

Limb Lengths of Primary School Children in a City From Western Region of Turkey

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ABSTRACT

Anthropometry has been used for the assessment of growth at different ages. Among the anthropometric measurements, weight, height, arm circumference, and lower and upper limb lengths are of the most important criteria showing the development of children in school age. The aim of the present study was to measure the lengths of upper (arm, forearm, hand) and lower (thigh, leg, foot) limbs of children studying in primary schools of Aydin, a city in the western region of Turkey, and to assess the differences according to the gender (female, male) and living areas (urban, rural). In different age groups, many differences were observed when compared for gender and area. Differences were also seen when compared with the other studies done in different part of Turkey. The data was the first one for the region and it might be useful for further regional studies or for national comparisons. More studies designed with bigger sample sizes that cover many cities belonging to the same region of the country are needed. In addition to cross-sectional studies, longitudinal studies may give more useful knowledge for understanding the growth of children.

Key words: anthropometry, limb length, students, growth

Introduction

Anthropometry has been used for the assessment of growth, health, nutrition and social well being at different ages¹. Anthropometric techniques are used by different groups for different objectives, commonly by anthropologists and medical scientists, and also by people for determining body compositions for industrial usage such as shoe sizing^{2,3}. Among the anthropometric measurements weight, height, arm circumference, lower and upper limb lengths are of the most important criteria showing the development of children in school age⁴. The growth pattern of children is a good indicator of their nutritional status, health and socio-economic levels. Similarly, nutritional anthropometric measurements are useful for measuring such growth pattern.

In Turkey, some studies on the assessment of the growth and development of children have already been done. However, these studies usually have focused on the weight and height measures, which are the two of the most easily, obtained and used anthropometric measures, and very convenient to compare with the results obtained from other countries or even other ethnic groups^{5,6}.

The aim of the present study was to measure the lengths of upper (arm, forearm, hand) and lower (thigh, leg, foot) limbs of children studying in primary schools of Aydin, a city in the western region of Turkey, and to assess the differences in the measurements according to the gender (female, male) and living areas (urban, rural).

Subjects and Methods

The data for the present study was acquired from the primary schools in urban and rural areas of Aydin, Turkey, between May 1st, 2001 and May 30th, 2001. Aydin is a city in the western part of Turkey with a population of 861,613. There were 60,206 children attending eight-year compulsory primary education at the time when the study was conducted. The study design was a cross-sectional, and population-based survey. Multi-stage sampling was used in the selection of the study sample. Aydin was separated into four regions according to the socioeconomic and health data taken from Directory of Health. Two schools, one from urban and one from rural

area, were selected randomly from each region. The children at the schools were selected from the classes randomly based on the weight of age and gender. The required permission for the study was given by the Directory of Education.

Eight major anthropometric measures were assessed in the study. The standardization of measuring was supplied as following:⁷ Total arm length (arm+forearm+hand lengths) was taken by measuring the length between the dactylon point of the middle finger, which is the longest finger, and the acromion point, which is placed at the lower border of the outmost point of acromion project on scapula. Among the upper limbs, the arm length was measured as the distance from the acromial angle to supero-lateral margin of radial head (acromion-radiale); the forearm length was measured as

the distance from the supero-lateral margin of radial head to distal end of radial styloid process (radiale-stylian) and the hand length was measured as the distance from the distal end of radial styloid process to distal end of the distal phalanx of third finger (stylian-acromelion). Among the lower limbs, the thigh length was measured as the distance from the trochanter major to distal of medial condyle of tibia; the leg length was measured as the distance from the most projecting superior part of medial condyle of tibia (anterior to collateral tibial ligament) to distal margin of medial malleolus (tibiale-sphyrian), and the foot length was measured as the distance from the extreme point (pternion) of heel to the extreme point (acropodion) of the longest toe (either first or second toe). Measurements were taken by the same person and from the right sides of the par-

TABLE 1
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE TOTAL UPPER EXTREMITY LENGTHS OF THE BOYS ACCORDING TO AGE AND SCHOOL AREA

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	3	48.97	2.41	46.30–51.00	–	–	–	–	3	48.97	2.41	46.30–51.00
7	17	51.18	2.55	45.30–55.10	15	53.65	4.32	47.70–61.50	32	52.33	3.65	45.30–61.50
8	20	55.60	2.57	49.50–59.30	14	54.15	3.59	48.50–60.80	34	55.00	3.07	48.50–60.80
9	20	56.97	2.94	52.40–64.30	13	57.57	2.89	53.20–62.50	33	57.21	2.89	52.40–64.50
10	19	60.47	3.59	54.90–66.80	20	59.22	4.09	51.30–68.20	39	59.83	3.86	51.30–68.20
11	24	61.29	4.11	53.60–71.40	13	62.96	4.21	58.00–70.20	37	61.88	4.16	63.60–71.40
12	17	63.42	6.08	50.10–76.20	19	60.61	5.47	55.00–73.80	36	64.58	5.79	50.10–76.20
13	31	70.08	6.23	55.50–88.70	27	68.05	4.35	56.00–74.50	58	69.14	5.60	55.50–88.70
14	20	70.26	7.06	60.00–85.30	14	71.16	6.25	62.20–84.60	34	70.63	6.65	60.00–85.30
15	–	–	–	–	2	65.70	1.84	64.40–67.00	2	65.70	1.84	64.40–67.00
16	–	–	–	–	–	–	–	–	–	–	–	–
Total	171	61.66	8.08	45.30–88.70	137	62.23	7.36	47.70–84.60	308	61.92	7.76	45.30–88.70

TABLE 2
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE TOTAL UPPER EXTREMITY LENGTHS OF THE GIRLS ACCORDING TO AGE AND SCHOOL AREA

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	5	51.66	5.93	46.40–61.50	–	–	–	–	5	51.66	5.93	46.40–61.50
7	20	50.79	2.93	45.00–56.30	16	50.89	2.89	44.50–55.90	36	50.83	2.87	44.50–56.30
8	20	55.26	3.05	50.70–60.40	14	53.30	2.79	48.30–59.40	34	54.45	3.06	48.30–60.40
9	20	56.98	3.85	52.00–64.50	12	57.83	4.83	53.10–68.80	32	57.30	4.19	52.00–68.80
10	24	60.00	5.24	53.60–78.10	20	58.47	3.36	52.90–63.60	44	59.31	4.50	52.90–78.10
11	24	62.52	4.13	54.20–69.80	16	61.90	3.75	53.00–67.80	40	62.28	3.95	53.00–69.80
12	38	67.52	5.57	55.50–85.00	11	67.30	3.98	58.50–71.50	49	67.47	2.22	55.50–85.00
13	25	67.97	4.88	56.20–79.20	20	67.27	4.81	56.90–73.80	45	67.66	4.81	56.20–79.20
14	16	67.36	5.57	51.50–76.20	14	69.87	3.37	62.10–74.00	30	68.54	4.77	51.50–76.20
15	1	72.42	–	–	1	66.10	–	–	2	69.25	4.75	66.10–72.40
16	1	72.20	–	–	–	–	–	–	1	72.20	–	–
Total	194	61.59	7.63	45.00–85.00	124	60.858	7.40	44.50–74.00	318	61.30	7.54	44.50–85.00

ticipants. The birth data (day, month and year) of students were obtained from their school records.

The upper (arm, forearm, hand) and lower (thigh, leg, foot) limb lengths of students were summarized as mean (\bar{X}), standard deviation (SD), minimum and maximum values (min-max) classified according to the area, age and gender. Independent-samples, t-test and Mann-Whitney U Test were used to compare statistical significance. SPSS for Windows 8.0 was used as the software for statistical procedures.

Results

626 children, 308 (49.2%) males and 318 (50.8%) females, were included in the study. 365 (58.3%) of them

were from urban, and 261 (41.7%) were from rural areas. The age distribution of students had a range of 6 to 16 years old.

The results of the total upper extremity, arm, forearm and hand lengths of children according to living area, age and gender are shown in Tables 1–8.

In the eight-year-old group, the students from urban area had longer total upper extremity length according to the rural; and, in 12-year-old group the girls had longer total upper extremity length according to the male ($p < 0.05$). No more statistically significant difference was observed for the length of total upper extremity (Table 1 and 2).

There was no statistically significant difference between urban and rural areas according to the arm

TABLE 3
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE ARM LENGTHS OF BOYS ACCORDING TO AGE AND SCHOOL AREA

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	3	20.46	1.50	19.60–22.20	–	–	–	–	3	20.46	1.50	19.60–22.20
7	17	21.25	1.48	18.20–23.50	15	22.12	1.92	20.00–26.70	32	21.65	1.73	18.20–26.70
8	20	22.94	1.41	19.60–25.00	14	22.83	1.55	20.20–25.40	34	22.89	1.45	19.60–25.40
9	20	23.72	1.34	20.70–26.00	13	23.93	1.53	22.20–26.50	33	23.80	1.40	20.70–26.50
10	19	25.24	1.61	22.20–27.60	20	24.71	1.77	21.00–28.20	39	24.96	1.69	21.00–28.20
11	24	25.58	1.90	21.60–30.00	13	26.71	1.87	24.00–29.50	37	25.98	1.94	21.60–30.00
12	17	26.40	2.48	22.30–32.00	19	27.85	2.67	23.50–34.00	36	27.16	2.65	22.30–34.00
13	31	28.38	3.62	16.80–35.20	27	28.42	2.01	23.00–32.00	58	28.40	2.95	16.80–35.20
14	20	28.64	2.65	24.00–34.00	14	30.25	2.90	26.00–37.00	34	29.30	2.84	24.00–37.00
15	–	–	–	–	2	27.40	1.98	26.00–28.80	2	27.40	1.98	26.00–28.80
16	–	–	–	–	–	–	–	–	–	–	–	–
Total	171	25.45	3.36	16.80–35.20	137	26.13	3.36	20.00–37.00	308	25.75	3.35	16.80–37.0

TABLE 4
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE ARM LENGTHS OF THE GIRLS ACCORDING TO AGE AND SCHOOL AREA

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	5	20.94	2.41	18.50–24.60	–	–	–	–	5	20.94	2.41	18.50–24.60
7	20	21.11	1.46	18.00–23.80	16	21.26	1.98	17.60–24.50	36	21.18	1.69	17.00–24.50
8	20	22.90	1.39	20.70–25.50	14	22.29	1.21	20.00–24.80	34	22.65	1.34	20.00–25.50
9	20	23.36	1.57	20.70–26.50	12	24.65	3.53	22.30–34.50	32	23.84	2.51	20.70–34.50
10	24	25.00	2.26	21.50–30.80	20	24.35	1.34	21.20–26.00	44	24.73	1.91	21.20–30.80
11	24	26.28	1.96	22.00–30.30	16	26.01	1.44	22.50–28.00	40	26.17	1.75	22.00–30.30
12	38	27.25	2.29	26.60–33.00	11	28.25	1.77	24.60–31.00	49	27.48	2.21	26.6–33.00
13	25	27.94	3.04	18.60–31.00	20	28.37	2.17	22.60–32.00	45	28.13	2.67	18.60–32.00
14	16	27.95	2.40	21.00–30.80	14	29.00	1.49	25.50–31.20	30	28.44	2.06	21.00–31.20
15	1	28.00	–	–	1	27.30	–	–	2	27.65	0.49	27.30–28.00
16	1	28.20	–	–	–	–	–	–	1	28.20	–	–
Total	194	25.37	3.19	18.00–33.00	124	25.51	3.28	17.00–34.50	318	25.43	3.22	17.00–34.50

lengths for boys, girls and as a whole ($p>0.05$). There was also no significant difference between boys and girls from urban or rural areas ($p>0.05$) (Table 3 and 4).

At the age group of eight and thirteen, the forearm lengths of urban students were longer than the ones of rural ones ($p<0.05$) (Table 5 and 6). At twelve, the forearm lengths of girls were longer than the corresponding measure of boys at urban areas and at totally ($p<0.05$). Also in 14-year-old group, forearm lengths of female students in urban primary schools were shorter than that of female students in rural schools ($p<0.05$). There was no more statistically significant difference.

In seven-year-old group, the hand lengths of girls in urban primary schools were shorter than that of the ones in rural schools ($p<0.05$). On the contrary, in eight-

year-old group, the hand lengths of the girls in urban primary schools were longer than that of the ones in rural schools ($p<0.05$). In thirteen years old group, the boys had a longer hand than the girls in urban areas ($p<0.05$) (Table 7 and 8).

The thigh lengths of girls were longer than that of boys at six, seven, 11 and 12-year-old age groups. The thigh lengths of boys from urban area were shorter than the ones from rural area at seven, 11 and 12-year-old age groups. The thigh lengths of girls from urban area were shorter than the ones from rural area at seven, nine and 14-year-old age groups (Table 9 and 10). However, all these differences were not statistically significant.

The leg lengths of boys were longer than that of girls in nine, 10, 13 and 15-year-old age groups. However, the

TABLE 5
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE FOREARM LENGTH OF THE BOYS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	3	16.36	0.32	16.00–16.60	–	–	–	–	3	16.36	0.32	16.00–16.60
7	17	17.34	1.43	15.00–19.00	15	18.16	1.59	16.00–21.30	32	17.72	1.54	15.00–21.30
8	20	19.48	1.63	16.40–23.30	14	18.27	1.59	15.40–20.80	34	18.98	1.70	15.40–23.30
9	20	19.33	1.21	17.00–22.00	13	19.93	1.01	18.20–21.50	33	19.57	1.15	17.00–22.00
10	19	20.74	1.42	18.80–23.70	20	20.36	1.46	17.50–23.20	39	20.55	1.43	17.50–23.70
11	24	20.78	1.52	17.50–4.00	13	21.36	1.58	19.40–24.60	37	20.98	1.55	17.50–24.60
12	17	21.17	2.34	15.60–24.60	19	21.95	1.92	18.00–24.40	36	21.58	2.13	15.60–24.60
13	31	25.13	3.20	20.70–35.20	27	23.24	1.63	20.00–26.50	58	24.25	2.74	20.00–35.20
14	20	25.14	4.05	20.60–34.00	14	23.68	2.29	18.60–27.00	34	24.54	3.47	18.60–34.00
15	–	–	–	–	2	22.20	0.70	21.70–22.70	2	22.20	0.70	21.70–22.70
16	–	–	–	–	–	–	–	–	–	–	–	–
Total	171	21.38	3.56	15.0–35.2	137	21.12	2.52	15.40–27.00	308	21.26	3.14	15.0–35.2

TABLE 6
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE FOREARM LENGTH OF THE GIRLS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	5	17.30	2.05	14.40–20.20	–	–	–	–	5	17.30	2.05	14.40–20.20
7	20	17.44	1.49	15.00–20.00	16	16.76	1.23	15.00–19.00	36	17.14	1.40	15.00–20.00
8	20	18.94	1.48	16.70–22.00	14	18.48	1.04	16.00–20.00	34	18.75	1.32	16.00–22.00
9	20	19.57	1.68	17.40–22.00	12	19.63	1.66	17.00–24.00	32	19.59	1.64	17.00–24.00
10	24	20.91	3.05	17.00–30.80	20	19.88	1.31	17.70–22.00	44	20.44	2.45	17.00–30.80
11	24	21.43	2.13	17.80–27.00	16	21.11	1.71	18.00–24.60	40	21.30	1.96	17.80–27.00
12	38	24.60	3.47	19.50–33.00	11	22.90	1.75	19.20–25.00	49	24.22	3.23	19.20–33.00
13	25	24.14	2.81	21.30–31.00	20	22.87	1.98	19.50–26.00	45	23.58	2.53	19.50–31.00
14	16	23.54	2.93	18.80–30.20	14	24.15	1.93	21.00–29.00	30	23.83	2.49	18.80–30.20
15	1	28.0	–	–	1	23.30	–	–	2	25.65	3.32	23.30–28.00
16	1	28.2	–	–	–	–	–	–	1	28.20	–	–
Total	194	21.62	3.66	14.40–33.0	124	20.72	2.81	15.00–29.00	318	21.27	3.37	14.40–33.0

differences were not statistically significant. In eight and 10-year-old groups, there was a significant difference between urban and rural areas for both males and females ($p < 0.05$). The urban students had longer legs compared to the students from rural areas for the age groups of eight and 10 (Table 11 and 12).

In 13 and 14-year-old groups, foot lengths of boys were longer than that of the girls both in urban and rural areas ($p < 0.05$) (Table 13 and 14).

Discussion

In a study from eastern region of Turkey, in 11-year-old boys group and in nine-year-old girls group, both from urban primary schools, the total arm length was

found to be longer. The seven-year-old boys had a longer total arm length than that of girls in urban primary schools ($p < 0.05$) and in rural primary schools ($p < 0.01$)⁸. In North Carolina, USA, it was found that nine-year-old rural girls had shorter upper and lower limbs lengths compared to the urban girls in the same age group⁹. In Malatya, Turkey, total arm lengths of boys were found to be significantly different from girls in nine-year-old age group ($p < 0.05$)¹⁰. The total upper extremity of eight to 12-year-old group boys were found to be longer compared to girls in Van, a city from eastern part of Turkey¹¹. In a research from Denmark, the extremities of Danish children were 3–4 cm longer than the extremities of English children¹². In the present study, the lengths of total upper extremities of the female students are longer than that of male students in 12-year-old

TABLE 7
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE HAND OF THE BOYS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max
6	3	12.13	1.90	10.20–14.00	–	–	–	–	3	12.13	1.90	10.20–14.00
7	17	12.58	1.07	10.50–14.20	15	13.36	1.35	10.60–15.70	32	12.94	1.26	10.50–15.70
8	20	13.18	0.99	11.50–15.00	14	13.04	0.96	11.60–15.00	34	13.12	0.97	11.50–15.00
9	20	13.91	1.03	12.60–16.70	13	13.70	0.98	12.20–15.30	33	13.83	1.00	12.20–16.70
10	19	14.47	1.37	12.70–17.40	20	14.14	1.40	12.00–18.00	39	14.30	1.38	12.00–18.00
11	24	14.91	1.31	13.00–18.40	13	14.88	1.05	13.50–16.60	37	14.90	1.21	13.00–18.40
12	17	15.84	1.83	12.00–19.80	19	15.80	1.45	13.20–18.30	36	15.82	1.62	12.00–19.80
13	31	16.56	1.49	13.20–20.00	27	16.38	1.35	13.00–18.70	58	16.47	1.42	13.00–20.00
14	20	16.47	1.18	14.00–18.50	14	17.22	1.87	14.60–21.00	34	16.78	1.52	14.00–21.00
15	–	–	–	–	2	16.10	0.56	15.70–16.50	2	16.10	0.56	15.70–16.50
16	–	–	–	–	–	–	–	–	–	–	–	–
Total	171	14.84	1.93	10.20–20.00	137	14.99	1.92	10.60–21.00	308	14.91	1.92	10.20–21.00

TABLE 8
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE HAND OF THE GIRLS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max
6	5	13.42	2.06	11.60–16.70	–	–	–	–	5	13.42	2.06	11.60–16.70
7	20	12.23	0.88	10.80–14.30	16	12.86	0.87	11.40–14.30	36	12.51	0.92	10.80–14.30
8	20	13.42	1.02	11.80–15.80	14	12.52	0.93	11.40–15.00	34	13.05	1.07	11.40–15.80
9	20	14.05	1.48	12.00–18.00	12	13.54	1.15	12.00–16.00	32	13.86	1.37	12.00–18.00
10	24	14.05	1.48	12.00–16.90	20	14.24	1.26	12.00–16.60	44	14.13	1.37	12.00–16.90
11	24	14.80	0.83	13.40–16.40	16	14.78	1.09	12.50–17.00	40	14.79	0.53	12.50–17.00
12	38	15.67	1.31	13.60–19.00	11	16.13	1.23	14.20–18.30	49	15.77	1.29	13.60–19.00
13	25	15.88	1.01	14.00–18.00	20	16.02	1.19	13.80–17.80	45	15.94	1.09	13.80–18.00
14	16	15.86	1.61	11.70–18.70	14	16.72	0.87	15.00–18.60	30	16.26	1.37	11.70–18.70
15	1	15.50	–	–	1	16.40	–	–	2	15.95	0.63	15.50–16.40
16	1	15.80	–	–	–	–	–	–	1	15.80	–	–
Total	194	14.60	1.71	10.8–19.00	124	14.62	1.79	11.40–18.60	318	14.61	1.74	10.80–19.00

group. Additionally, in the eight-year-old group, the students from urban area had longer total upper extremity length according to the rural.

In Gemlik, Turkey, it was found that in seven and nine-year-old groups of girls studying in rural primary schools, the arm lengths were longer. Considering in the whole population, the arm lengths of boys in the seven, nine, 10, 11 and 12-year-old age groups were longer than that of girls¹³. In Malatya, in seven-year-old group of boys from urban area, the arm lengths were found to be longer compared to girls; where in eleven-year-old group, the arm lengths of girls were longer than that of boys¹⁰. In the present study, no significant difference was found when comparing gender and area for arm length.

In Malatya, forearm lengths of boys in eight and nine-year-old groups were longer compared to girls; where in 10-year-old group the forearm of girls were longer¹⁰. In Gemlik, the forearm lengths of eight-year-old boys were longer than that of girls and the forearm lengths of nine and 11-year-old girls were longer than that of boys¹³. In the present study, at eight and 13-year-old groups, the forearm lengths of urban students were longer than the ones of rural students. At twelve, the forearm lengths of girls were longer than that of the boys at urban areas and also at totally. Also in 14-year-old group, forearm lengths of female students in urban primary schools were shorter than that of female students in rural areas.

TABLE 9
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE THIGH OF THE BOYS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	3	28.66	2.88	27.00–32.00	–	–	–	–	3	28.66	2.88	27.00–32.00
7	17	29.97	2.16	26.00–33.00	15	30.86	3.36	26.50–37.00	32	30.39	2.78	26.00–37.00
8	20	32.55	1.73	29.00–35.00	14	31.56	2.42	27.00–35.00	34	32.14	2.07	27.00–35.00
9	20	33.56	2.56	30.00–38.00	13	33.57	2.01	29.00–36.00	33	33.57	2.33	29.00–38.00
10	19	35.50	2.51	31.60–40.00	20	35.20	2.93	29.00–41.00	39	35.34	2.70	29.00–41.00
11	24	35.72	3.96	25.00–41.00	13	37.92	3.20	33.00–42.00	37	36.50	3.81	25.00–42.00
12	17	37.75	4.24	28.00–45.00	19	39.02	2.42	33.00–42.00	36	38.42	3.41	28.00–45.00
13	31	41.10	2.80	34.00–47.00	27	40.11	3.05	33.00–47.00	58	40.65	2.94	33.00–47.00
14	20	41.00	3.26	34.00–47.00	14	41.86	3.59	36.00–49.00	34	41.41	3.37	34.00–49.00
15	–	–	–	–	2	39.50	3.54	37.00–42.00	2	39.50	3.54	37.00–42.00
16	–	–	–	–	–	–	–	–	–	–	–	–
Total	171	36.19	4.85	25.00–47.00	137	36.70	4.69	26.50–49.00	308	36.42	4.77	25.00–49.00

TABLE 10
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE THIGH OF THE GIRLS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	5	31.30	2.73	28.00–35.00	–	–	–	–	5	31.30	2.73	28.00–35.00
7	20	30.46	1.81	28.00–33.00	16	31.78	2.52	29.00–39.00	36	31.05	2.22	28.00–39.00
8	20	32.32	2.39	27.00–37.00	14	32.17	2.73	26.50–36.50	34	32.26	2.50	26.50–37.00
9	20	32.96	2.77	28.00–39.00	12	34.40	2.85	31.00–41.50	32	33.50	2.84	28.00–41.50
10	24	35.52	2.63	32.00–43.00	20	35.90	2.37	32.00–42.00	44	35.69	2.49	32.00–43.00
11	24	37.60	2.28	34.00–41.50	16	36.84	2.06	33.00–40.50	40	37.30	2.20	33.00–41.50
12	38	39.46	2.87	31.00–47.00	11	39.90	2.45	35.00–43.50	49	39.56	2.76	31.00–47.00
13	25	40.70	2.65	36.00–48.00	20	40.02	2.75	35.00–44.00	45	40.40	2.68	35.00–48.00
14	16	39.41	2.88	32.00–44.50	14	40.35	2.46	38.00–47.00	30	39.85	2.69	32.00–47.00
15	1	40.00	–	–	1	41.00	–	–	2	40.50	0.70	40.00–41.00
16	1	37.00	–	–	–	–	–	–	1	37.00	–	–
Total	194	36.35	4.36	27.00–48.00	124	36.49	4.05	26.50–47.00	318	36.40	4.23	26.50–48.00

In Malatya, there was no significant difference for hand length between boys and girls from urban areas for seven to 11-year-old age groups¹⁰. In the present study, the hands of boys in the 13-year-old group were longer compared to girls.

In a research from Turkey, lower limb lengths were significantly longer in the 11-year-old boys and in the seven, nine and 11-year-old groups at girls in the urban primary schools¹⁴. The magnitude of the urban–rural difference in girls' leg lengths were greater than boys' in Mexico¹⁵. In Gemlik, the girls from rural areas had shorter thigh length compared to urban girls except 11-year-old group¹³. Also in Gemlik, the thigh lengths of boys were longer than that of girls except six-year-old ones; and except 11-year-old group, the thigh lengths of girls were shorter than that of boys in the rural area¹³.

In the present study, the thigh lengths of girls were longer than that of boys at six, seven, 11 and 12-year-old age groups. The thigh lengths of boys from urban area were shorter than the ones from rural areas at seven, 11, 12-year-old age groups. The thigh lengths of girls from urban area were shorter compared to those from rural areas at seven, nine and 14-year-old age groups. However, all these differences were not statistically significant. But, the present study's results seemed to be similar with the research done in Gemlik except six-year-old group.

In Gemlik, the leg lengths of rural students were shorter compared to the ones from urban areas and also leg lengths of girls are also shorter than boys in all age groups¹³. In Mexico, the leg lengths were longer in urban than rural in Mexico¹⁵. In India, leg lengths of rural

TABLE 11
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE LEG OF THE BOYS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max
6	3				–				3			
7	17	26.21	1.62	23.00–28.00	15	26.56	2.40	22.50–33.00	32	26.37	2.00	22.50–33.00
8	20	28.32	1.47	25.00–30.00	14	26.93	2.05	24.00–31.00	34	27.75	1.84	24.00–31.00
9	20	29.23	2.33	23.80–33.00	13	29.57	2.19	26.00–34.50	33	29.37	2.25	23.80–34.50
10	19	31.52	1.95	29.00–35.00	20	29.95	2.03	26.00–34.00	39	30.72	2.12	26.00–35.00
11	24	31.21	2.97	25.00–37.40	13	33.07	2.78	29.00–37.00	37	31.86	3.00	25.00–37.80
12	17	33.67	3.73	25.50–40.00	19	33.71	2.64	27.50–37.00	36	33.69	3.15	25.50–40.00
13	31	36.20	2.55	30.00–42.00	27	35.27	2.31	31.00–40.00	58	35.77	2.46	30.00–42.00
14	20	36.30	2.84	30.00–41.00	14	36.62	2.87	32.00–41.80	34	36.43	2.81	30.00–41.80
15	–				2	34.50	0.70	34.00–35.00	2	34.50	0.70	34.00–35.00
16	–				–				–			
Total	171	31.80	4.33	23.00–42.00	137	31.85	4.18	22.50–41.80	308	31.82	4.26	22.50–42.00

TABLE 12
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE LEG OF THE GIRLS IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max	N	\bar{X}	SD	min–max
6	5	25.50	2.82	23.00–29.00	–				5	25.50	2.82	23.00–29.00
7	20	26.17	2.30	21.00–31.00	16	25.63	2.30	21.00–29.50	36	25.93	2.28	21.00–31.00
8	20	28.68	2.09	25.00–32.70	14	27.14	1.31	25.00–29.00	34	28.05	1.95	25.00–32.70
9	20	29.19	2.45	26.00–34.00	12	29.50	2.62	26.00–35.00	32	29.31	2.47	26.00–35.00
10	24	31.49	2.52	28.00–38.00	20	29.62	2.56	25.60–33.50	44	30.64	2.68	25.60–38.00
11	24	33.12	2.32	28.00–38.00	16	32.25	2.30	26.00–37.00	40	32.77	2.32	26.00–38.00
12	38	33.75	2.50	29.70–42.00	11	34.77	2.02	31.00–37.50	49	33.98	2.42	29.70–42.00
13	25	35.92	1.52	32.00–40.00	20	34.75	2.34	29.00–38.00	45	34.94	1.91	29.00–40.00
14	16	34.88	2.18	28.00–37.60	14	35.57	1.61	33.00–38.00	30	35.20	1.94	28.00–38.00
15	1	32.50	–	–	1	35.00	–	–	2	33.75	1.76	32.50–35.00
16	1	33.00	–	–	–				1	33.00	–	–
Total	194	31.66	3.76	21.00–42.00	124	31.15	4.10	21.00–38.00	318	31.47	3.90	21.00–42.00

children were significantly lower ($p < 0.01$)¹⁶. In the present study, leg lengths of boys were longer than that of girls in 9, 10, 13, and 15-year-old age groups. However, the differences were not statistically significant. In 8 and 10-year-old groups, there was a significant difference between urban and rural areas for both males and females. The urban students had a greater mean of leg length compared to the ones at rural areas for the age group of eight and ten. The differences were significant.

In Malatya, the foot lengths were longer than girls in 7 and 9 years old boys from an urban area¹⁷. A significant difference was found between ages for foot length from 6 to 12-year-old groups in the middle part of Turkey¹⁸. For Javanese, Japanese and Filipinos, the length of foot of boys were found to be longer than that of girls¹⁹. In the present study, in 13 and 14-year-old

groups, foot lengths of boys were longer compared to the girls both in urban and rural areas ($p < 0.05$). This was similar to the data that there is significant sex dimorphism beginning at the age of 14, and continuing to adulthood with higher means in males²⁰. The male students' foot length was greater in the female students²¹.

The means of all measurements in both genders increased with age. This result was expected, and similar to many other researches^{10,13,15,21}.

As a conclusion, the lengths of lower and upper extremities of children were different even within the same country. The reasons for the differences could not be stated in the current study, because it was cross-sectional and not preferred in determining cause-effect relation. In fact, we did not look for the reasons, because the data collected for this study was the first one for the

TABLE 13
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE FOOT OF THE BOYS
IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	3	17.36	2.00	15.30–19.30	–				3	17.36	2.00	15.30–19.30
7	17	18.67	0.84	17.40–20.40	15	19.25	1.61	16.50–22.50	32	18.94	1.27	16.50–22.50
8	20	19.51	1.36	16.00–22.00	14	19.46	1.07	18.00–21.60	34	19.49	1.23	16.00–22.00
9	20	20.56	2.31	12.80–25.00	13	20.85	1.15	18.60–22.40	33	20.67	1.92	12.80–25.00
10	19	21.47	1.23	19.00–23.80	20	20.88	1.31	18.00–23.30	39	21.17	1.29	18.00–23.80
11	24	21.97	1.58	19.00–24.90	13	22.44	1.72	20.00–25.00	37	22.14	1.63	19.00–25.00
12	17	22.51	2.10	17.60–26.00	19	23.00	2.11	19.30–27.00	36	22.79	2.09	17.60–27.00
13	31	23.90	2.16	16.00–27.50	27	24.02	1.68	20.30–27.00	58	23.96	1.93	16.00–27.50
14	20	23.99	2.94	13.60–27.60	14	24.43	1.42	21.60–27.30	34	24.17	2.41	13.60–27.60
15	–				2	24.70	0.42	24.40–25.00	2	24.70	0.42	24.40–25.00
16	–				–				–			
Total	171	21.70	2.68	12.80–27.60	137	22.04	2.42	16.50–27.30	308	21.85	2.57	12.80–27.60

TABLE 14
MEAN (\bar{X}), STANDARD DEVIATION (SD), MINIMUM (MIN) AND MAXIMUM (MAX) VALUES OF THE FOOT OF THE GIRLS
IN THE URBAN AND RURAL PRIMARY SCHOOLS

Age	Urban				Rural				Total			
	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max	N	\bar{X}	SD	min-max
6	5	16.24	1.94	17.70–22.50	–				5	16.24	1.94	17.70–22.50
7	20	18.20	1.35	14.70–21.00	16	18.72	1.08	16.30–20.00	36	18.43	1.25	14.70–21.00
8	20	19.60	1.13	17.30–21.40	14	19.47	1.34	17.60–21.60	34	19.55	1.20	17.30–21.60
9	20	20.57	1.30	18.70–24.00	12	20.46	1.31	18.00–22.30	32	20.53	1.29	18.00–24.00
10	24	20.95	1.35	19.00–25.00	20	21.42	2.20	18.30–28.80	44	21.16	1.78	18.30–28.80
11	24	21.91	1.16	19.50–24.00	16	21.56	1.12	18.60–23.00	40	21.77	1.14	18.60–24.00
12	38	22.86	1.46	21.00–28.00	11	23.36	1.27	21.60–25.50	49	22.97	1.42	21.00–28.00
13	25	23.07	1.51	21.20–28.80	20	22.86	1.33	20.00–24.80	45	22.98	1.42	20.00–28.80
14	16	22.93	1.14	21.50–25.20	14	23.40	0.98	21.00–24.30	30	23.15	1.08	21.00–25.20
15	1	22.80	–	–	1	24.30	–	–	2	23.55	1.06	22.80–24.30
16	1	22.50	–	–	–				1	22.50	–	–
Total	194	21.40	2.09	14.70–28.80	124	21.30	2.14	16.30–28.80	318	21.41	2.11	14.70–28.80

region and it might be useful for further regional studies or for national comparisons. More studies designed with bigger sample sizes that cover many cities belonging to the same region of the country are needed. In addition

to cross-sectional studies, longitudinal studies may give more useful knowledge for understanding the growth of children.

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DUŽINA UDOVA KOD OSNOVNOŠKOLACA U GRADU U ZAPADNOM DIJELU TURSKJE

SAŽETAK

Antropometrija se koristi za procjenu rasta. Među antropometrijskim mjerama, težina, visina, opseg nadlaktice, te dužina donjih i gornjih udova, jesu najvažnije mjere koje govore o razvoju školske djece. Cilj ove studije je bio izmjeriti dužinu gornjih udova (nadalaktica, podlaktica, šaka) i dužinu donjih udova (natkoljenica, potkoljenica, stopalo) djece koja pohađaju osnovnu školu u Aydinu, gradu u zapadnoj regiji Turske, te ispitati postoje li razlike s obzirom na spol i područje u kojem djeca žive (grad, selo). Među promatranim dobnim skupinama pronađene su razlike s obzirom na spol i područje u kojem djeca žive. Razlike su pronađene i prilikom usporedbe rezultata s drugim studijama na različitim područjima Turske. Podaci iz ove studije jesu prvi za ovo područje i mogu biti korisni za daljnje regionalne studije ili za usporedbu na nacionalnoj razini. Potrebne su dodatne studije koje bi imale veći uzorak i obuhvatile mnoge gradove iz iste regije. Uz presječne studije, longitudinalne studije još bi više doprinjele saznanjima o rastu djece.