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Distribution of Subcutaneous Fat Tissue in 9-15-Year-Old Schoolchildren from Sofia

Z. Mitova

Institute of Experimental Morphology and Anthropology, Bulgarian Academy of Sciences, Sofia

In the present study the intersexual and inter-age differences in the topical distribution of subcutaneous fat tissue in 9-15 year-old schoolchildren was evaluated anthropometrically. The investigation was carried out during 2001-2003 in three Sofia schools. The results obtained show that between 9 and 14 years of age clearly expressed, non-changing and sex-determined differentiation of subcutaneous fat tissue distribution across trunk and extremities has not yet occurred. The sexually associated differentiation, typical of adults, begins in the 15th year both for boys and girls.

Key words: skin folds, body fat distribution, intersexsual differences.

Introduction

Intensive changes in the human body configuration and composition occur during the "border period" between childhood and adulthood — the puberty period. These changes are markedly manifested in the thickness of subcutaneous fat tissue and contribute to the typical of adult males and females anthropometrical characteristics [1, 2].

The aim of the present study is to evaluate anthropometrically, the intersexual and inter-age differences in the topical distribution of subcutaneous fat tissue in 9-15-year-old schoolchildren. This age period includes the end of pre-pubertal and the pubertal ages.

Material and Methods

The investigation was carried out during 2001-2003 in three Sofia schools.

Nine skin folds (SF) of the trunk and extremities in 566 boys and 570 girls (9-15 years of age), were measured with a Holtan caliper. The typical features in the topical distribution of subcutaneous fat tissue (SFT) were evaluated:

• the relative share of the thickness of each skin fold to the total quantity of the measured SFT [($\bar{X}$ thickness of every skin fold• 100)/($\bar{X}$ total sum from thickness of 9 SF)];

• the comparison between the relative share of the thickness of 4 SF on the trunk (subscapular SF + suprailiac SF + 10^{th} rib SF + abdominal SF) and 4 SF on the extremities (triceps SF+ biceps SF+ thigh SF + medial calf SF), as opposed to their total sum (8 SF).

The statistically significant differences were evaluated by the Student's t-test ($p<0.05$).

Results and Discussion

The results show that there are no significant intersexual and inter-age differences of the ratio (skin fold thickness)/(total SFT thickness) in the age interval 9-15yr., (Table. 1, 2).

Table 1. Absolute values (mm) of skin fold thicknesses

Skin folds	Boys							Girls						
	Age (years)							Age (years)						
	9	10	11	12	13	14	15	9	10	11	12	13	14	15
	n 81	n 80	n 82	n 84	n 80	n 83	n 80	n 81	n 80	n 80	n 85	n 83	n 82	n 82
subscapular	8.4	9.1	11.1	10.1	9.7	10.1	9.4	10.3	11.5	11.4	10.2	12.2	13.7	12.4
10^{th}- rib	6.1	6.2	7.4	6.8	7.0	7.4	7.6	7.5	8.7	8.6	7.6	9.6	10.3	9.5
suprailiac	7.1	7.4	8.5	7.6	8.0	8.7	8.3	8.6	10.1	10.3	9.3	10.9	11.3	10.9
abdomen	13.2	14.0	16.1	14.0	14.4	15.2	13.8	15.0	17.8	17.7	16.3	18.3	20.4	19.3
triceps	10.5	10.6	12.2	11.1	11.3	10.8	9.5	12.4	13.1	12.9	12.6	13.9	14.2	1.2
biceps	6.0	5.9	6.8	5.8	5.7	5.4	4.36	6.5	7.2	6.9	6.3	6.9	7.1	6.3
forearm	6.2	6.3	6.2	5.9	5.7	5.6	5.0	6.7	6.5	6.7	6.1	6.9	7.0	6.4
thigh	16.7	16.7	19.9	17.1	18.0	17.5	14.7	20.4	21.1	21.8	20.2	22.5	24.1	23.8
calf	12.1	12.0	14.7	13.5	14.2	13.9	11.7	14.6	15.7	16.9	15.6	17.7	18.1	16.6
Sum of 9 SF	86.7	88.0	102.7	91.8	93.9	94.6	84.4	102.0	111.7	113.1	104.1	119.0	126.2	119.4

Table 2. Relative share (%) of skin fold thicknesses

Skin folds	Boys							Girls						
	Age (years)							Age (years)						
	9	10	11	12	13	14	15	9	10	11	12	13	14	15
	n 81	n 80	n 82	n 84	n 80	n 83	n 80	n 81	n 80	n 80	n 85	n 83	n 82	n 82
subscapular	9.7	10.0	10.3	10.3	10.0	10.6	11.2	9.5	9.8	9.7	9.7	10.0	10.6	10.3
10^{th}-rib	7.0	6.9	7.0	7.2	7.5	7.9	9.0	7.0	7.2	7.2	7.2	7.9	7.9	7.9
suprailiac	7.8	8.1	8.0	8.1	8.4	9.0	9.4	8.2	8.9	8.9	8.8	9.0	8.9	8.9
abdomen	14.7	15.3	15.3	14.9	15.2	15.9	15.9	14.4	15.7	15.6	15.6	15.4	16.3	16.0
triceps	12.6	12.4	12.3	12.5	12.1	11.6	11.3	12.5	12.0	11.6	12,1	11,7	11,3	12,0
biceps	7.1	6.8	6.8	6.4	6.1	5.9	5.3	6.6	6.5	6.1	6.0	5.9	5.6	5.3
forearm	7.9	7.7	6.6	7.0	6.6	6.5	6.4	7.1	6.3	6.3	6.1	6.0	5.7	5.5
thigh	19.2	19.1	19.4	18.7	19.0	18.2	17.4	20.3	19.3	19.7	19.6	19.3	19.4	20.3
calf	14.1	13.7	14.4	14.9	15.2	14.5	14.1	14.5	14.3	15.0	15.0	15.0	14.4	13.9

Table 3. Distribution of SFT on the trunk and extremities

Boys														
Age	**9**		**10**		**11**		**12**		**13**		**14**		**15**	
	mm	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**
trunk - 4SF	39	43	40	44	40	43	41	44	41	44	43	46	46	49
extremities - 4 SF	53	57	52	56	53	57	52	56	52	56	50	54	48	51
Suma - 8 SF	92		92		93		93		93		94		94	
Girls														
Age	**9**		**10**		**11**		**12**		**13**		**14**		**15**	
	mm	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**	**mm**	**%**
trunk - 4SF	39	42	42	44	41	44	41	44	42	45	44	46	43	46
extremities - 4 SF	54	58	52	56	52	56	53	56	52	55	51	54	51	54
Suma - 8 SF	93		94		94		94		94		94		95	

However, the 15-year- old children already exhibit the SFT distribution characteristic of the adults — males have larger relative share of trunk SFT, while adult females have larger one on the extremities. For example, the 15 yr boys display a larger relative thickness of skin folds on the chest (subscapular and 10th rib) and around area suprailiaca (Fig. 1, 2, 3). Through the age-period 10-15yr girls show a larger relative SFT in the medium part of the abdomen at the umbilicus level.

When the upper extremities are considered, the relative SFT in both sexes is lower with increasing age. This process is more clearly expressed in the boys, which have thicker skin folds on the upper arm and forearms. Increasing SFT is observed in girls after the age of 14. This is illustrated by the crossed curves on the figures showing the relative share of the thickness of the triceps by years (Fig. 4).

Specific intersexual differences of relative SFT on the lower extremities (Fig. 5) are manifested in the skinfolds of the thigh. Throughout the studied age period, girls though not significantly display a larger relative SFT of the thigh than boys. At the age of 15 the intresexual differences for this features show greatest values as compared to the other analyzed features.

A general evaluation of the topical distribution of SFT on the trunk and the extremities may be obtained by the comparison between the relative share of the sum of thicknesses of 4 SF on the trunk and 4 SF on the extremities (Table 3 and Fig. 6).

Through the investigated age period (9-14yr) girls display a larger relative SFT on the trunk and the boys on the extremities. Between 14 и 15 yr the age-curves are crossed, illustrating that the thickness of SFT on the trunk is already larger in boys and the girls on the extremities.

Conclusions

The results obtained show that between 9 and 14 years of age clearly expressed, non-changing and sex-determined differentiation of subcutaneous fat tissue distribution across trunk and extremities has not yet occurred. The sexually associated differentiation, typical of adults, begins in the 15th year both for boys and girls.

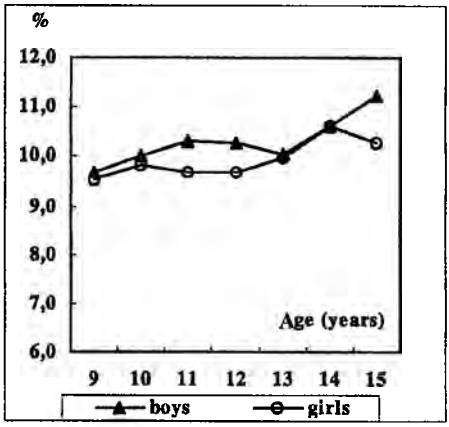

Fig. 1. Subscapular SF

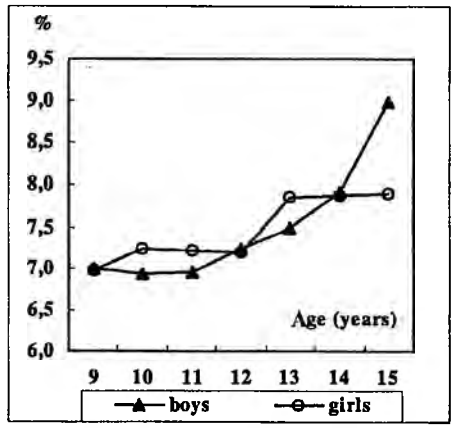

Fig. 2. 10^{th} — rib SF

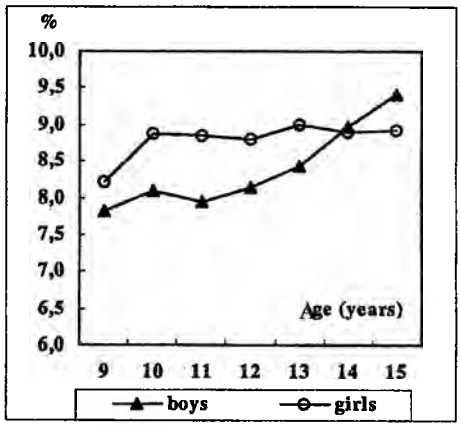

Fig. 3. Suprailiac SF

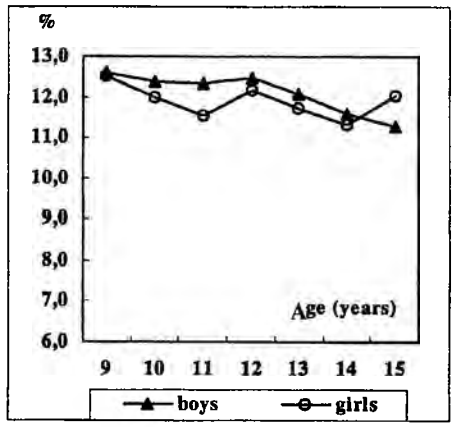

Fig. 4. Triceps SF

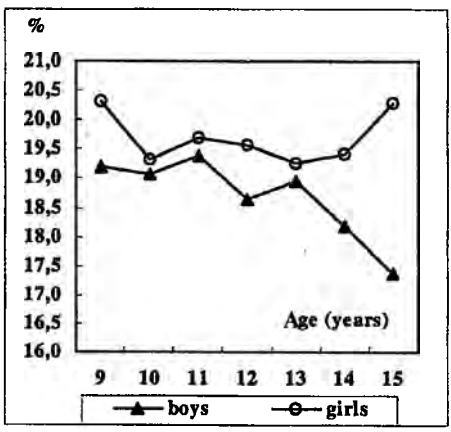

Fig. 5. Thigh SF

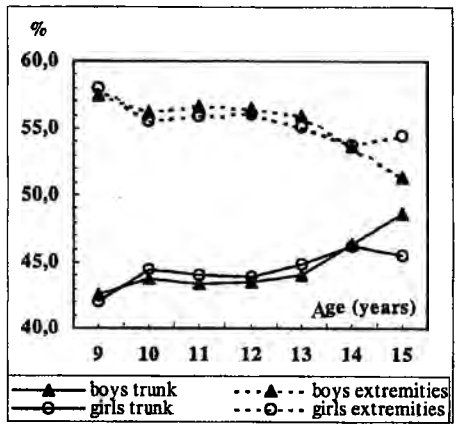

Fig. 6. Distribution of the SFT on the trunk and extremities

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