	13±	15	15	30
13.500-14.500	14±	13	15	28
14.500-15.500	15±	15	17	32
15.500-16.500	16±	16	16	32
16.500-17.500	17±	13	15	28
17.500-18.500	18±	12	14	26
18.500-19.500	19±	8	8	16
19.500-20.500	20±	6	9	15
Total		141	155	296

Date of births of subjects were taken from the school registers, and confirmed from the subjects. In case of an anomaly, subject was requested to get the date confirmed from his parents. Decimal age of each subject was calculated by subtracting the date of birth of the subject from the date of data collection, using decimal age calendar (Tanner et al., 1969). All the subjects between 13.500 and 14.500 years were classified in the age group 14 years, whereas those falling between 14.500 and 15.500 were included in the age group of 15 years. The same principle was applied throughout to classify subjects in various age groups.

Before commencing any physical anthropological study, it is necessary to determine the Mendelian nature of the population studied. There is an absence of intra sub-caste marriage among the Brahmins and Rajputs of Sundarnagar of Himachal Pradesh. This suggests that both the Brahmins and Rajputs castes follow the rule of caste endogamy and sub-caste exogamy in their marriage pattern thus could be considered as Mendelian populations.

In accordance with the aims and objectives of the study following ten body measurements were taken (Martin and Saller, 1957; Tanner et al., 1969):

1) Height vertex; 2) Weight; 3) Bicondylar humerus; 4) Bicondylar femur; 5) Upper arm circumference; 6) Calf circumference; 7) Skinfold at triceps; 8) Skinfold at Subscapula; 9) Skinfold at suprailiac; and 10) Skinfold at calf.

Anthropometric somatotyping was done with the help of above-mentioned anthropometric measurements using Heath and Carter's method (Carter, 1980; Heath and Carter, 1967). Finally, somatotype dispersion distance (SDD), somatotype dispersion mean (SDM), dispersion of somatotype distance (DSD), and migratory distance (MD) have also been calculated.

RESULTS AND DISCUSSION

Results of age changes in Anthropometric Somatotype and their comparison between the Brahmins and the Rajputs boys are presented in this section. Table 2 shows the descriptive statistics of various somatotype components between the Brahmins and the Rajputs boys, while age group-wise distribution of three different components of somatotype physique in the same boys is shown in figures 1 to 3.

Endomorphy

Endomorphy or the "component of relative fatness" in physique demonstrates its ranges from 1.62 to 2.35 in this age range from 10 to 14 years. No specific age trend has been found among the Brahmins but generally it increases till 14 years. While in case of Rajputs, age changes are more marked and the higher age group boys (18-20 years) are more endomorphic than the younger ones (10-14 years), with a range from 1.72 at the age of 12 years to 2.50 at the age of 20 years (Fiogure-1). The caste differences in endomorphy are not statistically significant, except that at the age of 12 years (Table 2).

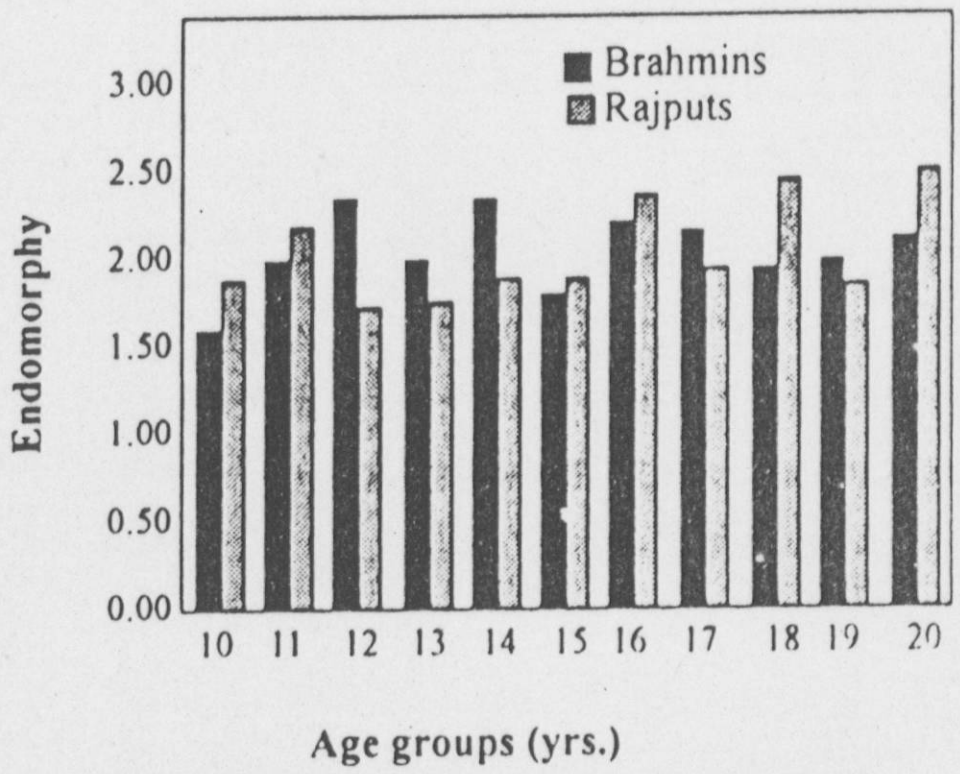

Fig. 1. Comparison of Endomorphy between Brahmins and Rajputs

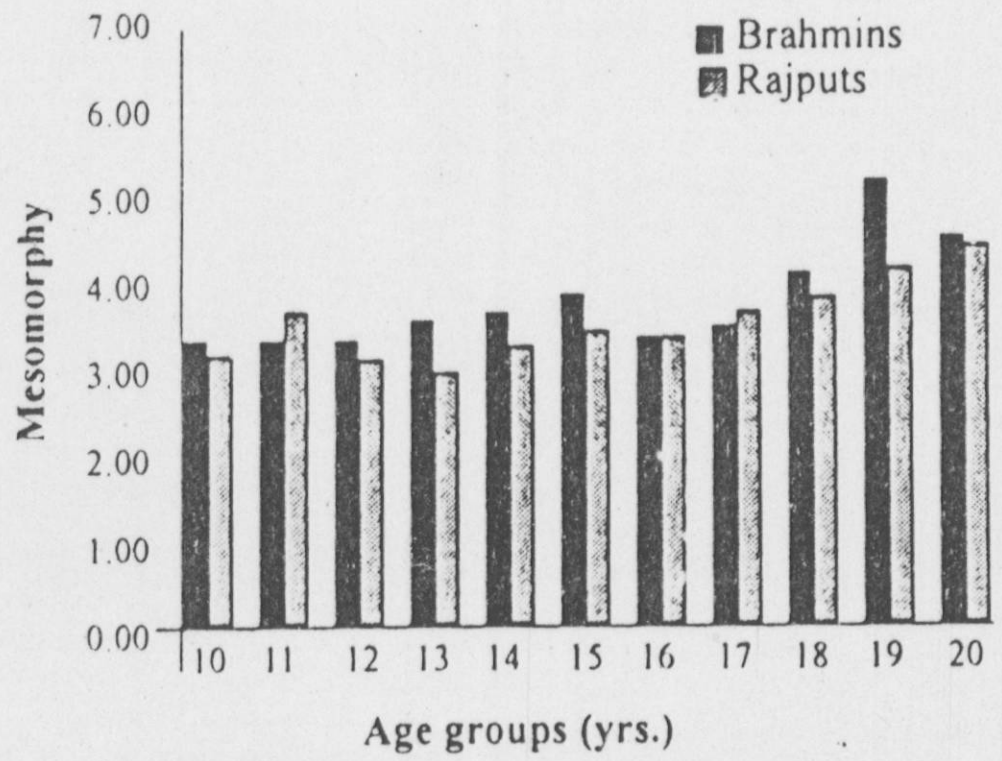

Fig. 2. Comparison of Mesomorphy between Brahmins and Rajputs

Mesomorphy

A gradual in crement of mesomorphic component is visible in Brahmins, which ranges from 3.64 (10 years) to 5.79 (19 years) in this age range, with slight fluctuations in between. On the other hand, in case of Rajputs boys, very slight and little increments or changes are visible (Figure 2). This however, does not mean that both younger and older Rajput boys are same in respect of their muscle mass, partly because of the fact that mesomorphy is adjusted for height. Proportionately there is no difference but absolutely there is difference in younger and older Rajputs boys. The "t"-values indicates that there is no statistically significant difference between these two population groups of boys, though mesomorphy shows higher values among the Brahmin than the Rajput all through the age groups (Table 2).

Ectomorphy

Ectomorphy or the "relative linearity of individual physique" remains almost at the same level as 4 throughout the different age groups with very minimal variations in between. On contrary, the ectomorphic components of Rajput boys vary throughout the ages with the fact that, younger boys are more linear than those of older age groups. Though there is no statistically significant difference between these two population groups, Rajput boys are more ectomorphic than that of Brahmins especially in lower ages, which gradually decline with the increment of age (Table 2).

Somatotype Dispersion

Age group-wise distributions of mean

Table 2: Comparison of somatotype components between the Brahmins and the Rajputs

Age Group (yrs.)	*Endomorphy*					*Mesomorphy*					*Ectomorphy*				
	Brahmins		*Rajputs*		*t-Test*	*Brahmins*		*Rajputs*		*t-Test*	*Brahmins*		*Rajputs*		*t-Test*
	Means	*S.E.*	*Mean*	*S.E.*		*Mean*	*S.E.*	*Mean*	*S.E.*		*Mean*	*S.E.*	*Mean*	*S.E.*	
10	1.62	0.18	1.90	0.15	1.20	3.64	0.14	3.47	0.30	-0.51	4.35	0.29	5.67	0.55	2.12*
11	2.00	0.31	2.20	0.29	0.47	3.73	0.28	4.07	0.22	0.95	4.42	0.45	3.65	0.27	-1.47
12	2.35	0.22	1.72	0.12	2.51*	3.73	0.35	3.44	0.18	-0.74	4.30	0.57	4.49	0.23	0.31
13	2.00	0.23	1.76	0.28	-0.66	3.97	0.39	3.24	0.38	-1.34	4.71	0.45	4.72	0.43	0.02
14	2.35	0.38	1.91	0.20	-1.02	4.06	0.36	3.61	0.23	-1.05	4.07	0.37	4.86	0.22	1.84
15	1.80	0.19	1.88	0.14	0.34	4.26	0.33	3.81	0.29	-1.02	4.46	0.34	4.61	0.44	0.27
16	2.23	0.23	2.36	0.18	0.45	3.73	0.20	3.70	0.30	-0.08	4.29	0.24	4.58	0.27	0.80
17	2.14	0.26	1.94	0.15	-0.67	3.87	0.39	4.04	0.32	0.34	4.40	0.34	4.21	0.63	-0.27
18	1.93	0.20	2.44	0.19	1.85	4.58	0.44	4.19	0.28	-0.75	4.19	0.63	3.81	0.29	-0.55
19	1.98	0.15	1.85	0.15	-0.61	5.79	0.61	4.65	0.22	-1.76	4.04	0.20	3.66	0.22	-1.28
20	2.10	0.29	2.50	0.21	1.12	4.99	0.68	4.89	0.41	-0.13	4.09	0.52	3.82	0.27	-0.46

* Significant at 5% probability level.

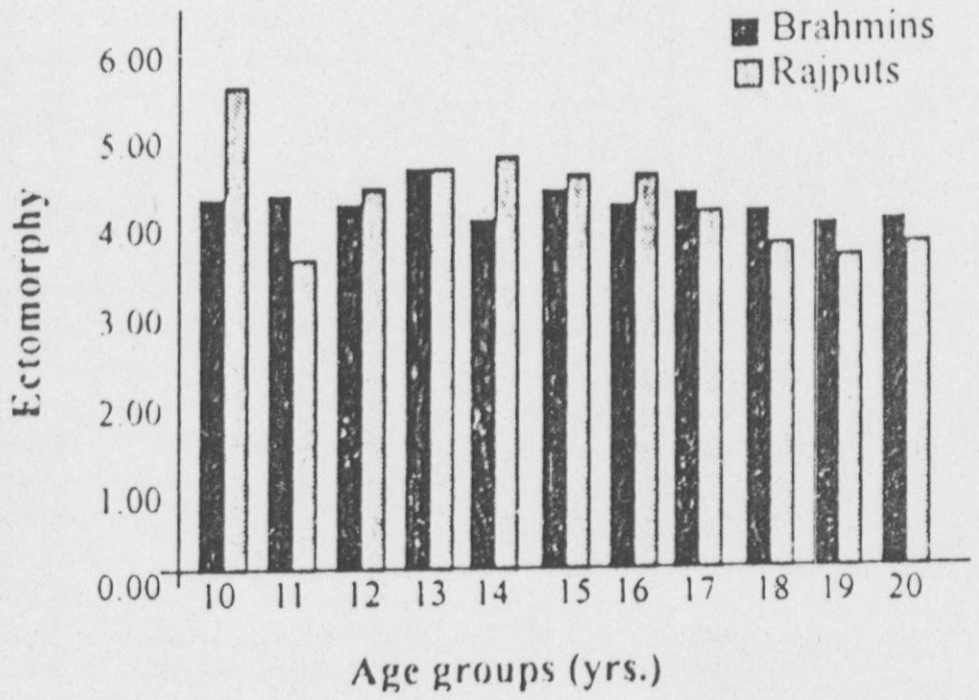

Fig. 3. Comparison of Ectomorphy between Brahmins and Rajputs

somatotypes of Brahmin and Rajput boys are represented in figures 4 and 5, which exhibits somatochart of Brahmins and Rajputs respectively. The somatochart of the Brahmin boys suggests that they are with a higher concentration Meso-ectomorph and closed to the central types. In fact, the younger boys are Meso-ectomorph, whereas, the Brahmins of higher age groups, that

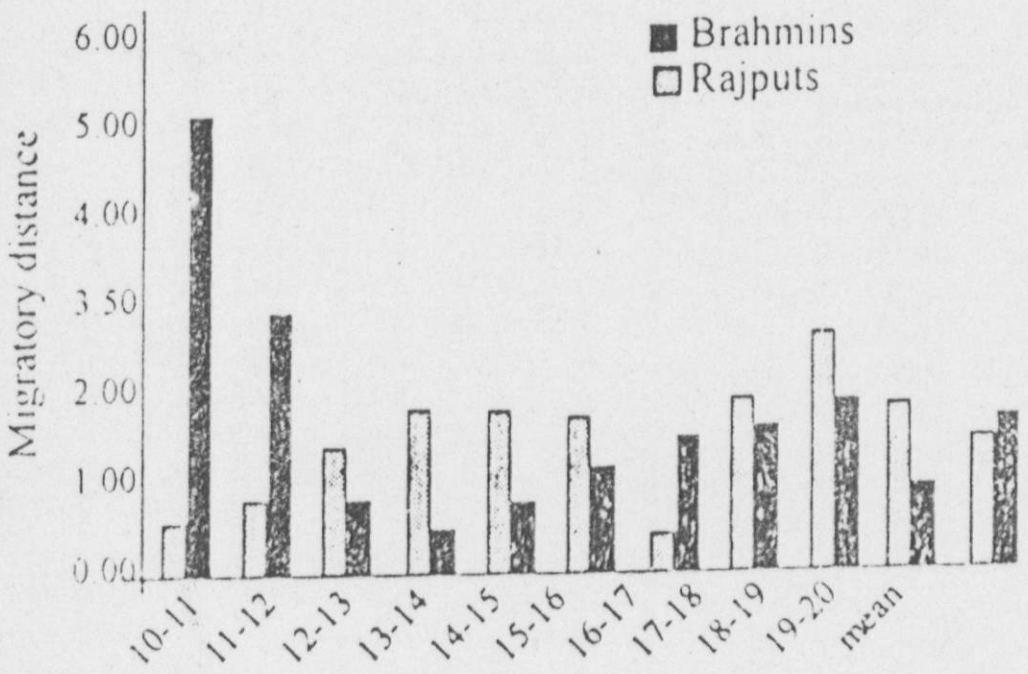

Fig. 4. Age changes in somatotype dispersion distance of the Brahmins and the Rajputs

is, 18-20 years show a concentration towards Ecto-mesomorph. Rajput boys begin as Balanced ectomorph (10-16 years) to become Ecto-mesomorph (17-20 years) as they advance in age. The age changes in physique from 10-20 years are greater in Rajputs than in Brahmins.

The Somatotype Dispersion Distance of the Brahmins and Rajputs boys with age through tabular depiction of the Somatotype Dispersion Mean (SDM) and the Dispersion of Somatotype

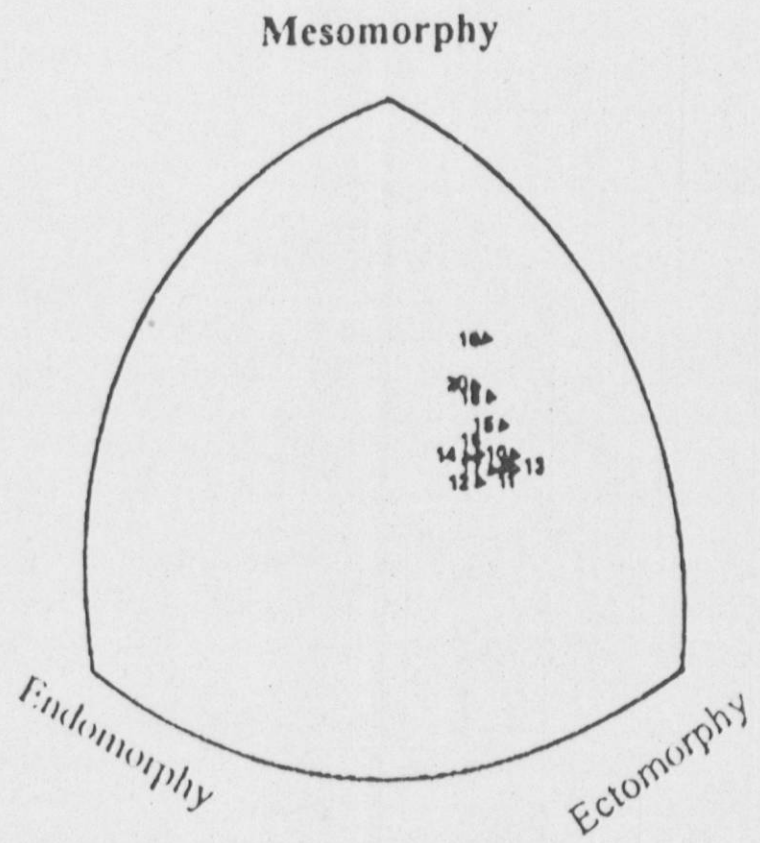

Fig. 5. Mean somatotype in Brahmin boys, by age

Distance (DSD) is represented in the Table 3. In both the cases a significant variation can be noticed all through the ages, for the mean somatotype dispersion.

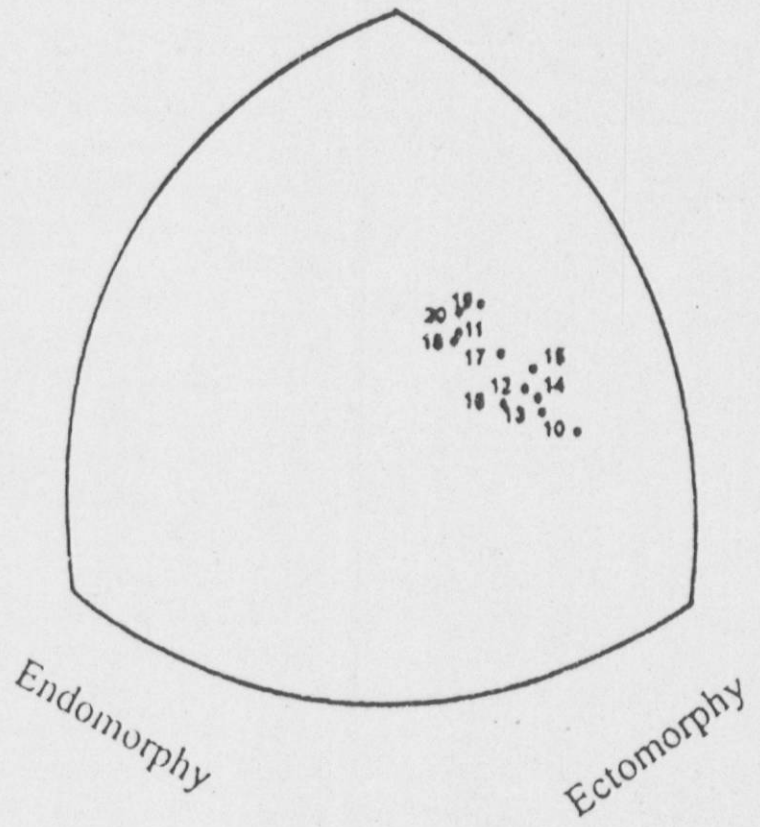

Fig. 6. Mean somatotype in Rajput boys, by age

Migratory distance of both the caste group boys suggests that age changes in physique from 10 to 20 years are greater in Rajput boys (Figure-4). Also the average somatotype dispersion distance in this age range is higher among the Rajputs (4.97) than the Brahmins (2.54), again Rajputs show the higher dispersion in younger

age group (10-11), while among the Brahmins the higher dispersion can be found in higher age group (18-19), (Table 4).

From the above results it can be concluded that both the Brahmins and Rajputs boys of Sundarnagar are more Ectomorphic and less Endomorphic. It is also evident that Endomorphic component is more common among young boys in both cases. Mesomorphic components are more prominent among the Brahmins boys that those of Rajputs boys, and it is always higher in higher age groups. In both cases they tend towards Mesomorphy with age changes. So in general adult Brahmin and Rajput boys are quite well built.

KEYWORDS Somatotype. Age Changes. Brahmin and Rajput Boys. Himachal Pradesh

ABSTRACT A cross sectional survey was conducted in November 2000, with a view to study the age changes and population differences in anthropometric somatotype and its three components, viz., endomorphy, mesomorphy and ectomorphy among the Brahmins and the Rajputs boys of Sundarnagar, Himachal Pradesh in the age range of 10-20 years. A total of 296 boys (Brahmins = 141; Rajputs = 155) were measured to meet the aim of the present study. Both the Brahmins and the Rajputs boys are more ectomorphic and less endomorphic. With the advancement in age, Brahmins boys tend to become ecto-mesomorph from meso-ectomorph, while the Rajputs boys have a tendency to become ecto-mesomorph from balanced ectomorph.

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