

Physical Growth and Anthropometric Somatotype of Rajput and Brahmin Boys of Chamba District, Himachal Pradesh

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ABSTRACT In the present study an attempt has been made to get information on adolescent physical growth and anthropometric somatotypes of Rajput and Brahmin boys of Chamba town of Himachal Pradesh, inhabiting an altitude of 1000 metres above mean sea-level. Cross-sectional data on 130 Rajput and 119 Brahmin boys aged 11 to 18 years were collected during 1987, for various anthropometric measurements which included height, weight, arm span, chest circumference and skinfolds. Standard techniques were followed (Weiner and Lourie 1969) and skeletal age was obtained from body measurements employing the Heath-Carter method (1967). The Rajput and Brahmin boys of Chamba town exhibit great similarities during growth in skeletal diameters, limb girths and skinfolds. The Brahmin boys are heavier especially after 16+ years. Chamba boys perform better than the Rajputs of Jammu but lower than the British, American and Punjabi populations in height, weight and skinfolds. Very small changes occur in somatotypes of Chamba boys during 11 to 18 years. Throughout this period these populations remain dominant in ectomorphic component.

Altitude imposes lot of stresses on the people inhabiting them. The populations living successfully at various zones in the hills must have adapted themselves to these stresses. By exploring variations between populations at various altitudes, the information on specific adaptations may be obtained. Generally, the factors at high altitude include low oxygen pressure, cold, greater intensity of ultra-violet radiations, rough terrain and strenuous habitual physical activity (Clegg et al., 1970). The adaptations to high altitude stresses generally include small body size, low body weight, prolonged growth period, and late and poorly defined adolescent spurt besides the large chest size (Baker, 1969; Basu et al., 1985; Beall et al., 1977; Eveleth and Tanner, 1976; Frisancho, 1969; Gupta and Basu, 1981; Haas, 1976; Hoff, 1973; Malik and Singh, 1978, 1979; Pawson, 1976, 1977a, 1977b, Singh, 1980; Singh et al., 1986). For the western Himalaya, information on various populations on adult morphology child growth and development are now available. However, comparisons are difficult to

make because of the lack of studies on genetically similar groups at high and low altitudes (Singh, 1988).

In the present study, an attempt has been made to get information on child growth from two distinct endogamous groups of Rajputs and Brahmins of Chamba town in Himachal Pradesh, inhabiting an altitude of about 1000 metres above mean sea-level.

MATERIAL AND METHODS

The present study has been conducted during 1987 on a cross sectional sample of 249 boys (130 Rajput and 119 Brahmin), ranging in age from 11 to 18 years, inhabiting Chamba town of Himachal Pradesh. The data were collected from various educational institutes of Chamba town. Every care was taken to include all boys belonging to Rajput and Brahmin castes, except those who were close relatives or had any physical deformity. In the present study age was calculated from date of birth and date

of examination. Birth dates were available from the school registers and these were considered to be fairly accurate. Yearly age grouping was done in such a manner so that the mean would be depicted as a mid-year figure, e.g. the group 11+ includes boys from 11.00 to 11.99 years, etc. Age-wise breakup of the sample is given in table 1.

Table 1: Age-wise distribution of the sample individuals

Age group (yr)	Age range (yr)	Rajput		Brahmin	
		N	Mean age(yr)	N	Mean age(yr)
11+	11.00-11.99	18	11.49	19	11.67
12+	12.00-12.99	26	12.50	26	12.55
13+	13.00-13.99	13	13.65	6	13.15
14+	14.00-14.99	19	14.46	19	14.57
15+	15.00-15.99	8	15.31	14	15.63
16+	16.00-16.99	24	16.53	17	16.43
17+	17.00-17.99	15	17.54	9	17.49
18+	18.00-18.99	7	18.23	3	18.09
	Total	130		119	
Grand Total				249	

Anthropometric measurements taken on each subject include size, body mass, skeletal diameters, circumferences and skinfolds. Standard techniques were employed for taking these measurements (Weiner and Lourie, 1969). The body weight was taken with the minimal clothing and a suitable correction was applied to obtain the nude weight. In order to minimize the effect of fatigue, the measurements were taken during the morning hours. Log conversions of skinfolds were done using tables of Edwards et al. (1955). Assessment of somatotypes were made from anthropometric measurements employing the Heath-Carter (1967) method.

RESULTS AND DISCUSSION

Comparisons of body weight and height of Rajput and Brahmin boys of Chamba are given in table 2. The differences in height are significant only at ages 15+ and 16+, the Brahmin boys being taller. In body weight, especially after 16+

years, the Brahmin boys are significantly heavier than the Rajput boys. The upper arm and calf circumferences in Rajput and Brahmin boys during this period are similar, since the differences are non-significant, only exception being the calf circumference at 15+ years, which is greater in Rajput boys. The skeletal diameters, i.e. humerus and femur bicondylar, do not show significant differences between the two groups either (Table 2). The mean, SD of log-transformed values of triceps and subscapular skinfolds are presented in table 2. The Rajputs possess significantly thicker fatfold at triceps at 12+ years compared to the Brahmins who are fatty over the subscapular region compared the former at 18+ years. All other comparisons show non-significant differences.

The anthropometric somatotypes of Rajput and Brahmin groups are shown in table 3. Generally, the two populations do not differ significantly in the three components of physique, viz., endomorphy, mesomorphy and ectomorphy.

The Rajput boys of Chamba are taller at all ages than the Rajput boys of nearby Bharmour area, living at altitudes 2000 metres above mean sea-level reported by Singh (1980). These two groups belong to the same endogamous group and may represent similar genetic constitution. Similarly the Chamba populations are heavier in body weight and possess thicker triceps skinfold than those of the Bharmour.

Figure 1 shows comparison of anthropometric somatotypes of Bharmour and Chamba populations. The endomorphy ratings of Chamba populations are higher and mesomorphy ratings lower than the Bharmour boys. However, the ectomorphy ratings are practically similar in all these populations.

The Rajput and Brahmin boys of Chamba town exhibit great similarities during growth in skeletal diameters, limb girths and subcutaneous tissue fold thicknesses. The Brahmin boys are significantly heavier in body weight, especially in the 16+ years ages. The people belonging to both these groups belong to middle and lower middle socio-economic groups. Most

Table 2: Anthropometric measurements of Rajput and Brahmin boys of Chamba, Himachal Pradesh

Age Group (yr)	Rajput		Brahmin		t-value	Rajput		Brahmin		t-value
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.	
1. Body Weight (kg) after Log transformation						2. Height (cm)				
11+	29.39	1.16	26.99	1.13	6.00*	135.8	6.23	136.2	4.77	0.21
12+	31.37	1.18	31.37	1.16	0.00	141.2	8.31	142.6	7.73	0.68
13+	36.87	1.02	32.90	1.19	7.06*	149.3	10.61	146.5	7.33	0.66
14+	31.42	1.77	38.77	1.21	14.94*	151.0	10.80	154.5	9.34	1.06
15+	48.97	1.30	47.12	1.14	3.36*	155.3	15.72	162.9	10.26	2.98*
16+	40.15	1.15	47.53	1.08	20.99*	159.5	7.12	165.0	5.47	2.80*
17+	47.11	1.17	49.16	1.14	4.22*	162.6	5.66	163.2	7.67	0.21
18+	46.37	1.11	50.48	1.10	6.96*	161.5	2.71	162.1	1.05	0.10
3. Calf Girth (cm)						4. Upper Arm Girth (cm)				
11+	25.37	2.71	24.76	1.69	0.79	17.00	2.81	17.02	1.42	0.00
12+	25.80	1.55	26.02	1.71	0.53	17.87	1.52	17.63	1.69	0.58
13+	27.66	3.12	27.38	2.63	0.20	19.12	2.86	17.41	2.05	1.48
14+	27.26	2.66	27.75	2.15	0.63	18.15	2.92	19.72	1.97	1.96
15+	32.15	3.08	29.68	2.10	2.02*	22.47	3.16	21.10	1.84	1.13
16+	29.63	2.44	29.15	2.70	0.58	21.66	2.85	21.38	1.33	0.42
17+	30.09	3.27	30.80	2.87	0.56	21.46	2.34	22.51	1.62	0.01
18+	29.80	2.03	31.00	1.00	1.25	21.60	1.61	21.53	2.29	0.05
5. Humerus Bicondylar Diameter (cm)						6. Femur Bicondylar Diameter (cm)				
11+	5.27	0.41	5.22	0.46	0.04	7.94	0.53	7.94	0.65	0.00
12+	5.40	0.52	5.58	0.65	1.28	8.05	0.56	8.17	0.45	0.90
13+	5.68	0.61	5.70	0.42	0.08	8.03	0.94	8.13	0.48	0.31
14+	5.59	0.67	5.91	0.74	0.52	8.42	0.75	9.45	0.69	0.13
15+	6.08	0.58	6.27	0.42	0.82	8.12	1.50	8.75	0.81	1.11
16+	6.04	0.39	6.25	0.35	0.26	8.51	0.67	8.78	0.39	1.74
17+	6.32	0.44	6.05	0.31	1.80	8.42	0.51	8.53	0.79	0.37
18+	6.04	0.36	5.96	0.23	0.44	8.68	0.47	7.96	0.60	1.85
7. Skinfold-Triceps (log)						8. Skinfold Subscapular (log)				
11+	176.44	16.00	182.33	16.90	1.02	166.77	21.12	165.46	21.72	0.17
12+	174.50	15.57	160.41	14.76	3.59*	162.04	14.39	156.00	28.68	1.09
13+	174.07	21.30	178.30	13.30	0.55	170.38	25.06	166.00	22.99	0.38
14+	170.94	26.84	170.00	20.83	0.12	167.63	9.14	168.70	17.08	0.24
15+	166.25	25.13	173.28	14.62	0.72	179.62	22.85	175.80	10.13	0.45
16+	167.41	17.00	172.94	11.28	1.48	172.91	14.58	179.00	8.83	1.39
17+	171.40	10.11	180.00	21.59	1.12	180.53	13.30	188.50	12.33	1.49
18+	160.85	18.75	174.50	12.00	1.38	179.14	6.20	189.33	2.88	3.55*

*P < 0.05

of them are engaged in shop keeping, small trading business, civil servants and a few of them in agriculture. There seems to be a lean period during the winter, when they are confined indoors and are hard pressed for resources. It may be assumed that certain nutritional stresses are operative; however, their magnitudes may not be too great. It

may be concluded that populations living under similar types of environmental situations for a very long time tend to resemble each other in respect of bodily characteristics. Findings on adult morphology of these two groups, viz. Rajput and Brahmin of Bharmour and Kulu have shown great resemblances in almost all of the physical

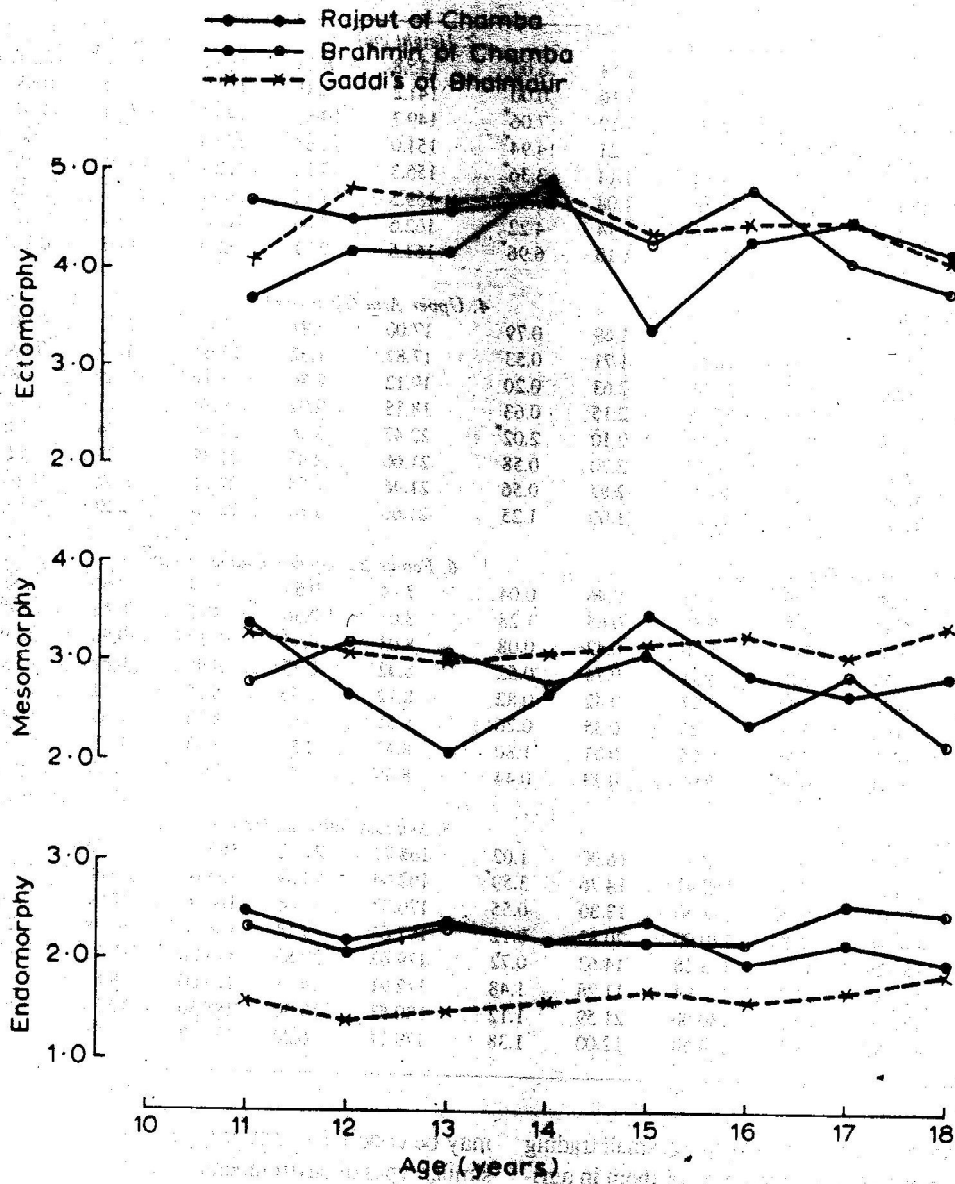


Fig. 2. Somatotype comparisons of Rajput and Brahmin boys of Chambo with Gaddi boys

Table 3. Somatotypes of Rajput and Brahmin boys of Chamba, Himachal Pradesh

Age group (yr)	Endomorphy				t-value	Mesomorphy				t-value	Ectomorphy				t-value
	Rajput		Brahmin			Rajput		Brahmin			Rajput		Brahmin		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.			
11+	2.52	0.67	2.89	0.48	3.36	0.76	2.83	0.74	0.65	3.69	1.22	4.70	1.08	2.65 ^a	
12+	2.17	0.61	2.73	0.75	2.69	0.42	3.15	0.68	3.07	4.20	0.95	4.53	1.06	0.95	
13+	2.42	0.56	2.66	0.69	2.05	0.77	3.08	0.86	1.04	4.23	1.65	4.58	1.20	0.53	
14+	2.18	0.41	2.74	0.01	2.71	0.82	2.78	1.13	0.23	4.92	0.65	4.72	1.32	0.61	
15+	2.37	0.83	2.17	0.46	0.05	3.50	0.92	3.10	0.96	0.98	3.43	1.47	4.34	1.63	1.46
16+	2.04	0.77	2.14	0.58	0.70	2.90	0.88	2.41	0.79	1.88	4.28	1.25	4.76	1.04	1.37
17+	2.19	0.48	2.65	0.82	1.51	2.67	1.01	2.88	0.82	0.57	4.53	1.15	4.05	0.91	1.17
18+	2.00	0.60	2.40	0.60	3.33	2.92	0.73	2.16	0.76	1.49	4.21	1.34	3.83	0.76	0.69

*P < 0.05

characteristics studied (Singh, 1981; Singh et al., 1988). The Chamba population lead a life which is less strenuous than that of the moderate altitude populations of Bharmour.

The socio-economic status of Bharmour people is generally lower than that Chamba people. So, a strenuous habitual physical activity of Rajputs of Bharmour associated with greater nutritional inadequacies may account to a major extent for smaller size of children, apart from the altitudinal stresses. Thin fatty layers of Bharmour Rajputs probably is an adaptation to lower intakes of fats and oils and relatively higher physical activity. (Singh and Sidhu, 1980 a).

During 11 to 18 years, the ectomorphy dominates over endomorphy and mesomorphy, in Rajput and Brahmin boys of Chamba. There is no change in the component dominance during these years. A longitudinal study elsewhere (Parizkova and Carter, 1976) indicates that individuals change considerably in somatotype during 11 to 18 years and 67% of them changed in component dominance. Cross-sectional studies have also referred to changes taking place in somatotypes during growth, especially before adolescence (Singh and Sidhu, 1980b; Heath and Carter, 1971). The findings of Claessens et al. (1986), however, are a little different and report that the constancy of the three somatotype components is fairly high during 13 to 18 years in Belgian boys studied longitudinally.

The growth performance in height and weight of the populations under study, viewed in the context of American (Hamill et al., 1976) and British (Tanner and Whitehouse, 1966) samples, indicates lower growth status. The present populations also show higher means as compared to the All-India pooled sample (ICMR, 1972). The triceps skinfold thickness of Rajput and Brahmin boys of Chamba fluctuates between the 10th and 50th centile of the British standards (Tanner and Whitehouse, 1975).

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