Anthropometrical Data of Urban and Rural Japanese Children

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Abstract For the purposes of anthropometrical reference, two groups of Japanese school children, aged 7 to 12, were measured: (1) an urban Tokyo group of 133 boys and 139 girls in 1985, and (2) a rural Zinego (Akita Prefecture) group of 117 boys and 136 girls in 1987. Means and standard deviations of 20 measurements and 17 indices of the Tokyo group, and of 14 measurements and 15 indices of the Zinego group and of the Tokyo and Zinego combined group are presented. Distribution normality for all measurements and indices was checked in each age group of each sex. Also, regional difference and sex difference were examined using the *t*-test and nonparametric test, because of non-normal distribution in many measurements arising from insufficient number of subjects. A difference of growth pattern between the Tokyo and Zinego groups in the same sex was suggested.

Key Words: children, anthropometry, Japan, urban Tokyo, rural Zinego

INTRODUCTION

As one can see in the data book (Eveleth and Tanner, 1990), growth studies in Japan, except of TW2 skeletal maturation, are not numerous. Secular trends in stature have been discussed based upon the annual reports of the Ministry of Education, Science, and Culture of Japan, in which stature, sitting height, chest circumference and body weight are presented. These measurements have been surveyed since 1900, except 1940 to 1947 (due to World War II), on about 10,000 children in each year from all over the nation, from 6 to 17 years of age (Ministry of Education, Science, and Culture of Japan, 1964–1991). Although these four measurements may be adequate for assessing school children's health, they do not encompass complete anthropological information. Today we need additional measurement data to these in this Ministry report in order to study more detailed secular trends, regional differences inside the country, and differences between Japanese and non-Japanese children. In the literature, we found only one anthropometrical reference of eight measurements on 1,300 Tokyo children, aged 4 to 17, in 1957–

1961 (Yanagizawa *et al.*, 1965). Unfortunately this study is not ideally suited as a standard, because, apart from the age of the data, the right side of the body was adopted for body symmetry measurements, on the one hand, and the age calculation differs from that we use today, on the other hand. In the reports of the Ministry and old Japanese references, children between ages 5 and 5 years and 11 months are designated as age 5, while for us they are age 5.5. This discrepancy compromises our ability to discuss in statistical terms the growth of Japanese children, and we must exercise caution concerning these points when we refer to Japanese data.

Therefore, in this report, we provide anthropometrical data on groups of Japanese children which correspond to international convention of growth study. Moreover, these data have become increasingly difficult to obtain because of changes in social conditions, especially the lack of free time in school schedules in Japan.

SUBJECTS

Two groups of elementary school children were measured: a Tokyo group and a Zinego group. Economic differences between regions and families are very small in Japan, and it is not necessary to take undernutrition into account, at least in the growth of normal children of the present.

(1) Tokyo group

133 boys and 139 girls from urban Tokyo, ages 7 to 12, were measured in November, 1985.

In this group, the children were born and were living in Chiyoda-ku and Taito-ku, while their parents or grandparents were from all parts of the country. Both districts are inside Tokyo in a strict sense; the former is characteristic of the modern civic center area, and the latter of the oldest commercial center, prosperous since the *Edo* period (17th–19th centuries). The majority of the Chiyoda-ku children's fathers were company employees and office workers (70%), while the Taito-ku children's fathers were shop and small domestic factory employees and owners (64%). We do not distinguish between the two groups from Chiyoda and Taito, because the sample number is too small statistically in each district, and economic differences of family occupations are relatively minor in Japan; thus we feel justified in grouping them as a single sample of urban children.

Head length and breadth were reported already in our previous report (Ashizawa, 1988).

(2) Zinego group

117 boys and 136 girls from rural Zinego, ages 7 to 12, were measured in May, 1987. One polydactyl child and one mentally-handicapped child were not included in this group.

Zinego is a village nestled in the hills in Akita Prefecture, in the northwestern part of the main island of Honshu, which is under heavy snow during the winter.

These regions were specified as depopulated areas by the Government. These village people are engaged mainly in rice paddy culture, and fully 40% of the families were farmers. Others were carpenters (9.5%), construction workers (9.9%), and drivers (4%). The relatively high percentages of the last two occupations are probably due to a lime quarry in this region. All the children were born in this and neighboring villages, and a certain family name is distinctly numerous among the villagers. Thus, it is possible to conjecture that the village had been a closed society geographically and genetically, so that consequently a high consanguinity could be presumed until recently. This situation contrasts markedly with that of the Tokyo group.

METHODS

Measurements were obtained following the IBP Anthropometry method (Weiner and Lourie, 1981); namely the left side was selected for symmetrical measurements, and the decimal age was recorded for all children. Thus, the 7-year age group includes children from 6.50 to 7.49 years old, and so on. GPM anthropometer and Holtain skinfold calipers were used. Measurements in the Tokyo children are: stature, suprasternal height, ilioaspin height, upper limb length, biacromial breadth, chest breadth, bicristal breadth, chest depth, chest circumference, waist girth, hip girth, maximum arm girth, maximum thigh girth, minimum leg girth, foot length, foot breadth, foot girth, triceps skinfold thickness, subscapular skinfold thickness, and body weight.

In the Zinego children, suprasternal height, waist girth, hip girth, arm girth, thigh girth and leg girth were not measured.

The skinfolds were transformed into logarithms according to Tanner (1963) to obtain Gaussian distribution: $Z = 100\log_{10}(\text{reading in } 1/10\text{mm} - 18)$.

The following preparations were performed. First, scattergrams of each measurement pair, in each sex of the Tokyo and Zinego groups respectively, were drawn to check for possible mismeasurement. Second, children whose measurement was outside of the mean $\pm 3\text{SD}$ in their own age group in Tokyo or Zinego were excluded from the subjects. Third, statistical analysis was conducted on these final groups that are presented in this report.

In the tables, means and standard deviations of the Tokyo and Zinego combined group are also provided for the further use. This is motivated, because, first, other regions than Tokyo and Zinego can be considered intermediate between the two, and second, the children's number is too meager in each group. And this combined group is possibly useful being referred to genetically different groups of outside Japan.

The SAS program provided by the Computer Center of Tokyo University was applied in this study.

RESULTS

1. Means and standard deviations.

In Table 1, number and mean ages of each age group of children are presented.

Table 1. Number and mean ages of subject children

Age groups	Tokyo				Zinego				Tokyo and Zinego			
	Boys		Girls		Boys		Girls		Boys		Girs	
	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
7	22	7.06	0.27	20	7.07	0.26	22	7.04	0.31	26	7.03	0.25
8	22	8.01	0.31	22	7.89	0.25	19	8.06	0.27	19	8.01	0.30
9	21	9.09	0.24	23	9.05	0.25	13	8.96	0.27	28	8.99	0.27
10	23	10.01	0.30	19	9.87	0.31	18	9.99	0.27	19	9.92	0.23
11	21	11.07	0.27	31	11.04	0.28	28	11.06	0.26	28	10.97	0.23
12	20	12.02	0.25	20	12.01	0.24	11	11.81	0.17	9	11.88	0.14
										31	11.95	0.24
										29	11.97	0.22

Mean sizes and indices are presented in Tables 2 and 3 respectively with standard deviations. As we mention below, some measurements present normal distribution, whereas some do not.

2. Test of normal distribution.

For anthropological measurements, normal distribution is not ensured by a small sample number, but no concrete example has been given in the literature. Therefore, we present the distribution of our series (Table 4a, b and c), which was checked by the Shapiro-Wilk test for a sample size of fewer than 50 in the SAS program.

In the Tokyo group, significant non-normal distribution is concentrated in age 10 in both sexes for size measurements, and in age 8 in boys and age 11 in girls for indices. The normal approximation is confirmed, in all age groups in both sexes, for biacromial breadth, chest depth, thigh girth, minimum leg girth, foot length, foot breadth, iliospinal height/stature, chest depth/chest breadth, foot length/stature, and foot girth/foot length.

In the Zinego group, no clear concentration of non-normal distribution is observed. Normal distribution, for all age groups in both sexes, is confirmed in biacromial breadth, chest breadth, chest circumference, foot length, foot breadth, foot girth, Z-triceps skinfold, iliospinal height/stature, biacromial breadth/stature, chest depth/stature, and foot length/stature.

In the Tokyo and Zinego combined group, measurements and indices of non-normal distribution are much more frequent than in either the Tokyo or Zinego group. This indicates that these two groups are heterogeneous.

3. Equality and inequality of variances.

The probabilities of equality of variances in the boys' and girls' group pairs (Tables 5a, b), and in the Tokyo and Zinego group pairs in the same sex (Table 5c) were checked. In the tables, a minus sign indicates the corresponding measurement was not taken in Zinego, and a cross indicates that the data distribution of either group was not normal. Consequently, the absence of any mark indicates that the pair variances were equal, and an asterisk(s) indicates the inequality of variances in the pair.

4. Sex difference.

Sex difference in each age group in the Tokyo, Zinego, and Tokyo and Zinego combined groups was examined by the *t*-test and nonparametric test (Wilcoxon) (Tables 6a, b, c). In the tables, a cross indicates that the *t*-test was not applied because of non-normal distribution of the corresponding measurement or index in either or both groups in the pair of comparison: 57 out of 222 measurements and indices (26%) in the Tokyo group, 33 out of 174 (19%) in the Zinego group, and 70 out of 174 (40%) in the Tokyo and Zinego combined group. Finally, a G indicates a significantly larger mean in the girls than in the boys.

In the pairs exhibiting significant sex difference, the negative probability is equal or higher in the nonparametric test than in the *t*-test except in one case: the bicristal breadth in age 12 of which $P = 0.0142$ in the *t*-test and $P = 0.0090$ in the nonparametric test. These two probabilities are the same fundamentally, rounding to three decimal places of the probability: $P = 0.01$.

The following observations were obtained from the results of the nonparametric test.

In the Tokyo group, sex difference is small in age 7, but it is detected in many measurements at age 8, and many measurements and indices at age 9. Namely, at age 8 boys' means are always larger, while at age 9 girls' are larger. At age 10, the number of items presenting significant sex difference decreases. This suggests a differential growth spurt according to sex: at age 9 in the girls' group for bicristal breadth, girths and skinfolds particularly, and at age 10 in the boy's group. Hip girth and hip girth/stature in the girls become larger again at age 12 than those in the boys. This suggests a movement towards the adult female physique.

In the Zinego group, the appearance of sex difference is different from that in the Tokyo group: namely, sex difference appears constantly except at age 10, and growth spurt differentiation between boys and girls is less marked. Thicker skinfolds in the Zinego girls from the early age group are detectable, and bicristal breadth in the girls become larger at age 11, one year earlier than in the Tokyo girls.

In the Tokyo and Zinego combined group, a marked differential growth spurt is not clearly observed also, except a larger bicristal breadth and thicker skinfolds in

Table 2. Mean sizes and standard deviations

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Stature (cm)	7	22	117.7	4.55	20	119.4	3.76	22	119.0	3.47	26	119.0	4.26	44	118.3	4.06	46	119.1	4.01
	8	22	125.5	6.23	22	121.9	4.06	19	123.3	5.97	19	124.2	5.41	41	124.5	6.13	41	123.0	4.81
	9	21	129.9	4.70	23	130.1	5.83	13	132.3	4.84	28	131.2	4.77	34	130.9	4.82	51	130.7	5.25
	10	23	135.1	6.35	19	134.2	6.40	18	136.1	4.53	19	134.5	6.23	41	135.6	5.58	38	134.3	6.23
	11	21	141.1	6.18	31	142.4	5.69	28	138.5	5.62	28	141.0	6.18	49	139.6	5.95	59	141.7	5.91
	12	20	147.3	6.71	20	148.1	6.15	11	142.8	6.43	9	147.1	7.97	31	145.7	6.85	29	147.8	6.63
Supra-sternal height (cm)	7	22	92.2	3.96	20	94.1	3.85												
	8	22	99.4	6.04	22	96.1	3.64												
	9	21	103.1	4.09	23	104.0	5.22												
	10	23	107.5	5.48	19	107.2	5.67												
	11	21	113.1	5.51	31	114.6	5.04												
	12	20	118.5	5.86	20	119.0	5.06												
Ilio-spinal height (cm)	7	22	62.9	3.36	20	64.5	2.73	22	63.9	2.39	26	63.8	2.94	44	63.4	2.92	46	64.1	2.84
	8	22	67.5	4.33	22	66.1	3.53	19	66.4	4.21	19	67.0	3.64	41	67.0	4.25	41	66.5	3.57
	9	21	70.7	3.74	23	69.5	3.87	13	72.2	3.41	28	73.1	2.75	34	71.3	3.63	51	71.5	3.73
	10	23	74.2	4.39	19	74.5	4.33	18	75.2	3.11	19	75.0	3.79	41	74.6	3.87	38	74.7	4.02
	11	21	78.7	3.62	31	78.6	3.21	28	77.1	4.03	28	79.1	4.45	49	77.8	3.90	59	78.9	3.82
	12	20	82.2	3.71	20	82.0	4.02	11	79.9	4.85	9	82.6	5.46	31	81.4	4.21	29	82.2	4.42
Upper limb length (cm)	7	22	50.5	2.60	20	50.7	1.93	22	51.3	1.83	26	50.8	2.24	44	50.9	2.26	46	50.8	2.09
	8	22	54.3	3.16	22	52.5	2.07	19	52.8	3.29	19	53.0	2.87	41	53.6	3.27	41	52.7	2.45
	9	21	56.0	2.83	23	55.5	2.49	13	57.9	2.85	28	56.7	2.55	34	56.7	2.95	51	56.2	2.56
	10	23	58.2	3.27	19	57.7	3.10	18	58.7	2.25	19	58.3	3.18	41	58.4	2.84	38	58.0	3.11
	11	21	61.5	2.83	31	61.4	2.55	28	60.4	3.02	28	61.5	3.00	49	60.8	2.96	59	61.4	2.75
	12	20	64.4	2.75	20	64.0	3.15	11	62.2	3.80	9	63.7	3.40	31	63.6	3.28	29	63.9	3.17

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Biacromial breadth (cm)	7	22	25.9	1.19	20	26.7	0.59	22	26.3	1.26	26	26.5	1.17	44	26.1	1.23	46	26.6	0.96
	8	22	28.2	1.81	22	27.0	1.39	19	27.5	1.41	19	27.5	1.49	41	27.8	1.65	41	27.3	1.44
	9	21	28.1	1.21	23	28.8	1.64	13	29.7	1.64	28	28.8	1.17	34	28.7	1.59	51	28.8	1.39
	10	23	29.4	1.53	19	29.4	1.63	18	30.4	1.51	19	29.7	1.75	41	29.8	1.60	38	29.5	1.67
	11	21	32.1	1.80	31	31.3	1.59	28	30.5	1.53	28	31.0	1.70	49	30.7	1.59	59	31.1	1.64
	12	20	32.1	1.80	20	32.4	1.82	11	31.6	1.90	9	31.7	1.51	31	31.9	1.82	29	32.2	1.73
Chest breadth (cm)	7	22	19.4	1.16	20	19.3	1.02	22	19.5	1.16	26	19.3	0.96	44	19.5	1.15	46	19.3	0.98
	8	22	21.3	2.49	22	19.6	1.06	19	19.9	1.22	19	19.7	1.08	41	20.6	2.10	41	19.6	1.06
	9	21	20.7	1.33	23	20.9	1.18	13	22.1	1.95	28	20.6	1.25	34	21.2	1.61	51	20.7	1.21
	10	23	22.7	1.98	19	21.3	1.94	18	22.1	1.47	19	21.5	1.69	41	22.4	1.78	38	21.4	1.80
	11	21	23.4	1.84	31	23.0	1.87	28	22.3	1.54	28	22.5	1.40	49	22.8	1.74	59	22.8	1.66
	12	20	23.6	2.07	20	23.5	1.74	11	22.6	1.80	9	23.5	2.51	31	23.2	2.00	29	23.5	1.96
Bicristal breadth (cm)	7	22	18.6	0.93	20	18.9	0.98	22	18.6	0.96	26	18.8	1.05	44	18.6	0.93	46	18.9	1.01
	8	22	20.2	2.29	22	19.3	1.41	19	19.4	1.10	19	19.5	1.21	41	19.8	1.87	41	19.4	1.31
	9	21	20.3	1.33	23	21.5	1.55	13	21.5	2.48	28	20.7	1.30	34	20.8	1.91	51	21.1	1.46
	10	23	21.9	1.80	19	21.5	2.69	18	21.5	1.68	19	21.5	1.80	41	21.7	1.74	38	21.5	2.26
	11	21	22.9	1.73	31	23.4	2.10	28	21.8	1.54	28	23.2	1.51	49	22.3	1.70	59	23.3	1.83
	12	20	23.6	2.09	20	24.4	1.81	11	22.0	1.57	9	24.3	2.31	31	23.1	2.05	29	24.4	1.94
Chest depth (cm)	7	22	13.4	0.69	20	13.1	0.58	22	13.9	0.79	26	13.2	0.63	44	13.6	0.76	46	13.2	0.60
	8	22	14.6	1.66	22	13.2	0.97	19	14.1	0.98	19	13.3	1.04	41	14.4	1.39	41	13.3	0.99
	9	21	14.2	0.88	23	13.6	0.99	13	14.8	1.22	28	13.9	1.14	34	14.5	1.04	51	13.8	1.07
	10	23	15.2	1.13	19	14.4	1.36	18	14.9	1.28	19	14.2	0.88	41	15.1	1.19	38	14.3	1.13
	11	21	15.8	1.29	31	15.0	1.54	28	15.2	1.19	28	14.6	1.11	49	15.4	1.25	59	14.8	1.36
	12	20	16.0	1.89	20	15.4	1.23	11	15.2	0.95	9	16.1	1.52	31	15.7	1.66	29	15.6	1.33

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Thigh girth (cm)	7	22	35.1	2.86	20	36.7	2.57												
	8	22	39.2	5.32	22	36.9	3.30												
	9	21	37.7	3.07	23	39.7	2.72												
	10	23	41.9	4.08	19	41.7	4.16												
	11	21	44.7	4.87	31	44.0	4.07												
	12	20	44.7	4.49	20	45.3	4.11												
Leg girth (cm)	7	22	16.1	1.14	20	16.2	0.78												
	8	22	17.4	1.64	22	16.6	1.13												
	9	21	17.0	1.01	23	17.3	1.22												
	10	23	18.2	1.22	19	18.2	1.14												
	11	21	19.2	1.21	31	18.9	1.21												
	12	20	19.8	1.85	20	19.3	1.06												
Foot length (cm)	7	22	18.5	1.11	20	18.6	0.78	22	18.3	0.87	26	18.2	0.88	44	18.4	0.99	46	18.4	0.85
	8	22	19.6	1.23	22	19.1	0.81	19	19.1	0.96	19	19.2	1.03	41	19.4	1.12	41	19.1	0.91
	9	21	20.2	1.35	23	20.2	1.06	13	20.6	0.97	28	20.2	0.78	34	20.4	1.22	51	20.2	0.91
	10	23	20.9	1.28	19	20.8	1.07	18	21.0	1.07	19	20.8	1.13	41	21.0	1.18	38	20.8	1.09
	11	21	21.9	1.27	31	21.7	0.85	28	21.6	1.17	28	21.4	1.11	49	21.7	1.21	59	21.6	0.99
	12	20	22.8	1.07	20	22.2	1.04	11	22.4	1.33	9	22.1	1.11	31	22.6	1.16	29	22.2	1.04
Foot breadth (cm)	7	22	7.7	0.38	20	7.6	0.37	22	7.6	0.41	26	7.5	0.36	44	7.7	0.39	46	7.5	0.36
	8	22	8.0	0.68	22	7.9	0.50	19	8.0	0.59	19	7.8	0.47	41	8.0	0.63	41	7.9	0.49
	9	21	8.1	0.48	23	8.2	0.57	13	8.5	0.45	28	8.2	0.45	34	8.3	0.48	51	8.2	0.50
	10	23	8.4	0.48	19	8.3	0.53	18	8.6	0.58	19	8.4	0.50	41	8.5	0.53	38	8.4	0.51
	11	21	8.9	0.46	31	8.8	0.50	28	8.7	0.52	28	8.7	0.46	49	8.8	0.50	59	8.7	0.48
	12	20	9.2	0.57	20	9.1	0.49	11	9.0	0.63	9	8.8	0.70	31	9.1	0.59	29	9.0	0.57

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Foot girth (cm)	7	22	18.7	0.89	20	18.1	0.90	22	18.7	0.88	26	18.6	0.67	44	18.7	0.87	46	18.4	0.81
	8	22	19.5	1.52	22	19.2	1.08	19	19.7	1.25	19	19.2	0.98	41	19.6	1.39	41	19.2	1.02
	9	21	19.6	0.80	23	19.6	1.43	13	20.9	1.27	28	20.0	0.96	34	20.0	1.17	51	19.8	1.20
	10	23	20.2	0.99	19	20.1	1.28	18	21.1	1.11	19	20.4	1.16	41	20.6	1.12	38	20.2	1.21
	11	21	21.5	1.16	31	21.1	1.07	28	21.4	1.23	28	21.2	0.93	49	21.4	1.19	59	21.1	1.00
	12	20	22.2	1.24	20	21.7	1.10	11	22.0	1.47	9	21.5	1.44	31	22.1	1.31	29	21.7	1.19
Z-Triceps skinfold	7	22	188	1.54	20	190	1.52	22	178	1.44	26	185	1.04	44	183	15.5	46	187	12.8
	8	22	185	2.14	22	185	1.44	19	176	1.34	19	187	1.42	41	181	18.5	41	186	14.2
	9	21	183	1.56	23	197	1.77	13	192	2.19	28	190	1.75	34	186	18.4	51	194	17.8
	10	23	197	2.14	19	194	1.86	18	185	2.13	19	191	1.52	41	192	22.0	38	192	16.8
	11	21	204	2.25	31	199	1.74	28	186	1.90	28	200	1.05	49	194	22.4	59	199	14.4
	12	20	194	1.71	20	199	1.48	11	180	1.94	9	206	1.59	31	189	18.9	29	201	15.3
Z-Subscapular skinfold	7	22	155	1.84	20	159	2.14	22	154	1.34	26	161	1.08	44	154	15.9	46	160	16.1
	8	22	165	2.66	22	160	1.60	19	150	1.05	19	167	2.23	41	158	21.8	41	163	19.3
	9	21	158	2.11	23	175	1.81	13	171	2.89	28	173	2.03	34	163	24.7	51	174	19.2
	10	23	183	2.35	19	182	2.23	18	172	2.67	19	175	2.12	41	178	25.2	38	178	21.7
	11	21	184	2.63	31	182	2.37	28	164	2.37	28	185	1.78	49	172	26.6	59	183	21.0
	12	20	179	1.66	20	188	1.65	11	163	1.97	9	193	2.38	31	174	19.2	29	190	18.8
Body weight (kg)	7	22	21.8	2.81	20	22.3	2.38	22	22.3	2.60	26	22.0	2.27	44	22.1	2.69	46	22.1	2.29
	8	22	27.1	6.38	22	23.3	3.44	19	24.7	3.37	19	24.5	4.03	41	26.0	5.29	41	23.8	3.73
	9	21	26.8	3.16	23	28.3	4.53	13	32.2	6.50	28	28.3	3.99	34	28.9	5.33	51	28.3	4.19
	10	23	32.3	5.45	19	31.1	6.56	18	32.5	5.10	19	30.4	5.34	41	32.4	5.23	38	30.8	5.91
	11	21	38.0	6.49	31	36.9	6.60	28	33.5	5.17	28	35.4	5.35	49	35.4	6.13	59	36.2	6.04
	12	20	40.7	8.45	20	40.4	6.16	11	35.5	5.45	9	41.2	9.76	31	38.8	7.84	29	40.7	7.28

Table 3. Mean indices and standard deviations

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Body mass index	7	22	15.7	1.60	20	15.6	1.33	22	15.7	1.39	26	15.5	1.10	44	15.7	1.48	46	15.5	1.19
	8	22	17.0	3.08	22	15.5	1.82	19	16.1	1.20	19	15.7	1.51	41	16.6	2.42	41	15.6	1.67
	9	21	15.8	1.81	23	16.6	1.68	13	18.2	2.71	28	16.4	1.73	34	16.8	2.46	51	16.5	1.69
	10	23	17.6	2.17	19	17.1	2.41	18	17.5	2.75	19	16.7	1.93	41	17.5	2.41	38	16.9	2.16
	11	21	19.0	2.49	31	18.1	2.65	28	17.3	1.71	28	17.7	1.86	49	18.0	2.22	59	17.9	2.30
	12	20	18.5	2.59	20	18.4	2.33	11	17.3	1.82	9	18.8	2.94	31	18.1	2.40	29	18.5	2.49
Rohrer index	7	22	133	14.26	20	130	11.79	22	132	11.6	26	130	9.7	44	132	12.8	46	130	10.5
	8	22	135	22.72	22	127	14.43	19	131	10.2	19	126	9.3	41	133	18.0	41	127	12.1
	9	21	122	15.73	23	128	12.20	13	137	18.1	28	125	13.0	34	128	18.0	51	126	12.6
	10	23	130	16.55	19	127	15.91	18	129	21.8	19	124	13.2	41	129	18.8	38	125	14.5
	11	21	134	18.00	31	127	18.41	28	125	10.8	28	125	13.7	49	129	14.9	59	126	16.2
	12	20	125	14.70	20	124	16.73	11	121	12.6	9	127	16.7	31	124	13.9	29	125	16.5
Iliospinal height/ Stature	7	22	53.4	1.44	20	54.0	1.21	22	53.6	1.44	26	53.6	1.10	44	53.5	1.42	46	53.8	1.15
	8	22	53.7	1.12	22	54.1	1.35	19	53.8	1.17	19	53.9	1.21	41	53.8	1.13	41	54.0	1.28
	9	21	54.4	1.23	23	53.4	1.36	13	54.5	0.96	28	55.6	1.03	34	54.4	1.12	51	54.6	1.65
	10	23	54.9	1.30	19	55.4	1.19	18	55.2	1.21	19	55.7	0.83	41	55.0	1.25	38	55.6	1.02
	11	21	55.7	0.66	31	55.2	0.90	28	55.6	1.24	28	56.0	1.36	49	55.7	1.03	59	55.6	1.21
	12	20	55.7	1.08	20	55.3	1.09	11	55.9	1.29	9	56.1	1.27	31	55.8	1.14	29	55.5	1.19
Upper limb length/ Stature	7	22	42.9	0.87	20	42.4	0.73	22	43.1	1.32	26	42.6	0.96	44	43.0	1.11	46	42.5	0.86
	8	22	43.2	1.07	22	43.0	1.03	19	42.7	1.08	19	42.6	1.10	41	43.0	1.08	41	42.8	1.07
	9	21	43.0	1.09	23	42.6	0.94	13	43.7	1.13	28	43.1	0.88	34	43.3	1.13	51	42.9	0.93
	10	23	43.0	1.05	19	42.9	0.83	18	43.1	1.02	19	43.3	0.92	41	43.1	1.02	38	43.1	0.88
	11	21	43.5	0.75	31	43.1	0.82	28	43.5	1.13	28	43.5	0.81	49	43.5	0.98	59	43.3	0.84
	12	20	43.7	0.98	20	43.2	1.20	11	43.5	1.01	9	43.2	0.64	31	43.6	0.98	29	43.2	1.04

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Biacromial breadth/ Stature	7	22	22.0	0.70	20	22.3	0.44	22	22.1	0.82	26	22.2	0.57	44	22.0	0.75	46	22.3	0.51
	8	22	22.4	0.83	22	22.1	0.93	19	22.2	0.68	19	22.1	0.70	41	22.3	0.76	41	22.1	0.82
	9	21	21.6	0.67	23	22.1	0.58	13	22.4	0.58	28	21.9	0.62	34	21.9	0.76	51	22.0	0.60
	10	23	21.7	0.61	19	21.9	0.94	18	22.3	0.94	19	22.0	0.64	41	22.0	0.82	38	21.9	0.80
	11	21	21.9	0.85	31	21.9	0.75	28	22.0	0.78	28	21.9	0.81	49	22.0	0.80	59	21.9	0.77
	12	20	21.7	0.60	20	21.8	0.65	11	22.1	0.99	9	21.5	0.94	31	21.9	0.77	29	21.7	0.74
Chest breadth/ Stature	7	22	16.4	0.98	20	16.1	0.92	22	16.4	0.83	26	16.1	0.60	44	16.4	0.90	46	16.1	0.75
	8	22	16.9	1.61	22	16.0	0.80	19	16.1	0.84	19	15.8	0.65	41	16.6	1.36	41	15.9	0.73
	9	21	15.9	0.84	23	16.0	0.73	13	16.6	1.07	28	15.7	0.88	34	16.2	0.99	51	15.8	0.83
	10	23	16.7	1.32	19	15.8	1.19	18	16.2	1.17	19	16.0	0.95	41	16.5	1.27	38	15.9	1.06
	11	21	16.5	1.24	31	16.1	1.26	28	16.0	0.82	28	15.9	0.79	49	16.3	1.03	59	16.0	1.06
	12	20	15.9	0.98	20	15.8	1.05	11	15.8	1.09	9	15.9	1.28	31	15.9	1.01	29	15.8	1.11
Bicristal breadth/ Stature	7	22	15.8	0.67	20	15.8	0.83	22	15.6	0.76	26	15.7	0.65	44	15.7	0.72	46	15.8	0.72
	8	22	16.1	1.47	22	15.8	0.99	19	15.7	0.62	19	15.7	0.69	41	15.9	1.16	41	15.7	0.86
	9	21	15.6	0.83	23	16.4	0.75	13	16.2	1.57	28	15.7	0.89	34	15.8	1.18	51	16.1	0.89
	10	23	16.2	1.19	19	15.9	1.52	18	15.7	1.36	19	15.9	0.99	41	16.0	1.27	38	15.9	1.27
	11	21	16.2	1.14	31	16.4	1.35	28	15.7	0.80	28	16.4	0.83	49	15.9	0.98	59	16.4	1.12
	12	20	16.0	1.05	20	16.4	1.12	11	15.4	0.93	9	16.5	1.09	31	15.8	1.04	29	16.4	1.09
Chest depth/ Stature	7	22	11.4	0.60	20	11.0	0.51	22	11.6	0.60	26	11.1	0.49	44	11.5	0.60	46	11.0	0.50
	8	22	11.6	1.15	22	10.8	0.75	19	11.4	0.70	19	10.7	0.55	41	11.5	0.96	41	10.8	0.66
	9	21	10.9	0.83	23	10.4	0.71	13	11.1	0.78	28	10.6	0.87	34	11.0	0.81	51	10.5	0.80
	10	23	11.2	0.87	19	10.7	0.78	18	10.9	1.01	19	10.5	0.55	41	11.1	0.94	38	10.6	0.67
	11	21	11.1	0.98	31	10.5	1.04	28	10.9	0.70	28	10.3	0.77	49	11.0	0.83	59	10.4	0.92
	12	20	10.8	1.07	20	10.4	0.92	11	10.6	0.81	9	10.9	0.71	31	10.7	0.98	29	10.5	0.88

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Chest girth/ Stature	7	22	49.6	2.74	20	48.5	2.07	22	50.3	2.20	26	48.8	1.69	44	49.9	2.49	46	48.7	1.85
	8	22	50.3	4.10	22	48.1	2.48	19	49.6	2.23	19	49.0	3.89	41	50.0	3.35	41	48.5	3.20
	9	21	48.1	2.62	23	48.2	2.44	13	51.3	3.08	28	48.7	3.00	34	49.3	3.17	51	48.5	2.75
	10	23	50.1	3.45	19	48.2	4.06	18	50.0	4.13	19	49.0	2.64	41	50.1	3.71	38	48.6	3.40
	11	21	50.1	3.96	31	49.3	4.40	28	49.3	2.46	28	49.3	3.03	49	49.6	3.18	59	49.3	3.78
	12	20	48.6	3.30	20	48.8	3.79	11	48.1	3.35	9	50.2	4.54	31	48.5	3.27	29	49.2	4.01
Waist girth/ Stature	7	22	44.8	2.83	20	43.2	2.62												
	8	22	45.2	5.31	22	42.6	2.51												
	9	21	42.5	3.02	23	42.3	2.59												
	10	23	44.4	3.44	19	42.4	3.85												
	11	21	44.7	3.79	31	41.6	4.06												
	12	20	43.5	3.26	20	40.6	3.08												
Hip girth/ Stature	7	22	52.2	2.80	20	52.4	2.38												
	8	22	52.6	4.53	22	52.0	2.69												
	9	21	50.6	2.90	23	53.6	2.63												
	10	23	52.7	3.27	19	53.5	3.61												
	11	21	53.8	3.53	31	54.4	3.50												
	12	20	52.1	2.71	20	54.8	3.04												
Bicristal breadth/ Biacromial breadth	7	22	71.9	2.83	20	71.0	3.42	22	70.8	4.35	26	70.8	2.83	44	71.3	3.68	46	70.9	3.06
	8	22	71.8	5.11	22	71.3	4.31	19	70.5	2.12	19	70.9	3.32	41	71.2	4.02	41	71.1	3.84
	9	21	72.3	4.30	23	74.4	3.37	13	72.2	6.09	28	71.8	4.26	34	72.3	4.97	51	73.0	4.07
	10	23	74.0	4.97	19	72.7	6.16	18	70.5	4.42	19	72.3	4.02	41	72.8	5.13	38	72.5	5.13
	11	21	67.5	4.28	31	74.9	5.47	28	71.6	4.12	28	74.8	3.61	49	72.6	4.32	59	74.9	4.64
	12	20	73.6	4.52	20	75.2	4.94	11	69.6	3.08	9	76.5	5.27	31	72.2	4.45	29	75.6	4.98

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD	N	Means	SD
Chest depth/ Chest breadth	7	22	69.4	3.95	20	68.3	3.99	22	71.0	3.57	26	68.7	2.36	44	70.2	3.81	46	68.5	3.14
	8	22	68.5	5.02	22	67.7	4.19	19	70.8	3.78	19	67.8	4.33	41	69.6	4.58	41	67.7	4.20
	9	21	69.0	4.84	23	65.3	3.44	13	67.2	3.31	28	67.6	4.35	34	68.3	4.35	51	66.5	4.09
	10	23	67.4	4.17	19	67.4	3.72	18	67.4	3.79	19	65.9	4.24	41	67.4	3.96	38	66.7	4.01
	11	21	67.5	3.73	31	65.3	3.73	28	68.3	4.69	28	65.0	4.40	49	68.0	4.28	59	65.2	4.03
	12	20	67.9	5.67	20	65.7	4.37	11	67.4	5.62	9	68.4	4.07	31	67.7	5.57	29	66.6	4.39
Foot length/ Stature	7	22	15.7	0.68	20	15.5	0.34	22	15.3	0.53	26	15.2	0.45	44	15.5	0.63	46	15.4	0.43
	8	22	15.5	0.46	22	15.6	0.46	19	15.4	0.44	19	15.4	0.42	41	15.5	0.45	41	15.5	0.45
	9	21	15.5	0.61	23	15.5	0.47	13	15.5	0.52	28	15.4	0.41	34	15.5	0.57	51	15.4	0.44
	10	23	15.4	0.53	19	15.4	0.41	18	15.4	0.53	19	15.4	0.43	41	15.4	0.52	38	15.4	0.41
	11	21	15.4	0.48	31	15.2	0.60	28	15.5	0.49	28	15.1	0.44	49	15.5	0.48	59	15.2	0.53
	12	20	15.4	0.36	20	15.0	0.51	18	15.6	0.55	9	15.0	0.27	31	15.5	0.44	29	15.0	0.44
Foot breadth/ Foot length	7	22	41.6	2.21	20	40.7	2.17	22	41.6	1.41	26	40.0	1.98	44	41.6	1.83	46	40.9	2.05
	8	22	41.0	1.66	22	41.4	1.88	19	41.9	1.94	19	40.5	1.88	41	41.4	1.83	41	41.0	1.91
	9	21	40.3	2.70	23	40.4	2.01	13	41.1	1.56	28	40.5	1.63	34	40.6	2.33	51	40.5	1.79
	10	23	40.3	2.03	19	40.1	1.48	18	40.9	2.49	19	40.2	1.93	41	40.6	2.24	38	40.1	1.69
	11	21	40.7	1.48	31	40.3	2.25	28	40.2	1.78	28	40.5	1.30	49	40.5	1.66	59	40.4	1.85
	12	20	40.6	1.41	20	41.0	1.54	11	40.2	1.68	9	39.7	2.03	31	40.5	1.49	29	40.6	1.79
Foot girth/ Foot length	7	22	101.2	5.48	20	97.4	5.27	22	102.2	3.92	26	102.3	4.15	44	101.7	4.74	46	100.2	5.24
	8	22	99.6	4.17	22	100.3	4.46	19	103.3	4.33	19	100.1	4.34	41	101.3	4.58	41	100.2	4.35
	9	21	97.0	4.91	23	96.9	4.71	13	101.3	4.51	28	99.0	3.60	34	98.7	5.15	51	98.1	4.22
	10	23	97.0	4.66	19	96.7	3.17	18	100.6	5.11	19	97.8	3.98	41	98.6	5.12	38	97.2	3.59
	11	21	98.3	4.81	31	96.9	5.44	28	99.0	3.86	28	99.1	3.12	49	98.7	4.26	59	98.0	4.58
	12	20	97.3	3.20	20	97.7	3.66	11	98.0	3.93	9	96.9	2.87	31	97.6	3.43	29	97.4	3.40

	Age groups	Tokyo						Zinego						Tokyo and Zinego					
		Boys			Girls			Boys			Girls			Boys			Girls		
		N		Means	N		Means	N		Means	N		Means	N		Means	N		Means
		SD		SD	SD		SD	SD		SD	SD		SD	SD		SD	SD		SD
Foot breadth/ Foot girth	7	22	41.1	0.85	20	41.8	1.05	22	40.7	1.17	26	40.0	1.07	44	40.9	1.04	46	40.8	1.37
	8	22	41.1	0.91	22	41.3	0.78	19	40.6	0.98	19	40.4	0.86	41	40.9	0.97	41	40.9	0.91
	9	21	41.5	1.47	23	41.7	1.16	13	40.5	0.63	28	40.9	0.98	34	41.1	1.30	51	41.3	1.13
	10	23	41.5	1.04	19	41.4	1.24	18	40.7	1.18	19	41.1	0.67	41	41.1	1.17	38	41.2	1.00
	11	21	41.5	1.33	31	41.5	1.13	28	40.6	0.91	28	40.9	0.76	49	41.0	1.17	59	41.2	1.02
	12	20	41.7	0.96	20	42.0	0.89	11	41.0	0.78	9	40.9	1.33	31	41.4	0.95	29	41.7	1.15

Table 4a. Test of non-normality in the Tokyo group

Age groups	BOYS						GIRLS					
	7	8	9	10	11	12	7	8	9	10	11	12
Stature										*		
Suprasternal height			*							**		
Iliosapinal height									*	*		
Upper limb length										*		
Biacromial breadth												
Chest breadth				**					*	*	**	
Bicristal breadth		**		*					*			
Chest depth												
Chest circumference				*					**	**		
Waist girth				*						*	*	
Hip girth										*		
Arm girth				*								
Thigh girth												
Minimum leg girth												
Foot length												
Foot breadth												
Foot girth										*		
Z-Triceps skinfold												*
Z-Subscapular skinfold	**	*	**	*							*	*
Body weight									*	*		
Body mass index		*								*	**	
Rohrer index		**				*					**	
Iliosapinal height/Stature												
Upper limb length/Stature							*					
Biacromial breadth/Stature					*							
Chest breadth/Stature				*							**	
Bicristal breadth/Stature		**				**					**	*
Chest depth/Stature											**	
Chest circumf./Stature				*			*			*	**	
Waist girth/Stature		**								*	**	*
Hip girth/Stature		**								*	*	*
Bicristal b./Biacromial b.		**				**					**	*
Chest depth/Chest breadth												
Foot length/Stature			**									
Foot breadth/Foot length												
Foot girth/Foot length												
Foot breadth/Foot girth	*											

* : $P < 0.05$ ** : $P < 0.01$

Table 4b. Test of non-normality in the Zinego group

Age groups	BOYS						GIRLS					
	7	8	9	10	11	12	7	8	9	10	11	12
Stature						*						
Iliosapinal height	*											
Upper limb length										*		
Biacromial breadth							**					
Chest breadth												
Bicristal breadth			*						*			
Chest depth			*									
Chest circumference												
Foot length												
Foot breadth												
Foot girth												
Z-Triceps skinfold					**	**						
Z-Subscapular skinfold												
Body weight												
Body mass index	*				*	*						
Rohrer index	**		*	*							*	
Iliosapinal height/Stature					**	**						
Upper limb length/Stature												
Biacromial breadth/Stature												
Chest breadth/Stature				**								
Bicristal breadth/Stature				**								
Chest depth/Stature												
Chest circumf./Stature			*	*	**	*		**				
Bicristal b./Biacromial b.											*	
Chest depth/Chest breadth										*	*	*
Foot length/Stature												
Foot breadth/Foot length					*							
Foot girth/Foot length							*					
Foot breadth/Foot girth	**	*										*

* : $P < 0.05$ ** : $P < 0.01$

Table 4c. Test of non-normality in the Tokyo and Zinego combined group

Age groups	BOYS						GIRLS					
	7	8	9	10	11	12	7	8	9	10	11	12
Stature										*		
Iliosapinal height										**		
Upper limb length										**		
Biacromial breadth							**					
Chest breadth		**	*	**					*	**		
Bicristal breadth			**	**						*	*	
Chest depth						**						
Chest circumference		*	*	**		*			*	**		*
Foot length												
Foot breadth						*				*		
Foot girth										**		
Z-Triceps skinfold		**										
Z-Subscapular skinfold	*	*	**	**	**	*		*			**	*
Body weight		**	**			*			*	**		
Body mass index	*	**				**				**	**	
Rohrer index	*			**		**			*	*	**	*
Iliosapinal height/Stature											*	
Upper limb length/Stature						*		*		*		
Biacromial breadth/Stature		**			**							
Chest breadth/Stature		**		**			*	*			**	
Bicristal breadth/Stature			**	**		*					**	
Chest depth/Stature		*										
Chest circumf./Stature		**		**	*	*		**		*	**	*
Bicristal b./Biacromial b.							*			*	**	**
Chest depth/Chest breadth								*			*	
Foot length/Stature			*									
Foot breadth/Foot length												
Foot girth/Foot length	*											
Foot breadth/Foot girth		*								*		*

* : $P < 0.05$ ** : $P < 0.01$

Table 5a. Test of inequality of variances between the Tokyo boys and girls, and the Zinego boys and girls

Age groups	TOKYO						ZINEGO					
	7	8	9	10	11	12	7	8	9	10	11	12
Stature				x								x
Suprasternal height			x	x			—	—	—	—	—	—
Iliosapinal height			x	x			x					
Upper limb length				x						x		
Biacromial breadth	**						x					
Chest breadth		***	x	x	x							
Bicristal breadth		x	x	x					x			
Chest depth		*							x			
Chest circumference		**	x	x								
Waist girth		***		x	x	*	—	—	—	—	—	—
Hip girth		*		x			—	—	—	—	—	—
Arm girth		*		x			—	—	—	—	—	—
Thigh girth		*					—	—	—	—	—	—
Minimum leg girth						*	—	—	—	—	—	—
Foot length					*							
Foot breadth												
Foot girth			*G	x								
Z-Triceps skinfold						x					**	
Z-Subscapular skinfold	x	x	x	x	x	x		**G			x	x
Body weight		**	x	x					*			
Body mass index		x		x	x		x				x	x
Rohrer index		x			x	x	x		x	x	x	
Iliosapinal height/Stature												
Upper limb length/Stature		x									x	x
Biacromial breadth/Stature	*				x							
Chest breadth/Stature		**		x	x					x		
Bicristal breadth/Stature		x			x	x			*	x		
Chest depth/Stature					x					*		
Chest circumf./Stature		x		x	x			x	x	x	x	x
Waist girth/Stature		x		x	x	x	—	—	—	—	—	—
Hip girth/Stature		x		x	x	x	—	—	—	—	—	—
Bicristal b./Biacromial b.		x			x	x	*				x	
Chest depth/Chest breadth										x	x	x
Foot length/Stature	*											
Foot breadth/Foot length			x								x	
Foot girth/Foot length							x					
Foot breadth/Foot girth	x						x	x		*		x

* : $P < 0.05$ ** : $P < 0.01$ ***: $P < 0.001$

G : girls > boys

— : not measured

x : not compared

Table 5b. Test of inequality of variances between boys and girls in the Tokyo and Zinego combined group

Age groups	7	8	9	10	11	12
Stature				x		
Iliosspinal height				x		
Upper limb length				x		
Biacromial breadth	x	x				
Chest breadth		x	x	x		
Bicristal breadth		*	x	x	x	
Chest depth		*		*		x
Chest circumference		x	x	x		x
Foot length						
Foot breadth				x		x
Foot girth				x		
Z-Triceps skinfold		x			**	
Z-Subscapular skinfold	x	x	x	x	x	x
Body weight		x	x	x		x
Body mass index	x	x	*	x	x	x
Rohrer index	x	*	x	x	x	x
Iliosspinal height/Stature			*G		x	
Upper limb length/Stature		x		x		x
Biacromial breadth/Stature	*	x			x	
Chest breadth/Stature	x	x		x	x	
Bicristal breadth/Stature			x	x	x	x
Chest depth/Stature		x				
Chest circumf./Stature		x		x	x	x
Bicristal b./Biacromial b.	x			x	x	x
Chest depth/Chest breadth		x			x	
Foot length/Stature	*					
Foot breadth/Foot length			x			
Foot girth/Foot length	x			*		
Foot breadth/Foot girth		x		x		x

* : $P < 0.05$ ** : $P < 0.01$

G : girls > boys

x : not compared

Table 5c. Test of inequality of variances between the Tokyo and Zinego groups in each sex

Age groups	BOYS						GIRLS					
	7	8	9	10	11	12	7	8	9	10	11	12
Stature						x				x		
Iliosspinal height	x								x	x		
Upper limb length										x		
Biacromial breadth							x					
Chest breadth		**	*Z	x					x	x	x	
Bicristal breadth		x	x	x					x			
Chest depth			x			*						
Chest circumference		*	*Z	x					x	x		
Foot length												
Foot breadth												
Foot girth										x		
Z-Triceps skinfold		*									**	x
Z-Subscapular skinfold	x	x	x	x	x	x	**				x	x
Body weight		**	**Z						x	x		
Body mass index	x	x			x	x				x	x	
Rohrer index	x	x	x	x	*	x					x	
Iliosspinal height/Stature					**Z						*Z	
Upper limb length/Stature					x	x		x				
Biacromial breadth/Stature					x							
Chest breadth/Stature		**		x	*						x	
Bicristal breadth/Stature		x	*Z	x		x					x	x
Chest depth/Stature		*									x	
Chest circumf./Stature		*	x	x	x	x		x		x	x	
Bicristal b./Biacromial b.		x				x					x	x
Chest depth/Chest breadth							*			x	x	x
Foot length/Stature												
Foot breadth/Foot length	*		x		x						**	
Foot girth/Foot length							x				**	
Foot breadth/Foot girth	x	x	**							*	*	x

* : $P < 0.05$ ** : $P < 0.01$

Z : Zinego > Tokyo

x : not compared

Table 6a. Test of sex difference in the Tokyo group

Age groups	7		8		9		10		11		12	
Tests	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR
Stature			*	*			X					
Suprasternal height			*	*	X		X					
Iliosapinal height					X		X					
Upper limb length			*	*			X					
Biacromial breadth	* G *		*	*								
Chest breadth			**	*	X		*	*	X			
Bicristal breadth			X		X G *		X					
Chest depth			**	**	*	*	*	*				
Chest circumference			**	*	X		X	*				
Waist girth			*	*			X	*	X	*	*	*
Hip girth					** G *		X				* G *	
Arm girth					* G *		X					
Thigh girth					* G *							
Minimum leg girth												
Foot length												
Foot breadth												
Foot girth	*	*					X					
Z-Triceps skinfold					** G **						X	
Z-Subscapular skinfold	X		X		X G **		X		X		X	
Body weight			*	*	X		X					
Body mass index			X				X		X			
Rohrer index			X						X		X	
Iliosapinal height/Stature					* *				* *			
Upper limb length/Stature			X									
Biacromial breadth/Stature					** G *				X			
Chest breadth/Stature			*	*			X	*	X			
Bicristal breadth/Stature			X		*** G **				X		X	
Chest depth/Stature	*	*	*	*	* *		*	*	X	*		
Chest circumf./Stature			X				X	*	X			
Waist girth/Stature			X				X	*	X	**	X	**
Hip girth/Stature			X		*** G **		X		X		X G **	
Bicristal b./Biacromial b.			X						X		X	
Chest depth/Chest breadth					** **				* *			
Foot length/Stature											** **	
Foot breadth/Foot length					X							
Foot girth/Foot length	*											
Foot breadth/Foot girth	X											

NPAR : Nonparametric test

* : $P < 0.05$ ** : $P < 0.01$ *** : $P < 0.001$

G : girls > boys

x : not compared

Table 6b. Test of sex difference in the Zinego group

Age groups	7		8		9		10		11		12	
Tests	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR
Stature											x	
Iliosspinal height	x											
Upper limb length							x					
Biacromial breadth	x											
Chest breadth					**	*						
Bicristal breadth					x				** G **		* G *	
Chest depth	**	*	*	*	x							
Chest circumference	*	*			*	*						
Foot length												
Foot breadth												
Foot girth					*	*	*	*				
Z-Triceps skinfold			* G *						** G **		** G *	
Z-Subscapular skinfold	* G		** G *						x G ***		x G *	
Body weight												
Body mass index	x				*	*			x		x	
Rohrer index	x				x	*	x		x			
Iliosspinal height/Stature					** G **							
Upper limb length/Stature									x		x	
Biacromial breadth/Stature					*							
Chest breadth/Stature					**	*	x					
Bicristal breadth/Stature							x		** G **		* G *	
Chest depth/Stature	**	**	**	**	*				**	*		
Chest circumf./Stature	**	*	x		x	*	x		x		x	
Bicristal b./Biacromial b.									x G **		** G *	
Chest depth/Chest breadth	*	*	*	*			x		x	*	x	
Foot length/Stature									**	**	**	*
Foot breadth/Foot length			*	*					x			
Foot girth/Foot length	x		*	*								
Foot breadth/Foot girth	x		x								x	

NPAR : Nonparametric test

* : $P < 0.05$ ** : $P < 0.01$ *** : $P < 0.001$

G : girls > boys

x : not compared

Table 6c. Test of sex difference in the Tokyo and Zinego combined group

Age groups	7		8		9		10		11		12	
Tests	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR	<i>t</i> -test	NPAR
Stature							X					
Iliospinal height							X					
Upper limb length							X					
Biacromial breadth	X		X									
Chest breadth			X	*	X		X	**				
Bicristal breadth					X		X		X	G **	*	G **
Chest depth	**	**	***	***	**	*	**	**	*	*	X	
Chest circumference			X	*	X		X	*			X	
Foot length												
Foot breadth	*						X				X	
Foot girth	*						X					
Z-Triceps skinfold			X								*	G *
Z-Subscapular skinfold	X	G *	X		X	G **	X		X	G **	X	G **
Body weight			X	*	X		X				X	
Body mass index	X		X	*			X		X		X	
Rohrer index	X				X		X		X		X	
Iliospinal height/Stature							*	G	X			
Upper limb length/Stature	*		X				X				X	
Biacromial breadth/Stature			X						X			
Chest breadth/Stature	X		X	**			X	*	X			
Bicristal breadth/Stature					X		X		X	G *	X	G *
Chest depth/Stature	***	***	X	***	**	**	**	*	***	***		
Chest circumf./Stature	**	**	X	*			X		X		X	
Bicristal b./Biacromial b.	X						X		X	G *	X	G *
Chest depth/Chest breadth	*	*	X						X	**		
Foot length/Stature									**	**	***	***
Foot breadth/Foot length					X							
Foot girth/Foot length	X											
Foot breadth/Foot girth			X				X				X	

NPAR : Nonparametric test

* : $P < 0.05$ ** : $P < 0.01$ *** : $P < 0.001$

G : girls > boys

x : not compared

the girls of ages 11 and 12. This suggests a difference of growth pattern between the Tokyo and Zinego groups in the same sex.

5. Regional difference.

Difference between the Tokyo and Zinego groups, in each sex and each age, was examined using the *t*-test and nonparametric test (Wilcoxon) (Tables 7a, b). In the tables, a cross indicates that the *t*-test was not applied because of a non-normal distribution of the corresponding measurement or index in either or both of the compared Tokyo and Zinego children's groups: 40 out of 174 measurements and indices (23%) in the boys, and 35 out of 174 (20%) in the girls. And a Z indicates a significantly larger mean in the children in Zinego than those in Tokyo. The negative probability of the nonparametric test is equal to that of the *t*-test or higher except in foot length in girls of age 11, where significant regional difference was detected by the nonparametric test ($P = 0.0494$), while it was not by the *t*-test ($P = 0.1402$). The former becomes 0.05, showing no significant regional difference when it is rounded to three decimal places of probability.

From the results of the nonparametric test, the following observations can be summarized.

In the boys, no difference was detected at ages 7 and 8, except foot girth/foot length at age 8, where the Zinego boys have a relatively wider foot than the Tokyo boys. But at age 9, the Zinego boys are larger than the Tokyo boys in breadth and girth of the shoulder, chest, foot, and body weight. At age 10, however, the Zinego boys maintained superiority over the Tokyo boys in biacromial breadth and foot girth only. At age 11, the Tokyo boys became larger in biacromial and bicristal breadths, skinfolds, and body weight. But these regional differences disappear at age 12. This suggests differential growth patterns in boys in Tokyo and Zinego in the period from age 9 to age 11.

In the girls, in contrast with the boys, regional difference is obscure, except absolute and relative foot girth at age 7, and iliospinal height at age 9, where the Zinego girls are larger than the Tokyo girls.

The suggestion of a differential growth in the boys, but not in the girls, of Tokyo and Zinego coincides with the observations on sex difference mentioned above.

Table 7a. Test of the regional difference between the Tokyo and Zinego boys

Age groups	7	8	9	10	11	12
Tests	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR
Stature						x
Iliosapinal height	x					
Upper limb length						
Biacromial breadth			** Z **	* Z *		
Chest breadth		*	* Z *	x	* *	
Bicristal breadth		x	x	x	* *	*
Chest depth			x			
Chest circumference			*** Z **	x		
Foot length						
Foot breadth						
Foot girth			*** Z **	** Z *		
Z-Triceps skinfold	*				** **	*
Z-Subscapular skinfold	x	x	x	x	x *	x **
Body weight			* Z *		** *	
Body mass index	x	x	** Z *		x *	x
Rohrer index	x	x	x Z *	x	* *	x
Iliosapinal height/Stature						
Upper limb length/Stature					x	x
Biacromial breadth/Stature			*** Z **	* Z *	x	
Chest breadth/Stature			* Z *	x		
Bicristal breadth/Stature		x		x		x
Chest depth/Stature						
Chest circumf./Stature			x Z **	x	x	x
Bicristal b./Biacromial b.		x		** **		x *
Chest depth/Chest breadth						
Foot length/Stature						
Foot breadth/Foot length			x		x	
Foot girth/Foot length		** Z *	* Z *	* Z *		
Foot breadth/Foot girth	x	x	** *	* *	** *	

NPAR : Nonparametric test

* : $P < 0.05$ ** : $P < 0.01$ *** : $P < 0.001$

Z : Zinego > Tokyo

x : not compared

Table 7b. Test of the regional difference between the Tokyo and Zinego girls

Age groups	7	8	9	10	11	12
Tests	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR	<i>t</i> -test NPAR
Stature				X		
Iliosapinal height			x Z **	X		
Upper limb length				X		
Biacromial breadth	x					
Chest breadth			x	x	x	
Bicristal breadth			x			
Chest depth						
Chest circumference			x	x		
Foot length					*	
Foot breadth						
Foot girth	* Z *			x		
Z-Triceps skinfold						x
Z-Subscapular skinfold					x	x
Body weight			x	x		
Body mass index				x	x	
Rohrer index					x	
Iliosapinal height/Stature			*** Z ***		** Z *	
Upper limb length/Stature		x			* Z *	
Biacromial breadth/Stature						
Chest breadth/Stature					x	
Bicristal breadth/Stature			** **		x	x
Chest depth/Stature					x	
Chest circumf./Stature		x		x	x	
Bicristal b./Biacromial b.			* *		x	x
Chest depth/Chest breadth			* Z *	x	x	x
Foot length/Stature	* *					
Foot breadth/Foot length						
Foot girth/Foot length	x Z **					
Foot breadth/Foot girth	*** **	** **	* *		* *	x *

NPAR : Nonparametric test

* : $P < 0.05$ ** : $P < 0.01$ *** : $P < 0.001$

Z : Zinego > Tokyo

x : not compared

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