

PHYSIQUE CHARACTERISTICS OF RAJPUT BOYS AGED 11-18 YEARS OF CHAMBA, HIMACHAL PRADESH

Rajan Gaur, Indu Talwar and Sarabjit Kaur

ABSTRACT

Physique characteristics of a cross-sectional sample of Rajput boys of Chamba area of Himachal Pradesh are described. The sample consisting of boys aged 11 to 18 years was drawn from various schools of Chamba Town and surrounding areas. Physique was evaluated with the help of somatotype analysis employing the Heath-Carter anthropometric protocol. In all, ten measurements, viz. weight, stature, bicondylar breadths of the humerus and femur, flexed upper-arm and calf circumferences, and the triceps, subscapular, supraspinale, and median calf skinfolds, were taken on each subject using standard instruments and techniques. The mean somatotype of the sample as a whole was 1.71-3.20-4.36, which can be categorized as mesomorphic ectomorph. The results indicate that, during adolescence, ectomorphy remains the dominant component in Chamba boys.

Keywords: Somatotype, endomorphy, mesomorphy, ectomorphy, adolescents, Rajputs

INTRODUCTION

Ever since Sheldon introduced the concept of somatotype, it has been attracting the attention of anthropologists to understand variations in human physique. Apart from anthropologists, technique of

somatotyping has been of interest to researchers from a number of disciplines such as, sports and exercise science, human biology, nutritional sciences, psychology and medicine. Therefore in addition to understanding population variations, somatotyping has been used in connection with sports, fitness and performance, diseases, eating disorders and psychological issues (Carter and Heath, 1990; Gaur *et al.*, 2008; 2014).

Broadly, a somatotype is three number description of the size dissociated gross morphology of an individual. The three numbers represent the components of

Dr. Rajan Gaur, Professor, Department of Anthropology, Panjab University, Chandigarh (India), *E-mail:* rajan_gaur7@yahoo.com; **Dr. Indu Talwar, Professor**, Department of Anthropology, Panjab University, Chandigarh (India) and **Ms. Sarabjit Kaur, Student**, Department of Anthropology, Panjab University, Chandigarh (India).

endomorphism, ectomorphism and ectomorphism. Endomorphism represents general fatness, mesomorphism the musculo-skeletal development and ectomorphism the leanness of an individual. The concept of somatotype was first developed as a photoscopic technique by Sheldon and colleagues (Sheldon *et al.*, 1940). Subsequently, the method underwent several modifications (Carter and Heath, 1990). Heath and Carter (1967) introduced the anthropometric somatotype procedure, which is now a days the most widely used somatotyping technique (Carter, 1997).

A number of investigations have been conducted on somatotypes of male populations of India (Berry and Deshmukh, 1964; Berry, 1972; Singh and Sidhu, 1980; Singh, 1981; Singal and Sidhu, 1984; Singh *et al.*, 1986,1988; Singal *et al.*, 1990; Singh and Singh, 1991; Gaur and Singh, 1997; Talwar and Kaur,1997; Gaur and Sarkar, 1998; Gaur and Kaur, 2001; Gaur and Sharma, 2004; Gaur *et al.*, 1999, 2000, 2008, 2014). However, very little is understood about the somatotype variations among the boys of Chamba area of Himachal Pradesh. In the present paper we report the somatotypes of 11 to 18 year old Rajput boys of Chamba area of Himachal Pradesh.

MATERIALS AND METHODS

For the present study, a cross-sectional sample of 205 Rajput girls of Chamba area ranging in age from 10 to 17 years was collected from the following schools of Chamba area:

1. Rajkiya Baristh Madhyamik Kanya Vidyalaya, Chamba
2. Rajkiya Baristh Madhyamik Vidyalaya, Sarol , Chamba

Only healthy boys were included in the study. The data were recorded on a special proforma. Information about age of the boys was taken from the school records. The age was converted into decimal age with help of method given by Tanner and Whitehouse (1966). Age mid-points were used to divide the sample into eight age groups. Apart from anthropometric measurements, some general information of each subject was also recorded.

Somatotype of each boy was calculated using the Heath-Carter anthropometric somatotype method (Carter and Heath, 1990). Ten measurements used for this purpose included weight, stature, bicondylar breadths of the humerus and femur, flexed upper-arm and calf circumferences, and the triceps, sub-scapular, supraspinale, and median calf skinfolds. All the measurements were taken with the help of standard instruments using the methods given by Carter and Heath (1990). The individual component ratings were computed using the techniques given in Carter and Heath (1990). The X and Y co-ordinates for each subject were calculated using the formulae of Carter *et al.* (1983). Mean somatotypes were plotted on somatoplots using X and Y co-ordinates on a superimposed grid. Descriptive statistics were calculated for height, weight and the three somatotype components, namely endomorphy, mesomorphy, and ectomorphy.

The study area

The data for the present study was collected from Chamba Town and surrounding area. The present area forms a part of the Chamba District of Himachal Pradesh. Chamba District is situated between north latitude $32^{\circ} 11' 30''$ and $33^{\circ} 13' 6''$ and east longitude $75^{\circ} 49'$ and $77^{\circ} 3' 30''$. It is bounded in the north-west by Jammu and Kashmir State, in the east and north-east by Ladakh area of Jammu and Kashmir State and Lahaul area of Himachal Pradesh and in the south and south-east and by the Kangra District of Himachal Pradesh and Gurdaspur District of the Punjab, respectively. The district is basically mountainous with height ranging from 2,000 feet to 21,000 feet above mean sea level. The administrative headquarters of the district are at Chamba Town. The district is divided into seven Tehsils, namely Chamba, Dalhousie, Tissa, Chowari, Bharmour, Pangi and Salooni. According to 2011 Census, Chamba had a population of 519,080 (261,320 male and 257,760 female) with a literacy rate of 72.17% (82.59% for males and 61.67% for females), and a sex ratio of 986 females per 1000 males (Census of India, 2011). Though the official language is Hindi but the local language *Pahari*, and Himachali are commonly spoken by the people of the area.

Because of its natural beauty, Chamba District is an attractive tourist destination of Himachal Pradesh. Dalhousie, Khajjiar and Chamba Towns of the district attract a lot of tourists every year. There are many lakes, temples, and wild life sanctuaries in the district. Chamba is known for its miniature 'Pahari' paintings and the Chamba 'Rumal'.

RESULTS

The descriptive statistics of height, weight, endomorphy, mesomorphy and ectomorphy of Rajput boys in the present sample are displayed in Table-1. It is clear from the table that the mean height of Rajput boys shows an increasing trend with increase in age. The mean height increases from 136.00 cm at 11 years to 168.02 cm at 18 years thus recording a total gain of 32.02 cm over the age range considered here. The maximum gain in height was noticed from 13 to 15 years. Like height, the mean weight of the Rajput boys of Chamba shows a steady increase with increase in age. The mean weight increased from 30.50 kg at 11 years to 52.16 kg at 18 years. The net gain in weight over the age range was 21.66 kg.

Figure 1 and Table 1 display the age trends of the three somatotype components of the Rajput boys in the present sample. As can be seen in the figure, the mean ectomorphy, by and large, increases with increase in age from 3.63 at 11 years to 4.36 at 18 year thus recording an overall gain of 0.91 units. Up to 15 years the mean ectomorphy gradually increases then declines up to 17 years and increases again at 18 years. Mean mesomorphy shows a slight decrease from 3.59 at 11 years to 3.53 at 18 years. Not much change was noticed in mean endomorphy, which marginally increased from 1.74 at 11 years to 1.79 at 18 years.

The mean somatotype of the sample as a whole was 1.71-3.20-4.36, which can be categorized as mesomorphic ectomorph. Figure 2 depicts the somatoplots of the mean somatotypes at different ages of the Chamba boys in the present sample on a two-dimensional somatochart. At 11 years the boys are located in the mesomorph ectomorph sector of the somatochart. Thereafter, from 12 to 18 years, the somatoplots of mean somatotypes, including the sample mean, are located in the mesomorphic ectomorph sector of the somatochart. The results indicate that in the present sample of Rajput boys from Chamba area, ectomorphy remains the dominant component during adolescence.

DISCUSSION

To evaluate the sex differences in somatotypes, the three components of the Chamba boys have been compared with those of Chamba girls reported by Gaur et al. (2014), using a student's t-Test (Table 2). However, it was not possible to comment on gender variations in 10 and 18 age groups due to non-availability of data. It is clear from the table that the sex differences in endomorphy were, in general, significant ($p < 0.05$), with girls showing higher mean values of endomorphy. The sex differences in mesomorphy were not significant in any age group. The Chamba boys were, on

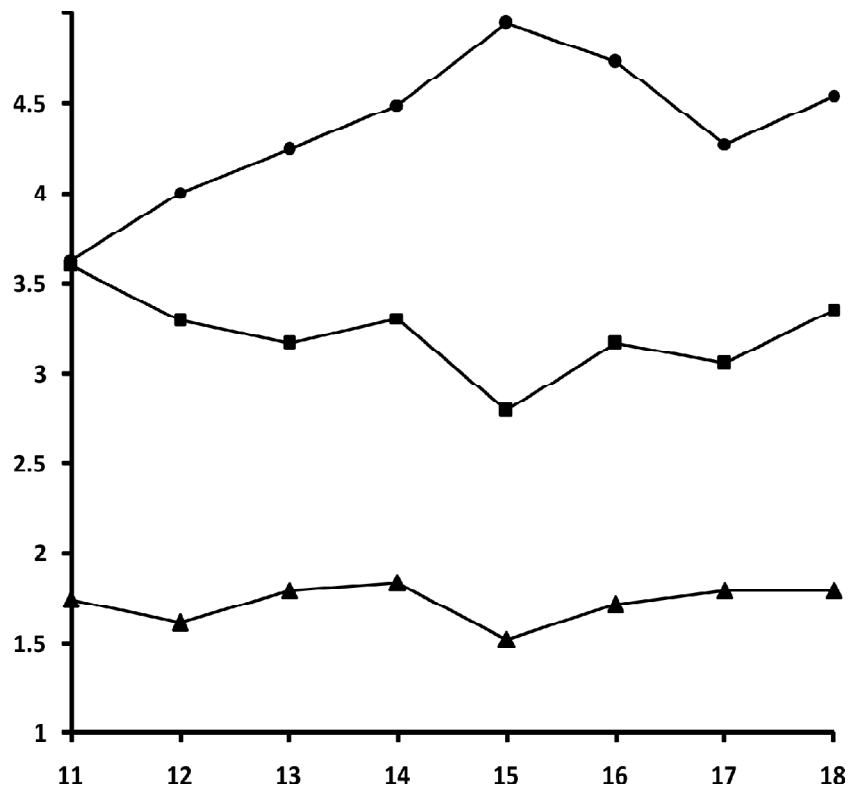


Figure 1: Age trends in endomorphy, mesomorphy and ectomorphy among adolescent Rajput boys of Chamba area

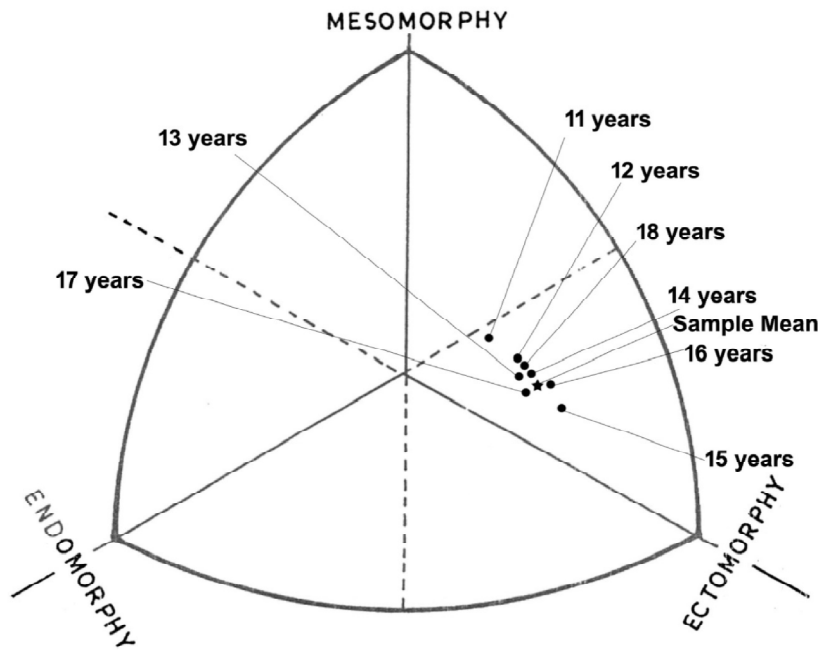


Figure 2: A somatochart showing mean somatotypes of 11 to 17 year old Rajput boys of Chamba

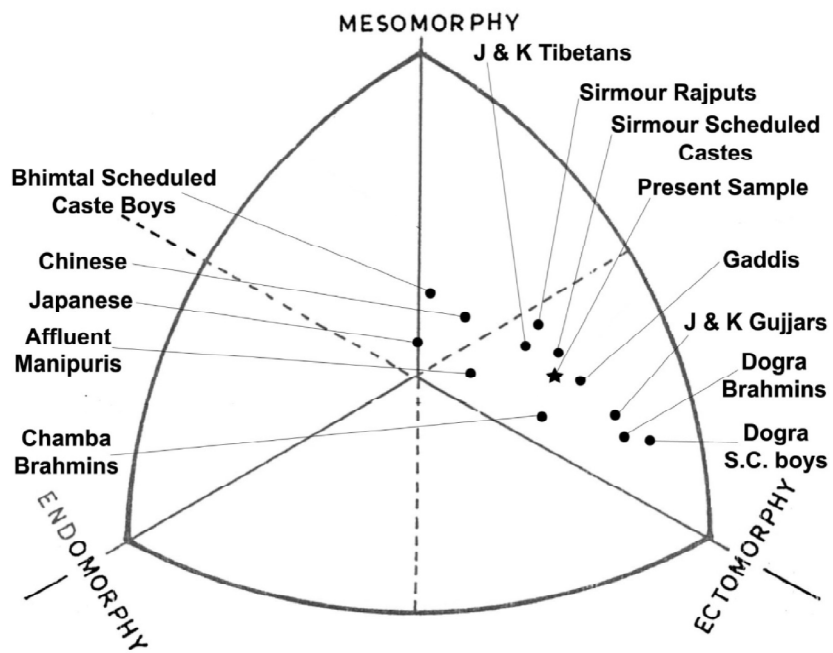


Figure 3: Somatochart showing somatoplots of mean somatotypes of the various populations

the whole, more ectomorphic than the Chamba girls. The sex differences in ectomorphy were significant ($p < 0.05$) from 12 to 15 years. The Chamba boys are significantly more ectomorphic and less endomorphic than the females. The less endomorphic nature of the Chamba boys is consistent with the general understanding that the female of the human species has overall more fatness than the male (Forbes, 1987; Frisancho, 1981; Malina *et al.*, 1988). In general, girls tend to have more subcutaneous fat at all ages. (Roemmich and Rogel, 1995; Rolland_Cachera, 1995; Jurimae and Jurimae, 2001; Gaur *et al.*, 2014).

The mean somatotype of the Chamba boys in the present sample have been compared with age matched samples of boys of other Indian populations. Figure-3 displays a comparison of somatoplots of mean somatotypes of adolescent boys in the present with age-matched samples of Chinese (Ji and Oshawa, 1996), Japanese (Chino-Japanese Cooperative Inventory Team, 1986), Gaddis (Singh and Sidhu, 1980), Chamba Brahmins (Singh and Singh, 1991), Gujjars and Tibetans of Jammu and Kashmir (Bhasin and Singh, 1991), Dogra Brahmins and Scheduled Castes (Singh and Bhasin, 1990) and Sirmour Rajputs and Scheduled Castes (Gaur *et al.*, 2008). It is clear from the figure that the mean somatoplots of most of the Indian boys, including the present sample, are positioned in the mesomorphic ectomorph sector of the somatochart. The Japanese and Manipuri boys are located in the central sector of the somatochart. It is also apparent from the figure that the Indian boys are less mesomorphic and more ectomorphic than the Japanese and Chinese boys. This difference in physique of Indian boys could be due to ethnic differences. The figure further reveals that the mean somatotypes of adolescent boys of various populations under comparison depict dominance of ectomorphy over endomorphy and mesomorphy from 11 to 17 years. Thus ectomorphy remains the dominant somatotype component during the adolescence among boys.

Table 1: Mean \pm Standard Deviation for height (cm), weight (kg), Endomorphy, Mesomorphy and Ectomorphy of adolescent Rajput boys of Chamba area

Age Group	N	Height (Mean \pm SD)	Weight (Mean \pm SD)	Endomorphy (Mean \pm SD)	Mesomorphy (Mean \pm SD)	Ectomorphy (Mean \pm SD)
11	30	136.0 \pm 13.02	30.50 \pm 4.80	1.74 \pm 0.71	3.59 \pm 1.72	3.63 \pm 1.61
12	28	139.53 \pm 8.49	31.24 \pm 6.67	1.61 \pm 0.46	3.29 \pm 0.91	4.00 \pm 0.94
13	23	141.48 \pm 6.08	32.25 \pm 7.20	1.79 \pm 0.59	3.16 \pm 0.99	4.24 \pm 1.21
14	30	153.75 \pm 7.19	40.03 \pm 7.27	1.83 \pm 1.00	3.30 \pm 1.62	4.49 \pm 1.51
15	33	159.97 \pm 8.46	43.46 \pm 7.70	1.52 \pm 0.88	2.79 \pm 1.41	4.94 \pm 1.68
16	26	163.65 \pm 6.03	46.87 \pm 6.13	1.71 \pm 0.78	3.16 \pm 1.50	4.73 \pm 1.31
17	27	167.55 \pm 6.73	52.74 \pm 9.08	1.79 \pm 0.88	3.05 \pm 1.17	4.27 \pm 1.39
18	20	168.02 \pm 3.92	52.16 \pm 8.99	1.79 \pm 0.90	3.35 \pm 3.17	4.54 \pm 1.77
11-18	217	153.33 \pm 14.50	40.79 \pm 10.99	1.71 \pm 0.79	3.20 \pm 1.61	4.36 \pm 1.48

Table 2: Mean somatotype components of Rajput boys and Girls of Chamba

Age Group	N		Endomorphy		Mesomorphy		Ectomorphy	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
10	30	-	2.02	-	3.59	-	2.73	-
11	18	30	2.26* (-2.96)	1.74	3.29	3.68	3.01 (1.26)	3.63
12	14	28	2.31	1.61	3.16	4.54	2.83* (2.33)	4.00
13	23	23	2.50* (-3.38)	1.79	3.30	3.64	3.07* (3.15)	4.24
14	29	30	2.01* (-4.83)	1.83	2.79	3.84	3.68* (2.64)	4.49
15	33	33	2.52* (-4.83)	1.52	3.16	2.85	4.04* (2.64)	4.94
16	26	26	3.06* (-6.27)	1.71	3.05	2.81	3.97 (1.92)	4.73
17	32	27	2.43* (-3.13)	1.79	3.35	2.94	3.75 (1.51)	4.27
18	-	20	-	1.79	-	3.34	-	4.54
Ages combined	205	217	2.41* (-8.36)	1.71	3.20 (-0.71)	3.34	3.75* (3.12)	4.36

*Significant difference ($p < 0.05$);

Values in parentheses represent t-values;

-negative t-values indicate higher mean values for girls.

REFERENCES

- Berry, J.N., 1972. Somatotype distribution in male college students in northern India. *Am. J. Phys. Anthropol.*, 36: 85-94.
- Berry, J.N. and P.Y. Deshmukh, 1964. Somatotype of male college students in Nagpur, India. *Hum. Biol.*, 36: 157-176.
- Bhasin, M.K. and L.P.Singh, 1991. Somatotype changes during adolescence in Gujjars and Tibetans of Jammu and Kashmir, India. *J. Hum. Ecol.*, 2: 81-84.
- Carter, J.E.L., Ross, W.D., Duquet, W. and S.P. Aubry, 1983. Advances in somatotype methodology and analysis. *Yearbook Phys. Anthropol.*, 26:193-214.
- Carter, J. E. L., 1997. Somatotype Analysis-Review and Comments. *Ind.J.Sports Sc. P.Ed.*, 9: 1-10.
- Carter, J.E.L. and B.H. Heath, 1990. Somatotyping – Development and Applications. Cambridge Studies in Biological Anthropology, Cambridge: Cambridge University Press.
- Census of India, 2011. Provisional Population Totals Paper 2, Volume 2 of 2011: Himachal Pradesh. The Registrar General & Census Commissioner, India, New Delhi, Ministry of Home Affairs, Government of India.
- Chino-Japanese Cooperative Inventory Team, 1986. Chino-Japanese Cooperative Study on Physical Fitness of Children and Youth. Tokyo: Japanese Physical Education Association.

- Forbes, G.B. 1987. Human Body Composition: Growth, Aging, Nutrition, and activity. New York: Springer-Verlag.
- Frisancho, A.R., 1981. New norms of upper limb fat and muscle areas for assessment of nutritional status. *Am. J. Clin. Nutr.*, 34: 2540-2545.
- Gaur, R., Lakhanpal, M., Kaur, M., and S. Rastogi, 2000. A study of somatotypes of 4 to 13 years old Convent School children of Ludhiana. In: *Anthropology at the turn of the Century*. Vashisht, R.N., Banerjee, B.G., Pathak, R. K. and Edwin, C.J. (Eds.). Chandigarh: Department of Anthropology, Panjab University. Pp.22-31
- Gaur, R. and Kaur, N.P., 2001. Anthropometric Somatotypes of 9 to 16 Year Old Rural Jat Girls of Jind District of Haryana. In : *The Science of Man in Service of Man* . M.K.Bhasin and S.L. Malik. (Eds.) Delhi: Department of Anthropology, University of Delhi. Pp. 95-102
- Gaur, R. and P. Sarkar, 1998. Somatotypes of North Indian Children with Thalassemia Major. *Acta Medica Auxologica*, 30(2) :89-95.
- Gaur, R. and A. Sharma, 2004. Somatotypes of Adolescent Brahmin and Scheduled Caste boys of Bhimtal, Uttaranchal. In: *Issues and Themes in Anthropology- A Festschrift in Honour of Professor D. K. Bhattacharya*. V. K. Srivastava and M. K. Singh (Eds.), Delhi : Palaka Prakashan, pp. 503-519.
- Gaur, R. and R.P. Singh, 1997. Age differences in somatotypes of Garhwali males 17 – 60 years of age. *Am. J. of Hum. Biol.*, 9: 285 – 290.
- Gaur, R., Maurya, M., and P.S. Kang, 2008. Sex, age and caste differences in somatotypes of Rajput and Scheduled Caste adolescents from Sirmour District of Himachal Pradesh, India. *Anthrop. Anz.*, 66(1): 81-97.
- Gaur, R., Singh, S.G. and M. Lakhanpal, 1999. Somatotypes of urban Meities of Imphal, Manipur. *Anthropologist*, 1: 235-240.
- Gaur, R., Talwar, I., Devi, I. and V. Negi, 2014. Age and Sex Variations in the Somatotypes of Rajput Adolescents of the Kullu District of the Himachal Pradesh Province, North India. *International Journal of Anthropology (Milano)*, 29(4): 227-244.
- Health, B.H. and J.E.L. Carter, 1967. A modified somatotype method. *Am. J. Phys. Anthropol.*, 27: 57-74.
- Ji, C. and S.Ohsawa, 1996. Changes in Somatotype During Growth in Chinese Youth 7-18 Years of Age. *Am. J. Hum. Biol.*, 8:347-359.
- Jurimae, T, 2001. *Physical Activity and Motor Development in Prepubertal Children*. Boca Raton: CRS Press.
- Malina, R.M., Bouchard, C. and C. Beunen, 1988. Human growth: selected aspects of current research on well-nourished children. *Ann. Rev. Anthr.*, 17:187-201.
- Roemmich, J.N. and A.D. Rogel, 1995. Physiology of growth and development. Its relationship to performance in the young athletes. *Clin.Nutr. Sports Med.*, 14:483-502.
- Rolland-Cahera, M.F., 1995. Prediction of adult body composition from infant and child measurements. In: *Body Composition Techniques in Health and Disease*. Davis, P.S. and Cole, T.J.(Eds.). Cambridge: Cambridge University Press. Pp. 100-105.

- Sheldon WH, Stevens SS and W.B. Tucker, 1940. *The varieties of human physique*. New York: Harper Bros.
- Singal, P. and L. S. Sidhu, 1984. Age changes and comparison of somatotypes during 20 to 80 years in Jat Sikh and Bania females of Punjab (India). *Anthrop. Anz.*, 42: 281-289.
- Singal, P., Bhatnagar, D. P. and S. Kaur, 1990. Changes in somatotypes between 5 to 16 years in Rajput and Brahmin girls of Chamba District (H.P.). *Ind. J. Phys. Anth. & Hum. Genet.* 16: 49-62.
- Singh, L.P. and S.P. Singh, 1991. Physical Growth and Anthropometric somatotype of Rajput and Brahmin boys of Chamba District, Himachal Pradesh. *J. Hum. Ecol.* 2:121-126.
- Singh, L.P. and M.K. Bhasin, 1990. Somatotype changes in adolescence among Dogras of Jammu and Kashmir, India. *J. Hum. Ecol.*, 1: 169-174.
- Singh, S. P. and L.S. Sidhu, 1980. Changes in somatotypes during 4 to 20 years in Gaddi Rajput boys. *Z. Morph. Anthrop.*, 71: 285-293.
- Singh, S. P., Sidhu, L.S. and P. Malhotra, 1988. Body measurements and somatotypes of young adult Jat-Sikh men of Punjab, India. *Anthrop. Anz.*, 46:261-267.
- Singh, S.P. , 1981. Body morphology and anthropometric somatotypes of Rajput and Brahmin Gaddis of Dhaula Dhar Range, Himalayas. *Z. Morph. Anthrop.*, 72:315-323.
- Singh, S.P., Sidhu, L.S. and P. Malhotra, 1986. Body morphology of high altitude Spitiens of North West Himalayas. *Z. Morph. Anthrop.*, 76:189-195.
- Talwar, I. and M. Kaur, 1997. Somatotype changes during adolescence among Punjabi Bania Girls. *Ind. J. Sport Sc. P. Ed.*, 9: 53-62.
- Tanner, J.M. and R.H. Whitehouse, 1966. Notes on the use of height and weight standard charts. London: Creasey Hertford.

This document was created with Win2PDF available at <http://www.win2pdf.com>.
The unregistered version of Win2PDF is for evaluation or non-commercial use only.
This page will not be added after purchasing Win2PDF.