

A Comparative Study of Growth Pattern and Motor Quality of Boys of Jawahar Navodaya Vidyalaya and Kendriya Vidyalaya in Chhattisgarh, India

Shukla¹, M., Venugopal¹, R. and Mitra², M.

¹School of Studies in Physical Education, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh

²School of Studies in Anthropology, Pt. Ravishankar Shukla University, Raipur, Chhattisgarh

Abstract

A cross sectional study of the physical growth and physical fitness was carried out on 900 boys, aged 10+ to 18+ years in Jawahar Navodaya Vidyalaya (JNV) and Kendriya Vidyalaya (KV) of Chhattisgarh. The study was aimed to find out the growth pattern of the boys of JNV, which is a residential school of children from the rural area, and was compared with the boys of KV, a non-residential school of the children of Central government employees including defense personnel. Anthropometric measurements taken in to consideration are stature, body weight, sitting height, biacromial diameter, biiliocrystal diameter, upper arm circumference, calf circumference and triceps, biceps and sub scapular skin folds. Data was also collected for vertical jump and pull-ups to measure motor fitness components. All anthropometric measurements show increasing trend with age in both groups, but it is not uniform in all the ages. However, comparison revealed that, the JNV boys' show lower values for almost all the anthropometric measurements in most of the ages but the motor fitness variables exhibited better scores for JNV boys. When height and weight of the JNV and KV boys were compared with all India (ICMR) boys, the JNV and KV boys are observed to be taller and heavier than the all India boys at all ages.

Key Words: Physical growth, Physical fitness, Boys

Introduction

Human growth is a dynamic changing process and is being influenced by heredity and environment. Genetic component and environment both contribute to attain final body structure. Certain factors like disease, proper diet, time, cultural pursuits, geographical conditions etc. have tremendous influence in the growth of a child.

Concern for the welfare of the school children is the next impetus to the study of growth. It has been realized that only mental or academic activity can adversely effect the growth and development of a child as most of the blood circulation is towards brain depriving other organs from it.

Health and physical education programs aid students in achieving their

fullest potential through the acquisition of knowledge and skill necessary to attain healthy levels of well being and to maintain active life styles through out life span. Healthy and physically active life style of a person helps to increase capacity for effective work, positive behavioral choices and increased academic pursuits.

It has been observed that growth curves of various body dimensions vary from one population to another (*Tanner, 1960; Hiernaux, 1964, 1968*), while growth differences of this kind are primarily genetical in origin, they may be considerably influenced by environmental factors. *Mitra & Singrol (1982)* in a study reported growth pattern of Chhattisgarh girls to be superior to Manali Rajput girls but inferior to Orriya urban girls, whereas age, weight growth pattern of Chhattisgarh

girls is inferior to Manali Rajput girls and some what superior to girls of south India.

Many factors are known that affect growth and development (Tanner, 1961; Johnston et al, 1980). Hereditary (Susanne, 1980) as well as environmental factors are important in the process of growth and development (White Law, 1971; Cook et al, 1973; Malcom, 1974; Lindgren, 1976; Johston, 1980). Results of body composition have shown that children living under better social circumstances are not only heavier, because they have more developed skeleton and musculature but also have more body fat (Bodzsar, 1999). Mayuri & Madhvilata (2000) in a study of physical development of rural adolescents found that age, class and overall socio-economic status scores were significantly related to weight and stature. Singh & Singh (2000) reported that there was difference in the body dimensions of affluent and non-affluent Meitei boys of Manipur aged 12-18 years. Similar results were reported by Chang (1969), Bailey (1970), Miller et al (1972) and Evelenth & Tanner (1976) in developing and developed countries. Comparable findings were also reported in Indian context by Udani (1963), Sharma & Kaul (1970), Banik et al (1972), ICMR (1972), Garg (1978) and Singh & Malhotra (1991).

Material & Methods

The present study was conducted on students of Jawahar Navodya Vidyalaya [JNV] and Kendriya Vidyalaya [KV]. JNV is a residential school, predominantly for the children of rural area whereas the KV is a non residential school, mainly for the students belonging to urban area.

A total of 900 boys formed the sample for the present study, 450 boys from JNV and KV each. The age of the students ranged from 10+ years to 18+ years. The students were classified into four categories according to the surname, personal identification and certificate issued by Government of India/Chhattisgarh. The categories were ST, SC, OBC & General. Accordingly it is indicated that a higher percentage of boys of JNV belonged to ST from rural areas whereas boys belonging to caste population were more in KV as compared to JNV. Keeping in mind the differences with regard to ethnicity, geographical locale as well as socioeconomic status between the two schools, the study was conducted to compare the growth pattern of JNV and KV boys. Stature, body weight, sitting height, biacromial diameter, biilliocristal diameter, upper arm circumference and calf circumference were recorded according to the standard procedures (Weiner and Lourie, 1969). Physical fitness test for explosive strength and shoulder strength were measured by vertical jump and pull ups. Descriptive analysis was carried out and comparative statistics was used to observe difference between JNV & KV boys on various anthropometric measurements and physical fitness components. Correlation coefficient was computed to see the relationship between anthropometric and physical fitness variables. SPSS was used to compute data (Nie et al, 1975).

Results

All anthropometric measurements exhibit uniform increase with advancement of age in both groups. However, the JNV boys had lower value in all anthropometric measures as compared to KV boys. The difference

being statistically significant at almost all ages.

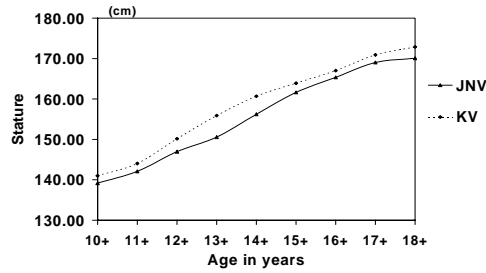


Figure 1: Distance curve of stature among the boys

The distance curve of height shows gradual increase during the growth period from 10+ to 18+ years

age among JNV and KV boys. The maximum difference between two successive ages is 5.63 cm among JNV boys and 6.11 cm among KV boys, which is in correspondence with adolescent growth spurt. Second increment in case of stature was observed at 14+ years in JNV boys and 17+ years in KV boys. Higher standard deviation in case of JNV at 14+ and KV at 11+ years age may be due to higher individual variability. KV boys seem to be taller than JNV boys in almost all the age groups.

Table 1: Mean and standard deviation for anthropometric measurements of JNV and KV boys by age

AGE GROUP (YRS.)	N	HEIGHT (CM)		WEIGHT (KG)		SITTING HEIGHT (CM)		BIACROMIAL DIAMETER (CM)		BILIOCRISTAL DIAMETER (CM)		UPPER ARM CIRCUM. (CM)		CALF CIRCUM. (CM)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
JNV Boys															
10+	50	139.18	6.98	33.28	6.36	71.78	4.50	31.14	1.09	20.92	1.79	18.50	1.43	25.85	3.23
11+	50	142.10	7.84	34.02	6.85	72.41	3.66	32.06	0.27	21.20	2.42	18.96	1.75	26.93	2.09
12+	50	146.96	7.72	34.14	5.68	73.08	4.64	33.29	1.88	22.13	1.91	19.78	1.62	28.43	1.73
13+	50	150.58	7.25	37.26	4.59	76.31	4.06	34.31	3.41	23.50	1.69	20.96	1.91	29.50	2.37
14+	50	156.21	8.05	40.08	3.81	78.11	4.71	35.28	3.56	29.52	1.59	21.05	2.57	31.30	2.61
15+	50	161.64	6.15	45.31	6.56	81.00	4.23	36.06	3.58	24.98	2.31	22.65	2.37	32.10	3.34
16+	50	165.36	5.60	48.07	5.37	83.86	3.27	37.18	3.45	25.10	1.63	23.76	2.13	32.57	2.54
17+	50	169.04	6.00	51.11	6.88	85.88	3.78	38.13	3.08	25.69	3.71	24.44	1.88	32.58	2.37
18+	50	170.08	7.54	53.08	4.82	87.43	4.54	39.16	4.89	26.02	2.91	25.32	2.71	34.35	4.16
KV Boys															
10+	50	141.00	6.56	33.83	7.23	72.78	5.63	32.17	2.80	22.23	2.82	20.34	3.33	27.15	2.87
11+	50	144.04	9.18	34.71	6.83	73.36	6.03	32.38	2.40	22.96	2.28	20.56	2.42	27.47	2.57
12+	50	150.15	8.00	40.87	9.19	77.98	4.87	34.06	2.93	23.61	2.14	20.74	2.74	29.44	3.17
13+	50	155.89	6.48	45.38	9.98	79.40	5.35	35.91	2.94	24.15	2.43	22.06	2.81	29.93	2.85
14+	50	160.68	8.47	45.97	7.27	81.41	4.47	36.24	2.27	25.16	2.80	22.62	2.45	30.24	2.69
15+	50	163.91	7.68	50.87	8.58	82.49	4.15	38.00	3.24	25.95	3.25	23.72	3.10	32.93	3.29
16+	50	167.02	6.71	54.52	10.31	85.26	3.94	38.18	2.87	26.03	4.36	24.29	5.37	33.01	6.78
17+	50	170.92	4.83	55.32	7.95	88.20	4.42	39.19	2.13	26.22	2.22	24.76	3.28	33.61	4.33
18+	50	172.80	4.91	55.72	7.79	88.99	3.47	40.06	2.29	26.38	2.85	25.86	2.73	34.89	4.18

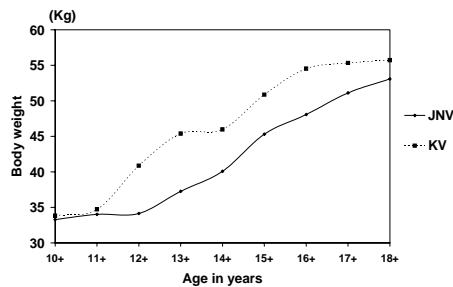


Figure 2: Distance curve of weight among the boys

The mean weight of JNV and KV boys was almost same at the age of 10+ and 11+ years but after 11+ years the mean weight of KV boys crossed the distance curve of weight of JNV boys. From 11+ years onwards there was rapid increase in weight of KV boys. The maximum increase in weight was 5 kg among JNV boys between 14+ and 15+ years and 6.16 kg for KV boys between 11+ and 12+ years which are in

concurrency with growth spurt in both the groups. Second phase of increment in weight was observed at 15+ years for both groups.

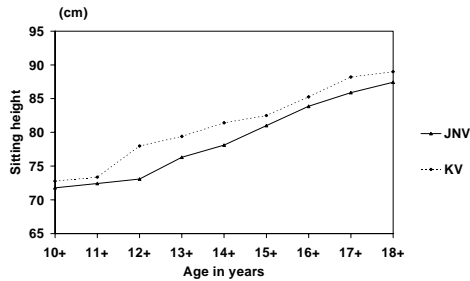


Figure 3: Distance curve of sitting height among the boys

The distance curve of sitting height for KV boys remains slightly higher than the JNV boys throughout the age range under study. The increment for both the groups was gradual and uniform. The maximum age group difference in sitting height between two successive age groups is 3.23 cm among JNV boys between 12+ and 13+ years and 4.62 cm among KV boys between 11+ and 12+ years indicating the adolescent growth spurt. Next increment was observed at 15+ years for JNV boys and at 16+ years for KV boys. Higher standard deviation was observed at 12+ years in JNV boys and 14+ years in KV boys.

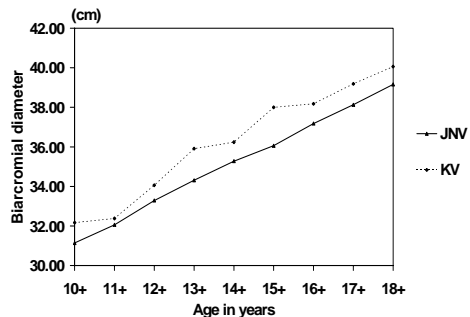


Figure 4: Distance curve for biacromial diameter among boys

Biacromial diameter for two groups shows that the distance curve for KV boys crosses that of JNV boys after 11+ years and then continues to rise at more rapid rate than the JNV boys. The growth pattern in this variable was gradual for both the groups but uniform in JNV boys. The maximum increase of 1.23 cm between 11+ and 12+ years in JNV boys and 1.85 cm between 12+ and 13+ years for KV boys were observed. A comparison of distance curves of the biacromial diameter for two groups reveal that the curve for KV boys was higher than those of JNV boys through out the age under study. Second spurt of growth was observed at 15+ years for JNV boys and at 13+ years for KV boys.

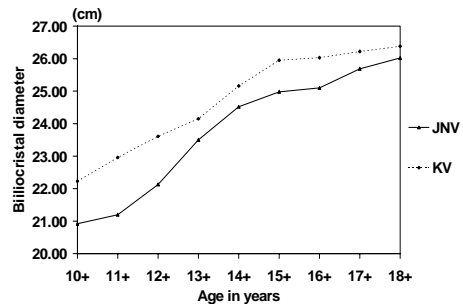


Figure 5: Distance curve for biliocristal diameter among boys

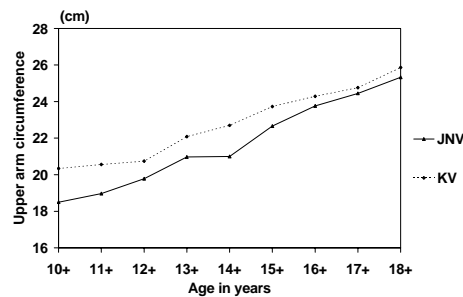


Figure 6: Distance curve for upper arm circumference

A comparison of distance curve of biliocristal diameter exhibits that KV boy's remains at a higher level than JNV boys through out the ages. The growth

spurt was observed at the age 14+ years for JNV boys and at 13+ years for KV boys. The difference between the two successive age groups was 1.01 cm and 1.37 cm for JNV boys and KV boys respectively.

Upper arm circumference exhibits gradual and smooth increment throughout the age groups. KV boys seem to be slightly on higher side in all the age groups. The maximum age group difference between two successive age groups is 1.66 cm between 14+ and 15+ years and 1.34 cm between 12+ and 13+ years for JNV and KV boys respectively, which indicates the adolescent growth spurt of the two groups.

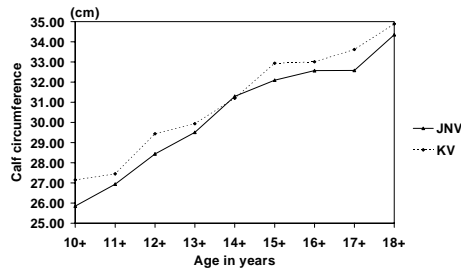


Figure 7: Distance curve for calf circumference

The KV boys had slightly higher value for calf circumference as compared to JNV boys. The growth increment was smooth, gradual and almost parallel for the two groups. Adolescent growth spurt was observed at 12+ years for JNV boys as the maximum age group difference was 1.91 cm between 14+ and 15+ years whereas in KV boys the maximum age group difference was 1.99cm between 11+ and 12+ years, corresponding to the growth spurt.

The performance in vertical jump increased with increase in age in both the groups. The performance recorded were

34.13/26.53 cm at 10+ to 48.86/47.60 cm at 18+ in JNV & KV children respectively. Performance of JNV children were significantly higher in all the age groups except at 18+. The scores of pull ups test for shoulder followed same trend like other motor component JNV children scores were significantly high. Minimum and maximum mean scores were 22.26 & 17.52 at 10+ and 37.62 & 28.34 at 18+ for JNV & KV respectively.

Table 2: Mean, SD and t-value of selected motor ability tests of JNV & KV boys (10+-18+ years)

		Vertical Jump, Cm		Pull-Up Test Score	
		JNV	KV	JNV	KV
10+	Mean	34.13	26.53	26.26	17.52
	SE	0.82	0.50	0.87	0.54
	SD	5.84	3.54	6.16	3.83
	t test	7.86 **		8.51**	
11+	Mean	34.41	31.00	28.18	18.40
	SE	0.75	0.68	1.12	0.64
	SD	5.32	4.83	7.93	4.54
	t test	3.35 **		7.56**	
12+	Mean	38.20	35.10	31.92	19.06
	SE	0.93	0.95	1.40	0.64
	SD	6.59	6.78	9.92	4.53
	t test	2.32 *		8.33**	
13+	Mean	40.75	35.27	34.28	18.62
	SE	1.04	0.95	1.51	0.57
	SD	7.38	6.77	10.69	4.06
	t test	3.87**		9.68**	
14+	Mean	44.19	37.82	32.56	20.72
	SE	1.08	1.19	1.34	0.65
	SD	7.70	8.47	9.50	9.64
	t test	3.94**		7.91**	
15+	Mean	44.68	38.04	33.06	20.80
	SE	0.86	0.71	1.00	0.53
	SD	6.09	5.04	7.12	3.77
	t test	5.94**		10.75**	
16+	Mean	48.00	43.58	36.32	22.48
	SE	0.65	0.90	1.10	0.67
	SD	4.66	6.40	7.83	4.77
	t test	3.94**		10.66**	
17+	Mean	48.54	44.01	37.62	27.32
	SE	0.66	0.55	0.81	0.51
	SD	4.73	8.93	5.76	3.61
	t test	5.20**		10.70**	
18+	Mean	48.86	47.60	33.24	28.34
	SE	0.60	0.68	0.71	0.58
	SD	4.27	4.81	5.02	4.14
	t test	1.38		5.32**	

*p <0.05, ** p<0.01

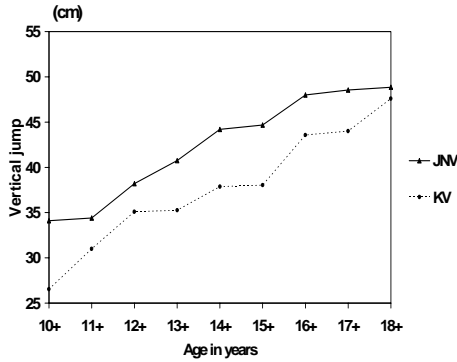


Figure 8: Distance curve for vertical jump

The distance curve of Vertical jump shows a gradual increase during growth period of 10+ to 18+ years age among JNV & KV boys. The JNV boys exhibited higher scores than KV boys throughout the growth period under study. The maximum difference between two successive ages is 11.01 cm among JNV boys between 11+ and 12+ years and 16.80 cm among KV boys between 10+ and 11+ years.

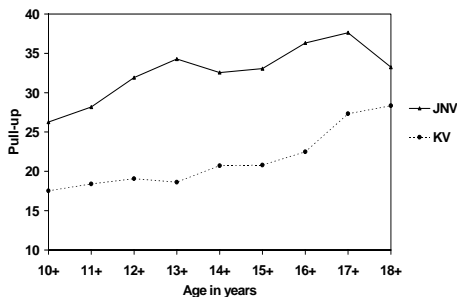


Figure 9: Distance curve for Pull up

The distance curve of Pull-up shows gradual increase during the growth period of 10+ to 18+ years age among JNV & KV boys. The JNV boys showed better score than KV boys throughout the growth period under study. The maximum difference between two successive ages is 13.27 among JNV boys, between 11+ and 12+ years and among KV boys the

maximum differences recorded was 21.53 between 16+ and 17+ years.

The Vertical jump of JNV boys when compared with KV boys was found to be higher in all the age groups. However, the inter group difference is non-significant at 18+ years of age. The scores of Pull-up of JNV boys when compared with KV boys were found to be higher in all the age groups. The inter group difference is significant in all the ages.

The difference in mean stature, weight, sitting height, biacromial diameter, upper arm circumference and calf circumference between JNV and KV boys are shown in table 2. The KV boys were taller than JNV boys at 13+ and 14+ years ($p < 0.01$) and 17+ years ($p < 0.05$) of age. Significant difference between the two groups was observed in weight, the KV boys being heavier at 12+, 14+, 15+, 17+ years ($P < 0.01$) of age and at 18+ years of age ($p < 0.05$). The boys of KV have significantly higher sitting height at 12+, 14+, 18+ ($p < 0.01$) and 17+ ($p < 0.05$) years of age.

Biacromial diameter exhibited significant differences between the two groups at age group 10+, 13+ and 17+ years. KV boys showed significantly higher values at 0.01 level. Higher values for biiliocrystal diameter was also observed for KV boys at age 10+, 11+ and 13+ years ($p < 0.01$). In case of upper arm circumference there was significant difference between the two groups for 10+, 11+, 12+, 13+ and 14+ years of the age groups, KV boys showed higher values than JNV boys. Calf circumference was higher in KV boys at 10+, 12+ and 14+ years of age.

Table 3: Test of signification of various Anthropometric measurements between the JNV and KV boys

Age Group (Yrs.)	Height (Cm)	Weight (Kg)	Sitting Height (Cm)	Biacromial Diameter (Cm)	Billiocrystal Diameter (Cm)	Upper Arm Circumference. (Cm)	Calf Circumference. (Cm)
10+	1.35	0.40	0.98	2.42*	2.78**	3.57**	2.13*
11+	1.33	0.51	0.95	0.73	3.74**	3.76**	1.15
12+	2.02	4.40**	5.15	1.58	3.66**	2.14*	1.97*
13+	3.02**	5.52	3.25**	2.50*	1.56	2.27*	0.82
14+	2.71**	5.06**	3.60**	1.60	1.45	3.12**	1.99*
15+	1.63	3.64**	1.77	2.83**	1.73	1.93	1.25
16+	1.34	3.92**	1.92	1.58	1.40	0.65	0.44
17+	2.34*	2.83**	2.82**	2.01*	0.87	0.59	1.48
18+	1.15	2.04*	1.99*	1.17	0.63	0.99	0.65

The comparison of 5th through 95th percentile indicates that 90% of the 10+ year boys of JNV & KV have attained weight of 25.28 kg and 23.00 kg to 62.80 and 69.23 kg respectively while at 18+ years of age 90% boys' attained weight ranging from 45.92 and 44.33 Kg to 62.80 and 69.23 Kg.

Stature of JNV & KV boys when compared with 5th and 95th percentile of 10+ years showed that 90% of the boys attained stature of 128/128.64 cm to 154.18/152.52 cm, the corresponding stature values for 18+ years boys of JNV & KV ranged from 153.65/165.21 cm to 179.28/179.85 cm respectively. This shows gradual widening range of variation with increase of age from 10 to 18+ years.

Percentile scores on biacromial diameter showed that 90% of JNV & KV boys of 10+ to 18+ years measured between 31.14 and 32.17 cm to 39.16 and 40.06 cm respectively. Similarly comparison of percentile score of billiocrystal diameter showed wide range variation with increase of age, 5th percentile score of girth measurements also showed wide range of variation from 5th to 95th percentile for the two groups of different ages. 90% of the JNV & KV

boys measured between 21.53 and 21.90 cm at 10+ years of age to 28.33 and 28.60 cm at 18+ years of age respectively.

Comparison of upper arm girth between 5th & 95th percentile of 10+ years boys of JNV & KV showed that 5th percentile score of JNV and KV boys observed were 16.28 and 16.78 cm at 10+ years and 21.12 and 26.73 cm 18+ years of age respectively. It is evident from the percentile scores that the increase in 5th percentile between 10 to 18 years is 16.28 and 22.55 cm while during the same age increase in 95th percentile is 21.12 and 31.50 cm respectively in JNV and KV boys.

It is evident from the percentile values of vertical jump of JNV and KV boys that vertical jump shows steady rise from one age to the next but not uniform in all ages and also the upper limit (95th percentile) of age group 10+ year does not overlap with the lower limit (5th percentile) of age group 18+ years. The comparison between 5th and 95th percentile of all ages of JNV and KV boys shows that most of the children scored between 24.73/56.58–19.51/56.01 cm. The striking feature is that both in JNV and KV boys, between 5th and 95th percentiles of each group, the data ranges

has increased along with the advancement of age.

The percentile value of Pull-up scores of JNV and KV boys showed steady rise from one age to the next but not uniform in all ages and also the upper limit (95th percentile) of age group 10+ year does not overlap with the lower limit (5th percentile) of age group 18+ years.

The comparison between 5th and 95th percentile of all ages of JNV and KV boys shows that most of the children scored between 18.00 to 42.90 and 13.10 to 36.0 respectively. The striking feature is that both in JNV and KV boys, between 5th and 95th percentiles of each group, the data ranges has increased along with the advancement of age.

Table 4: Correlation between anthropometric and physical variables among JNV boys

	Weight	Biacromial Diameter	Bicristal Diameter	Upper arm circumference	Calf circumference	Vertical Jump	Pull up
Height	.80**	.63**	.63**	.70**	.71**	.68**	.32**
Weight		.62**	.63**	.76**	.72**	.64**	.27**
Biacromial Diameter			.48**	.55**	.51**	.48**	.26**
Bicristal Diameter				.61**	.66**	.58**	.25**
Upper arm circumference					.74**	.60**	.27**
Calf circumference						.60**	.30**
Vertical Jump							.40**

*p <0.05, ** p<0.01

Table 5: Correlation between anthropometric and physical variables among KV boys

	Weight	Biacromial Diameter	Bicristal Diameter	Upper arm circumference	Calf circumference	Vertical Jump	Pull up
Height	.77**	.78**	.51**	.50**	.57**	.70**	.54**
Weight		.79**	.57**	.66**	.73**	.56**	.43**
Biacromial Diameter			.52**	.52**	.59**	.59**	.45**
Bicristal Diameter				.45**	.50**	.34**	.28**
Upper arm circumference					.82**	.39**	.32**
Calf circumference						.45**	.33**
Vertical Jump							.57**

*p <0.05, ** p<0.01

Table 6: Comparison of body weight of JNV boys and KV boys with other Indian studies

Age (yrs.)	A Present study		B Inter national Studies (NCHS)		t-test (A & B)	C Indian studies (ICMR, 1972)		t-test (A and C)
	Sample	Mean	Sample	Mean		Sample	Mean	
JNV Boys								
10+	50	33.28	334	35.4	2.14*	961	23.6	10.08**
11+	50	34.02	324	39.8	5.16**	1012	26.2	7.90**
12+	50	34.14	349	44.2	10.06**	990	28.6	6.76**
13+	50	37.26	348	49.6	6.67**	930	32.4	2.78**
14+	50	40.08	359	56.9	11.36**	941	35.9	3.05**
15+	50	45.31	359	61.0	6.03**	904	40.3	2.41*
16+	50	48.07	349	66.8	10.95**	918	43.9	2.61**
17+	50	51.11	339	67.5	8.15**	785	46.5	2.40**
18+	50	53.08	1758	73.9	15.65**	724	47.9	3.95**
				KV Boys				
10+	50	33.83	334	35.4	1.41	961	23.6	9.47**
11+	50	34.71	324	39.8	4.59**	1012	26.2	8.60**
12+	50	40.87	349	44.2	2.33*	990	28.6	9.37**
13+	50	45.38	348	49.6	2.74**	930	32.4	9.08**
14+	50	45.97	359	56.9	9.73**	941	35.9	9.50**
15+	50	50.87	359	61.0	8.14**	904	40.3	8.52**
16+	50	54.52	349	66.8	7.91**	918	43.9	7.18**
17+	50	55.32	339	67.5	9.37**	785	46.5	7.67**
18+	50	55.72	1758	73.9	15.94**	724	47.9	6.92**

*p <0.05, ** p<0.01

Table 7: Comparison of stature of JNV and KV boys with other Indian studies

Age (yrs.)	A Present study		B Inter National Studies(NCHS)		t-test (A & B)	C Indian studies (ICMR, 1972)		t-test (A & C)
	Sample	Mean	Sample	Mean		Sample	Mean	
JNV Boys								
10+	50	139.18	334	140.9	1.64	961	128.6	10.58**
11+	50	142.10	324	146.4	6.64**	1012	133.5	7.54**
12+	50	146.96	349	152.2	4.48**	990	138.3	8.25**
13+	50	150.58	350	159.2	7.63**	930	144.6	5.64**
14+	50	156.21	359	167.1	8.93**	941	150.2	5.00**
15+	50	161.64	359	170.8	9.64**	904	156.5	15.54**
16+	50	165.36	349	174.5	10.39**	918	160.1	6.19**
17+	50	169.04	338	175.5	6.94**	785	162.6	7.16**
18+	50	170.08	1755	176.6	6.04**	724	163.8	5.66**
KV Boys								
10+	50	141.00	334	140.9	0.10	961	128.6	12.92**
11+	50	144.04	324	146.4	1.74	1012	133.5	7.98**
12+	50	150.15	349	152.2	1.69	990	138.3	10.22**
13+	50	155.89	350	159.2	3.25**	930	144.6	11.76**
14+	50	160.68	359	167.1	5.06**	941	150.2	8.38**
15+	50	163.91	359	170.8	5.99**	904	156.5	6.56**
16+	50	167.02	349	174.5	7.33**	918	160.1	6.99**
17+	50	170.92	338	175.5	5.87**	785	162.6	11.09**
18+	50	172.80	1755	176.6	5.35**	724	163.8	12.00**

*p < 0.05, ** p < 0.01

The stature and weight of the present study were compared with *NCHS (1990)* & *ICMR (1972)* data. The weight scores of JNV & KV boys were lower than NCHS at all the ages and the difference is statistically significant. When compared with National standard (*ICMR, 1972*) data on weight and stature were significantly lower than the boys of present study.

Discussion

Analysis of various body measures and nature of the distance curves reveals that the mean values of the different body measurements were representing more or less increasing trend with advancement of age. The rate of increase was however, not uniform in all the age groups. Further, it was noted from the distance curves that up to the 11+ years of age, KV boys remain at a higher level than JNV boys for most of the measures.

It was also observed that most of the body measure show age group difference which extended between 11+

to 15+ years in JNV boys and 11+ to 14+ years in KV boys which suggests that adolescent period last for about two to three years. The age group difference at many age levels was close to “HPV” for various body measurements indicating a high degree of multimodality growth spurt.

The growth gradient values of various measures revealed that more than 90 percent of total growth took place before 13+ years of age. The KV boys were found to have significantly higher values for body weight, stature, biacromial and biiliocrystal diameter and upper arm and calf circumference measurements. It was also observed that the scores of physical fitness test i.e. vertical jump and pull ups test were higher in JNV boys as compared to KV boys.

From the percentile values it can be concluded that the growth pattern of JNV and KV boys was faster than the all Indian children but slower than NCHS. There may be several socio-cultural and environmental factors associated with this

phenomenon. The factors responsible for the same have to be identified and proper intervention strategies are to be evolved in future.

References

- Bailey, K.V. 1970. A study of human growth in the framework of applied nutrition and public health nutrition programmes in the Western Pacific region. *Monogr. Soc. Res. Child Develop.*, **35**: 40-48.
- Banik, N.D., Nayar, S., Krishna, R. and Raj, L. 1972. The effect of nutrition on growth of pre-school children in different communities in Delhi. *Indian Pediatrics*, **9**: 460-466.
- Baumgartner, T.A., Jackson, A.S. 1995. *Measurement for Evaluation in Physical Education and exercise science*, 5th Ed., Brown & Benchmark Publication.
- Bodzsar, E.B. 1999. Socio-economic factors and body composition. *International J. of Anthr.*, **14(2)**: 171-180.
- Chang, K.S.F. 1969. Growth and development of Chinese children and youth in Hong Kong. University of Hong Kong, Hong Kong.
- Cook, J. Altman, D.G. Moore D.M.C., Topp, S.G. and Elliot, A. 1973. A survey of the nutritional status of school children relation between nutrient intake and socio-economic factors. *Br. J. Prev. Soc. Med.*, **27**: 91.
- Eveleth, P.B. and Tanner, J.M. 1976. *World wide variation in human growth*. Cambridge University Press, Cambridge.
- Garg, S.K. 1978. The physical growth of boys from the urban area of Chandigarh. *Anthrop.*, **22**: 1-2.
- Hiernaux, J. 1964. Weight/height relationship during growth in African and Europeans. *Hum. Biol.*, **36**: 273.
- Hiernaux, J. 1968. Bodily shape differentiation of ethnic groups and of the sex through growth. *Hum. Biol.*, **40**: 44.
- ICMR 1972. Growth and physical development of Indian infants and children, *Tech. Rep. Ser. No. 15*, New Delhi.
- Johnston, F.E., Roche, A.F., and Susanne, C. 1980. *Human physical growth and Maturation: Methodologies and factors*, New York: Plenum Press.
- Lindgreen, G. 1976. Height, weight and menarche in Swedish urban school children in relation of socioeconomic and regional factors. *Annals of Human Biology*, **3**: 501-528.
- Malcolm, L.A. 1974. Ecological factors relating to child growth and nutritional status. In: *Nutrition and Malnutrition*. Ed. Roche, A.F., Falkner, F. New York: Plenum Press: 329-352.
- Miller, F.J.W., Billewicz, W.Z. and Thompson, A.M. 1972. Growth from to birth adult life of 442 New Castle Upon Tyne children, *British Journal of Preventive and Social Medicine*, **26**: 224-230.
- Mitra, M. and Singhrol, C.S. 1982. A cross-sectional study of growth of Chhattisgarhi girls aged 6 to 16 years. In: *Human Biology – Recent advance* Ed. Sidhu et al., New Delhi: Today and Tomorrow's Printers and Publishers, 1: 29-46.
- Mayuri, K., Madhavilatha, K. 2000. Physical development of rural adolescents: A cross sectional study in Andhra Pradesh. *Man in India*, **80(3 & 4)**: 337-343.
- Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K. and Bent, D.H. 1975. SPSS: Statistical Package for Social Science, New York: Mc Graw-Hill.
- Sharma, J.C. and Kaul, S. 1970. Socio-economic differences in the growth of Punjabi boys. *Anthropologist*, **17**: 43-55.
- Singh, S.P., Malhotra, P. 1989. *Kinanthropometry*. Patiala: Lunar publication, Patiala.
- Singh, S.P., Malhotra P. 1991. Effect of social class and urbanization on physical growth of Patiala children. In: *New Horions in Human Biology* Ed. Bansal I.J.S. et al., 337-346. New Delhi: Today and Tomorrow's Printers and Publishers, New Delhi.
- Sing, L.D., Sing, T.S. 2000. Physical growth among the affluent and non-affluent Meitei boys of Manipur. *Man in India*, **80(3 & 4)**: 295-307.
- Susanne, C. 1980. Socioeconomic differences in growth patterns. In: *Human Physical Growth and Maturation*. Ed. Johnston, F.E., Roche, A.F., Susanne C. New York, London: Plenum Press, 329-338.
- Tanner, J.M. 1961. Education and physical growth. In: *Implications of the study of children's growth for educational theory and practice*. University Press, London.
- Udani, P.M. 1963. Physical growth of children in different socio-economic groups in Bombay. *Ind. J. Child. Health.*, **12**: 593.
- Whitlaw, A.G.L. 1971. The association of social class and sibling number with skin folds thickness in London school boys. *Human Biol.*, **43**: 414.
- Weiner, J.S., Lourie J.A. 1969. *Human Biology, a guide to field methods*, Abingdon, Berks, Great Britain.