

The Growth Progression in Linear Body Measures among the Jeunkuruba, Kadukuruba and Yerava Tribal Boys of Karnataka

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Abstract

The present study has been carried out to analyse population wise growth progression in linear body measures among the Jeunkuruba, Kadukuruba and Yerava (boys aged 10- 16 years) Scheduled tribes of Karnataka. A total of 475 subjects were measured cross sectionally for 12 linear body measurements following the standard measurement techniques.

Analysis results of the present study exhibits the prevalence of Cephalo-Caudal and Caudo-Cephalic sequence of maturation with in the components of extremities among Jeunkuruba and Kadukuruba boys, but in case of Yerava boys shows only Cephalo-Caudal sequence of maturation through out the age range studied. When taken account of within the subsegments of the upper extremities Jeunkuruba boys at all ages show only Caudo-Cephalic sequence of maturation, where as Kadukuruba boys show Caudo-Cephalic as well as mixed gradients of maturational sequence, but in case of Yerava boys shows Cephalo-Caudal sequence besides mixed gradients of maturational sequence. And in the sub segments of the lower extremities Jeunkuruba show Caudo-Cephalic sequence of growth, where as among Kadukuruba and Yerava exhibit Caudo-Cephalic as well as mixed gradients of maturational sequence through out the age range studied.

Keywords: Cephalo-Caudal; Caudo-Cephalic; Mixed Gradients; Lower Extremities; Upper Extremities; Proximodistally; Dolicocephalic Mesorrhinae; Chamaerhinae; Euryprosop; Mesoprosop and Leptoprosop.

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INTRODUCTION

The growth is one aspect of the many phenomena that together comprise development. It may also be defined as an increase in the structurally and functionally complete units that are acquired in the course of development, whether they be sub cellular elements, cells within an organism, organs

within a system or system within an organism.

The Human growth proceeds in variable rate through out the fetal period, but follows the same general S-shaped curve characteristics of post natal growth and typical of many species. Growth in living organisms does not proceed at the same rate of in all direction at once. Each part of the growing organisms has its own rate of growth which proceeds in an orderly and precise manner

until the final morphologic characteristics specific to the individual are achieved. The difference in the rate of growth at discrete stages of development, both within the species and among species, is a contributing factor to the polymorphism of the population. In man embryonic and fetal growth proceeds cephalo-caudally that is, the head matures before the neck, neck before the chest, chest before the pelvis and so forth and proximodistally arm growth precedes leg length and the upper arm grows before the lower arm which grows before the hand so on. These changes are also true for postnatal growth (Timira's et al. 1972).

The studies of Davenport (1932), Meredith (1939), Tanner (1962), Marshall (1977), Nath (1972, 1979, 1982, 1984, 1987) Nath and Chacko (1988), Singh & Sidhu (1981) demonstrated that the maturity gradient is said operate in leg running from an advanced maturity distally to retarded maturity proximally (c.f. Nath et al. 1993). The Nath et al. (1993) also stated the existence of cephalo-caudal as well as caudo-cephalic direction of maturity within the constituent components of stature and the extremities.

The comparative growth studies with regard to progression of growth in different parts of body at particular age group with different population are found to be very negligible when compared to study on growth characteristics of children (Dharma Rao et al. 1997, Ratanwali et al. 1997, Reddy et al. 1997, Sharma 2001 & Rajan Gaur et al. 2003) also in Karnataka especially on tribal population only head and face Anthropometric characters are explained. Hence, keeping in all these concepts the present study is an attempt to assess the progression of maturational sequence in linear body measures of tribal population such as Jenukuruba, Kadukuruba and Yerava boys of aged 10-16 Years.

The Jenukuruba, Kadukuruba and Yerava scheduled tribe are found in Kodagu and Mysore districts of Karnataka. According to 1981 census Jenukuruba population is 34,746, Kadukuruba 2,09,677 and Yerava 12,111. They inhabit hilly areas having moderate climate, low humidity, thin forest and medium rain fall. The Jeunkuruba are food gatherers and honey collection, they are endogamous group. The Jenukuruba women do not inherit the property of parents, and they participate in agriculture, cattle rearing and collection of herbs, roots and firewood and contribute to the family income. The Kadukuruba also distributed in Hassan and Dakshina Kannada district. They speak mixture of Tamil, Malayalam and Kannada which they call Kadukuruba language. They are expert

in making bamboo baskets and they also work as casual laborers for the forest and horticulture department. Inter community marriage is prohibited and there is no intermarriage between them and the Jenukuruba. The Kadu Kuruba women do not get any share in the parental property. They participate in domestic duties, go to the forest to collect edible leaves and roots and collect fuel and fodder. The Yerava are distributed in the border of the three southern states viz, Karnataka, Kerala and Tamil Nadu. In Karnataka they are concentrated in Virajpet, Somawarpet and Madakeri taluks of Kodagu district. They collect and eat roots and tubers that are available in the forest, Endogamy is the marriage rule. Traditionally Yerava are agricultural labourers or agriculturist and they also work in the forest department as casual labourers. They collect forest produce for contractors and earn money. The yerava women earn and contribute towards the family income by doing agricultural wage labour.

In anthropometric measurements the Jenukuruba population are found to be 'Short' as well as 'lower medium' in stature having 'Low' Sitting height vertex with 'very low' to 'Medium' facial height exhibiting 'Below medium' nasal height and 'above medium' nasal breadth with 'narrow' bizygomatic breadth 'Medium' head length and 'very narrow' head breadth. And they are characterized by 'Dolicocephalic head' having 'Mesorrhinae' and 'Chamaerhinae' nose with 'Mesen' and 'Lepten' type of face, together tendency to show 'Very broad' Jugofronta, possessing 'Normal' chest form of robusticity index (Keshava, 2000).

The Kadukuruba are 'Short' statured, 'Dolicocephalic' head and 'Mesorrhine' nose. Total facial Index is of higher mesoprosop to leptoprosop and upper facial index is of 'euryen' and 'mesen' classes (Sirajuddin et al. 1993).

The Yerava are 'Medium' as well as 'Below medium' statured, 'Dolicocephalic' head 'Mesorrhine' nose and face is of predominantly 'Euryprosop' and 'euryen' category (Singh 2003).

The present study aims at assessing category or population wise growth sequence in linear body measures among the population, the Jenukuruba, Kadukuruba and Yerava boys.

MATERIAL AND METHODS

The present study comprises data regarding growth dimension, collected from 160 Jenukuruba, 140 Kadukuruba and 175 Yerava boys ranging in age

from 10 to 16 years. All the subjects were measured cross sectionally for the following dimensions such as stature, sitting height, trunk height, head & neck length, upper extremity length, upper arm length, forearm length, hand length, lower extremity length, thigh length, leg length and foot length as per standard techniques mentioned in Singh & Bhasin (1989) & Fedric Jones (1971). Thigh length has been derived by subtracting height tibiale from height of iliospinale. The remaining measurements have been taken directly. The ages of all subjects were collected from the school register, all subjects were classed into mean age groups like 10.00, 11.00 and so on up to 16.00 years, for example age group 10 includes all subjects who attained the age of 9 years and 6 months, thereby providing the mean age as 10 years.

Statistical Analysis

“Growth Velocity” is increment per unit time of a variable is calculated by subtracting its mean value at lower age group (Quoted in Dharma Rao et al. 1997).

Velocity (V) = (A+1) -X.A. (X (A+1); Mean value of growth variable & X.A; Mean value of Lower age group).

“Growth Gradient” or attained size (the size of each dimension at a given age expressed in terms of percentage of its mature or final stage) was calculated for each of the 12 measurements by the formula (Quoted in Surinder nath et al. 1993).

Growth gradient or Attained size = X.A/M * 100.

Where XA is the mean value of measurements at age ‘A’ and ‘M’ is it’s mean value in the highest age group i.e. 16 years.

RESULTS AND DISCUSSION

The age wise Mean values, Standard deviation and the Velocity of Growth among Jenukuruba, Kadukuruba and Yerava boys aged 10 to 16 years are tabulated in the table 1 to 3. As the advancement of age, all the mean body measure exhibits are increasing trend for studied population groups. The annual velocity of growth maximum increase is variable in all three population groups for 12 linear body measures. The maximum annual increase of velocity of growth is found among Jenukuruba at 12 & 13 Years for hand length, at 13 & 14 years for stature, head & neck length, forearm length and foot length, at 14 & 15 years for sitting height, trunk height & leg length and at 15 & 16 years for upper extremity length, upper arm length, lower extremity length and thigh length.

Among Kadukuruba the maximum annual increase of velocity growth is found at 11 & 12 years for forearm length, at 12 & 13 Years for head & neck length, lower extremity length and foot length, at 13 & 14 years for stature, sitting height, trunk height, upper extremity length and thigh length, at 14 & 15 years for hand length and at 15 & 16 years for upper arm length and leg length.

TABLE.1: Statistical Constants of Linear Measurements of Jenukuruba Boys

Age	Constants	ST	SH	TH	HN	UEL	UAL	FAL	HL	LEL	TL	LL	FL
10	Mean	124.6	62.39	29.72	23.4	55.74	22.78	18.73	14.23	71.24	36.28	30.6	19.5
	SD	2.35	1.27	1.76	1.27	1.71	0.89	0.73	0.69	2.06	1.51	1.47	0.62
	VG	-	-	-	-	-	-	-	-	-	-	-	-
	GG	76.97	78.47	77.72	82.86	74.58	72.93	73.76	78.47	73.75	72.95	74.87	79.85
11	Mean	129.81	64.93	31.04	24.72	57.46	23.7	19.38	14.38	74.06	37.13	32.16	20.43
	SD	2.14	1.77	1.35	1.15	2.03	1.22	1.02	1.13	2.15	1.59	1.32	0.63
	VG	5.21	2.54	1.32	1.32	1.72	0.92	0.65	0.15	2.82	0.85	1.56	0.93
	GG	80.19	81.67	81.17	87.52	76.88	75.86	76.31	79.32	76.67	74.65	78.68	83.64
12	Mean	132.1	66.12	31.34	24.84	59.65	24.5	20.45	14.7	76.02	38.12	32.95	20.83
	SD	1.66	1.92	1.12	0.85	1.91	1.26	1.03	1.23	1.82	1.46	1.23	0.69
	VG	2.28	1.18	0.3	0.11	2.19	0.81	1.07	0.32	1.96	0.99	0.78	0.4

	GG	81.6	83.16	81.96	87.93	79.81	78.44	80.5	81.06	78.7	76.64	80.6	85.28
13	Mean	137.2	68.18	32.21	25.57	62	25.29	20.9	15.79	79.91	40.13	34.19	21.73
	SD	2.39	2.62	1.48	1.31	2.05	1.16	1.23	0.97	2.21	1.78	1.35	0.9
	VG	5.1	2.06	0.87	0.74	2.36	0.79	0.45	1.09	3.9	2.01	1.24	0.91
	GG	84.75	85.76	84.24	90.54	82.96	80.97	82.28	87.1	82.73	80.68	83.63	89
14	Mean	147.65	72.84	34.06	27.28	66.62	27.1	22.65	16.83	84.86	42.72	36.44	23.35
	SD	2.27	2.27	1.66	1.61	2.32	1.14	1.2	1.37	2.22	1.26	1.53	1.43
	VG	10.45	4.66	1.85	1.7	4.62	1.8	1.75	1.04	4.95	2.59	2.25	1.61
	GG	91.21	91.62	89.08	96.58	89.14	86.74	89.17	92.82	87.86	85.89	89.14	95.6
15	Mean	155.36	77.55	36.97	27.66	69.47	28.48	23.85	17.12	90.48	45.44	39.36	24.42
	SD	2.06	1.53	2.1	1.3	1.9	1.06	1.11	1.04	2.05	1.6	1.53	0.88
	VG	7.71	4.71	2.9	0.38	2.85	1.38	1.2	0.29	5.61	2.72	2.92	1.07
	GG	95.97	97.54	96.67	97.93	92.95	91.18	93.91	94.44	93.67	91.36	96.29	99.98
16	Mean	161.88	79.5	38.24	28.24	74.74	31.24	25.4	18.13	96.59	49.74	40.88	24.42
	SD	2.34	2.48	1.42	0.83	1.19	0.82	0.85	0.83	2.2	1.3	1.73	1.58
	VG	6.52	1.96	1.28	0.58	5.27	2.76	1.55	1.01	6.11	4.3	1.52	0
	GG	100	100	100	100	100	100	100	100	100	100	100	100

Table 2: Statistical Constants of Linear Measurements of Kadukurba Boys

Age	Constants	ST	SH	TH	HN	UEL	UAL	FAL	HL	LEL	TL	LL	FL
10	Mean	121.09	63.29	24.46	29.11	53.18	22.44	17.75	13	67.17	33.28	29.12	19.1
	SD	1.76	1.03	0.74	1.37	1.07	0.73	0.5	0.53	2.12	1.57	1.34	0.62
	VG	-	-	-	-	-	-	-	-	-	-	-	-
	GG	74.99	76.79	81.49	76.44	73.73	74.6	73	73.11	72.55	69.27	73.26	79.8
11	Mean	126.59	65.06	24.53	30.6	55.36	23.13	18.44	13.79	71.61	36.07	31.02	19.82
	SD	1.3	1.63	0.76	1.69	1.62	1.06	1.11	0.56	1.2	1.09	0.84	0.55
	VG	5.5	1.77	0.07	1.49	2.18	0.69	0.69	0.79	4.44	2.79	1.9	0.72
	GG	78.39	78.94	81.72	80.36	76.74	76.89	75.84	77.58	77.34	75.09	78.03	82.8
12	Mean	132.52	67.46	24.56	31.64	59.29	24.27	20.19	14.83	76.37	38.62	32.66	20.84
	SD	1.66	1.59	1.13	1.3	1.52	1.04	0.62	1	1.35	1	1.23	0.75
	VG	5.94	2.4	0.03	1.04	3.93	1.14	1.75	1.04	4.76	2.55	1.65	1.02
	GG	82.07	81.85	81.82	83.09	82.19	80.68	83.04	83.43	82.48	80.39	82.16	87.07
13	Mean	140.22	70.91	26.15	32.96	62.55	25.94	21.22	15.5	81.4	41.28	34.76	22.29

	SD	2.16	1.66	1.25	1.99	1.8	0.86	0.76	0.67	2.09	1.69	1.52	0.82
	VG	7.7	3.46	1.6	1.32	3.26	1.67	1.03	0.66	5.03	2.67	2.1	1.46
	GG	86.83	86.05	87.14	86.55	86.71	86.23	87.27	87.17	87.91	85.94	87.45	93.15
14	Mean	149.06	75.32	27.4	36	66.77	27.64	22.64	16.5	86.11	44.63	36.22	22.78
	SD	2.18	2.02	1.14	1.39	1.67	0.8	0.74	0.7	2.21	1.29	1.34	0.73
	VG	8.84	4.41	1.25	3.04	4.23	1.7	1.42	1	4.71	3.35	1.45	0.49
	GG	92.31	91.39	91.3	94.54	92.57	91.9	93.09	92.8	93	92.91	91.11	95.19
15	Mean	155.19	78.8	28.64	37.63	69.23	28.19	23.36	17.76	89.4	46.38	37.56	22.96
	SD	1.88	1.56	1.45	1.85	2.15	1.01	1	0.72	2.12	1.7	1.89	0.87
	VG	6.14	3.49	1.24	1.62	2.46	0.55	0.72	1.26	3.3	1.75	1.35	0.18
	GG	96.1	95.62	95.43	98.81	95.98	93.73	96.05	99.89	96.55	96.55	94.49	95.95
16	Mean	161.48	82.41	30.01	38.08	72.13	30.08	24.32	17.78	92.59	48.04	39.75	23.93
	SD	1.95	2.09	1.33	2.2	1.71	1.08	0.5	0.77	1.59	1.35	1.96	0.59
	VG	6.29	3.61	1.37	0.46	2.9	1.89	0.96	0.02	3.19	1.66	2.19	0.97
	GG	100	100	100	100	100	100	100	100	100	100	100	100

ST: Stature, SH: Sitting height, HN: Head and Neck length, TH: Trunk height, UEL: Upper extremity length, FAL: Fore arm length, HL: Hand length
 LEL: Lower extremity length, TL: Thigh length, LL: Lower leg length, FL: Foot length
 SD: Standard deviation, VG: Velocity of Growth, GG: Growth Gradient

Table 3: Statistical Constants of Linear Measurements of Yerava Boys

Age	Constants	ST	SH	TH	HN	UEL	UAL	FAL	HL	LEL	TL	LL	FL
10	Mean	124.04	61.98	24.09	30.62	54.46	22.54	18.1	13.81	69.79	35.3	29.74	19.08
	SD	2.47	2.28	1.48	1.4	2.17	0.85	1.09	1.06	2.48	1.78	1.57	0.61
	VG	-	-	-	-	-	-	-	-	-	-	-	-
	GG	75.69	75.38	79.09	75.67	74.47	76.63	74.99	71.48	73.08	73.01	71.94	77.16
11	Mean	129.99	65.08	24.18	31.4	59.38	24.15	20.2	15.03	75.61	38.12	32.61	20.33
	SD	2.12	1.72	1.51	1.83	2.42	1.28	1	1.2	2.01	1.56	1.68	0.76
	VG	5.95	3.1	0.1	0.78	4.92	1.61	2.1	1.22	5.82	2.82	2.86	1.25
	GG	79.32	79.15	79.41	77.6	81.2	82.09	83.68	77.77	79.17	78.83	78.87	82.22
12	Mean	134.3	68.27	25.32	31.57	59.7	24.26	20.28	15.16	77.3	38.23	33.9	20.82
	SD	2.41	2.07	1.84	1.4	1.7	0.89	0.92	1.11	2.48	1.25	1.8	1.14
	VG	4.3	3.18	1.13	0.16	0.32	0.11	0.09	0.13	1.69	0.11	1.3	0.48
	GG	81.94	83.02	83.12	78.01	81.63	82.47	84.04	78.43	80.94	79.06	82	84.18
13	Mean	142.56	70.75	26.06	33.48	64.24	25.52	22.01	16.71	83.27	41.46	36.34	22.16
	SD	1.86	1.88	1.22	1.68	2.21	0.88	0.99	1.31	2.22	1.44	1.79	0.97

	VG	8.26	2.48	0.74	1.91	4.54	1.26	1.72	1.56	5.97	3.22	2.43	1.35
	GG	86.99	86.03	85.57	82.72	87.85	86.76	91.18	86.48	87.19	85.73	87.89	89.63
14	Mean	151.23	75.87	27.1	36.79	68.27	27.12	23.3	17.84	87.94	43.52	38.78	23.45
	SD	2.07	1.9	1.25	2.09	2.11	1.24	0.87	0.91	2.36	1.93	1.78	0.66
	VG	8.67	5.12	1.04	3.31	4.02	1.6	1.3	1.13	4.67	2.06	2.44	1.28
	GG	92.28	92.26	88.99	90.91	93.35	92.18	96.55	92.34	92.08	90	93.79	94.82
15	Mean	156.11	78.77	28.86	38.39	69.69	28.17	23.42	18.17	90.54	45.1	39.71	23.46
	SD	2.37	2.39	1.06	2.01	2.08	0.92	0.67	1.42	2.21	1.77	1.79	0.81
	VG	4.88	2.9	1.76	1.6	1.42	1.05	0.12	0.32	2.6	1.58	0.94	0.02
	GG	95.26	95.79	94.76	94.87	95.29	95.74	97.03	94.02	94.81	93.27	96.05	94.89
16	Mean	163.89	82.23	30.46	40.47	73.13	29.42	24.14	19.32	95.5	48.36	41.34	24.73
	SD	2.15	2.39	1.42	1.64	2.05	1.37	0.99	0.85	2.17	2.44	1.55	1.07
	VG	7.78	3.46	1.6	2.08	3.44	1.25	0.72	1.16	4.96	3.26	1.63	1.26
	GG	100	100	100	100	100	100	100	100	100	100	100	100

ST: Stature, SH: Sitting height, HN: Head and Neck length, TH: Trunk height, UEL: Upper extremity length, FAL: Fore arm length, HL: Hand length
LEL: Lower extremity length, TL: Thigh length, LL: Lower leg length, FL: Foot length

SD: Standard deviation, VG: Velocity of Growth, GG: Growth Gradient

The Yerava boys record the maximum annual increase of velocity of growth at 10 & 11 years for upper extremity length, upper arm length, forearm length and leg length, at 12 & 13 years for lower extremity length & foot length, at 13 & 14 Years for stature, sitting height, trunk height & hand length, at 14 & 15 years for head & neck length and at 15 & 16 years for thigh length.

Growth Progressional sequence in different body segments

Segmental growth progression among Jenukuruba, Kadukuruba and Yerava boys have been evaluated through the growth gradients. The percentage of growth attained at each age from 10 to 16 years among said population, relative to their final size taken at 16 years for assessing the extent of growth progression achieved by the constituent components of the stature, sitting height, Upper and Lower extremity length. The maturational sequence is evolved on the basis of advanced or retarded maturity of the concerned body segments in terms of percentage of growth achieved at each age level as shown in the table 1 to 3.

Stature is marked indicator of growth. It has been observed that, the increase of sitting height and lower extremity length leads to the increase of

stature similarly within the segments, increase of sitting height led by increases of trunk height and head & neck length. And increase of lower extremity length depends on its sub segments thigh length and calf length increments. In the present study the growth percentage of Jenukuruba at 10 to 16 years sitting height greater maturity value than the lower extremity length among the segments of sitting height, where head & neck length greater maturity value than trunk height. Where as Kadukuruba at the age of 10 & 11 years shows sitting height, greater maturity value than the lower extremity length by the greater maturity value of head & neck length over trunk height, but at the age 12, 13, 14 & 15 years the lower extremity length higher the maturity value than the sitting height due to leg length higher maturity value over thigh length at 12 & 13 years and at 14 & 15 years the thigh length higher maturity value than the leg length. In case of Yerava boys at 10, 12, 14, & 15 years sitting height greater the maturity value than the lower extremity length by the higher the maturity value of head & neck length over trunk height at 10 & 12 Years but at 14 & 15 years' trunk height have greater maturity value over head & neck length. At 11 & 13 years' lower extremity length have greater maturity value than the sitting height by the greater maturity value of leg length over thigh length.

On comparing the two extremities i.e. the upper and the lower extremities, it is observed that the upper extremities is ahead in maturation over the Lower one from 10 to 14 years among Jenukuruba, thus exhibiting cephalo-caudal sequence of maturation, this trend is reversed to caudo-cephalic at 15 years. Whereas Kadukuruba boys shows at 10 years' age, Upper extremity is ahead in maturation over the lower extremity by the cephalo-caudal sequence of maturation but it reversed to caudo-cephalic sequence of growth from 11 to 15 years. In case of Yerava boys exhibits quite different to the aforesaid two populations by the upper extremity is ahead in maturation over the lower extremity through out the age range studied i.e, 10 to 16 years by the cephalo-caudal sequence of maturation.

The developmental sequence with in the constituent components of the upper and the lower extremities is much more complex than that of these two extremities. The three components of the upper extremity (Arm segment) i.e. upper arm, fore arm and hand length reveals a highly complex pattern among Kadukuruba and Yerava but Jeunkuruba at all ages shows hand length advanced over fore arm length, forearm length advanced over upper arm length i.e. Caudo-cephalic growth. Whereas Kadukuruba boys shows that, at ages 12 & 15 years' hand length advanced over forearm length, forearm length advanced over upper arm length by the Caudo-cephalic sequation of maturation but at 10 years shows upper arm hand forearm length gradients, at 11 years shows hand upper arm Fore arm length gradient and at 13 & 14 years shows forearm hand upperarm length gradients. In case of Yerava boys at the age of 10 years' upper arm length advanced over forearm length, forearm length advanced over hand length i.e. cephalo-caudal sequence of maturation observed, but at 11, 12, 13, and 15 years' forearm upper arm hand length gradients and at 14 years forearm hand upperarm length gradients have been observed.

The developmental progression in the constituent components of the lower extremities i.e. thigh length, leg length and foot length among Jenukuruba at all ages, foot length advanced over leg length, leg length advanced over thigh length i.e. Caudo-cephalic sequence of growth operated throughout the ages from 10 to 16 years. Whereas among kadukuruba revels Caudo-cephalic growth i.e. foot length advanced over leg length, leg length advanced over thigh length at 10, 11, 12 & 13 years but at 14 years' foot thigh leg length gradients and at 15 years' thigh foot leg length gradients have been observed. In case of yerava boys at the age of 10 Years exhibits foot thigh leg length gradients and

at 15 years' leg foot thigh length gradients but at 11, 12, 13 & 14 years Caudo-cephalic growth have been observed i.e. foot length advanced over leg length, leg length advanced over thigh length.

SUMMARY AND CONCLUSION

From the present study, we may be inferred by the above analysis as the prevalence of Cephalo-Caudal and Caudo-Cephalic sequence of maturation with in the components of extremities among Jenukuruba and Kadukuruba boys, but in case of Yerava boys shows only Cephalo-Caudal sequence of maturation through out the age range studied. When taken account of within the sub segments of the upper extremities Jenukuruba boys at all ages show only Caudo-Cephalic sequence of maturation, whereas Kadukuruba boys show Caudo-Cephalic as well as mixed gradients of maturational sequence, but incase of Yerava boys shows Cephalo-Caudal sequence besides mixed gradients of maturational sequence. And in the sub segments of the lower extremities Jenukuruba show Caudo-Cephalic sequence of growth, where as among Kadukuruba and Yerava exhibit Caudo-Cephalic as well as mixed gradients of maturational sequence through out the age range studied.

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