

Subcutaneous fat tissue - age and sex differences in 7 and 9 years old children (according to a longitudinal study)

Ts. Kazakova, E. Lazarova, L. Yordanova, D. Paskova-Topalova

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

The subcutaneous fat tissue's quantity and distribution in boys and girls at 7 and 9 years of age, as well as their intersexual and interage differences are studied comparatively in the present work. The data we discuss are an initial stage of a going on longitudinal investigation of school boys and school girls aged from 7 to 18 years, that is carried out in three schools in Sofia City. Ten standard skin-folds are measured. The middle values of the upper extremities' skin-folds, the lower extremities' skin-folds, thorax skin-folds and abdomen skin-folds and calculated too. The skinfolds thickness increase for both sexes during the ages. The skinfolds are thicker in girls at 7 and at 9 years of age. The relative share of the subcutaneous fat tissue reduces on the upper limb and the thorax, increase on the abdomen and the lower limb for both sexes.

Key words: longitudinal investigation, subcutaneous fat tissue, age and sex differences.

Introduction

The questions connected with genetic determination, age sexual differences, and the degree of their manifestations during fixed periods of children and youth development, as well as the influence of nutrition-type and nutrition-quantity over the organism, and the importance of sports and manner of life for the growth and the development are of a big interest for the specialists working in the field of School Health Services, Age morphology, and Sports medicine [1, 3, 4, 5].

Four national investigations about physical development and physical ability of the population in Bulgaria from birth till 70 years of age are carried out [2, 6, 7]. Such large scale investigations, however, limit the possibilities of the detailed analysis about separate, strictly determined periods of the human ontogenesis, because of the little number of the investigated features, and the lack of the purposefulness of their choice.

The AIM of the present work is to investigate comparatively the intersexual and the interage differences of subcutaneous fat tissue's quantity and distribution during two years period in children at 7 and 9 years of age.

Material and Methods

A scientific team from the Department of Anthropology at the Institute of Experimental Morphology and Anthropology at the Bulgarian Academy of Sciences began a longitudinal investigation of children and youths from 7 till 18 years of age in 1993. Three schools - one in the centre, and two in the opposite areas of Sofia by lottery method were fixed for the implementation of the study.

In the present work we use the metrical data about one of the most informative characterizations of human physical status. The following 10 standard skinfolds (SF) on body and extremities are measured: SF-triceps, SF-biceps, SF-forearm, SF-subscapular, SF-axilla, SF-X-th rib, SF-suprailiac, SF-abdomen, SF-thigh, and SF-calf. The middle SF-values for the upper limb, the lower limb, the thorax and the abdomen, as well as their relative share of the total Subcutaneous fat tissue (SFT) quantity are calculated additionally in order to evaluate the topical distribution of the SFT on these corresponding body areas in intersexual and interage aspects.

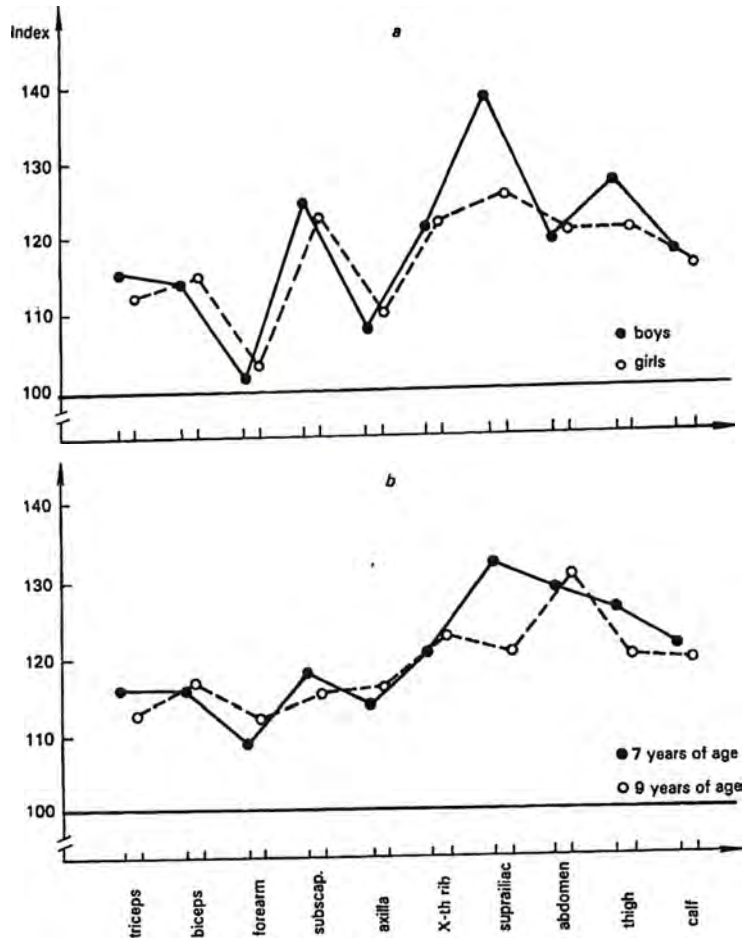


Fig. 1. Subcutaneous fat tissue — age and sex differences in 7 and 9 years old children
a — interage differences; *b* — sexual dimorphism

The differences between both sexes we assess according to the index about sexual dimorphism calculated by the formula:

$$\frac{\text{Values of the respective SF in girls}}{\text{Values of the respective SF in boys}} \times 100$$

The interage differences we assess according to the index about the age-growth by the formula:

$$\frac{\text{Values of the respective SF in 9 years old children}}{\text{Values of the respective SF in 7 years old children}} \times 100$$

The data valuation and analysis we made by the variation-statistical method, and the statistical significance of the established differences we assess by Student T-criterion at the level $P < 0.05$.

Results and Discussion

The data analysis about separate skinfolds shows that the SF-thickness increases with the age, and the growth is bigger for the skinfolds on thigh, on calf, on abdomen and on triceps (Table 1). It is established also that in both age groups the girls have significantly bigger quantity of subcutaneous fat tissue on the responsible area. The indexes for the intersexual differences we use give us a possibility to classify the sexual-differentiative meaning of every skinfold (Table 2). The biggest differentiative meaning have: SF-abdomen and SF-X-th rib; a middle sexual-differentiative meaning have: SF-thigh, SF-calf, and SF-suprailiac; followed by the SF-axilla and SF-biceps. The rest of skinfolds: on the upper limb and back have also a statistical significant sexual-differentiative meaning, although it is relatively more weak by them.

The interage differences are weaker than the intersexual ones (Table 1). The thickness of all the skinfolds increases during the ages. The indexes' data, out of a general analysis, show that subcutaneous fat tissue on triceps, subscapular, suprailiac, thigh and calf areas increase more markedly in schoolboys, while the SFT on forearm, axilla, thigh and calf areas increase more markedly in the schoolgirls during this two years period (Fig. 1).

Clearer idea about the topical distribution of subcutaneous fat tissue on separate body areas give the relative share of the middle skinfolds for upper extremity, lower extremity, thorax and abdomen (Table 2).

Table 1. Indexes about sexual dimorphism and interage differences

No	Skinfolds (SF)	Sexual dimorphism		Interage differences	
		7 years of age	9 years of age	boys	girls
1	Triceps	116.14	113.23	115.49	112.59
2	Biceps	116.44	116.96	114.19	114.70
3	Forearm	109.14	111.83	100.93	103.42
4	Subscapular	118.44	115.65	124.65	121.71
5	Axilla	113.67	116.17	108.33	110.71
6	X-th Rib	120.69	122.05	120.92	122.29
7	Suprailiac	131.97	119.65	138.22	125.32
8	Abdomen	129.21	130.45	118.92	120.07
9	Thigh	126.13	120.16	126.52	120.53
10	Calf	121.32	119.40	117.59	115.73

T a b l e 2. Average skinfolds and their per cent distribution on thorax and extremities

No	Average skinfolds (ASF), mm	7 years of age				9 years of age					
		boys	girls	T-cr	per cent from total ASF		boys	girls	T-cr	per cent from total ASF	
					boys	girls				boys	girls
\bar{x}	\bar{x}				\bar{x}	\bar{x}					
1	upper limb	6.34	7.25	2.68	22.10	20.68	7.05	8.02	2.77	20.47	19.45
2	thorax	4.89	5.75	9.58	17.04	16.40	5.79	6.81	2.37	16.81	16.51
3	abdomen	6.36	8.28	4.48	22.17	23.62	7.97	10.08	2.89	23.14	24.44
4	lower limb	11.10	13.78	7.51	38.69	39.30	13.63	16.33	3.65	39.58	39.60
	total four ASF	28.69	35.07	5.25			34.44	41.24	3.04		

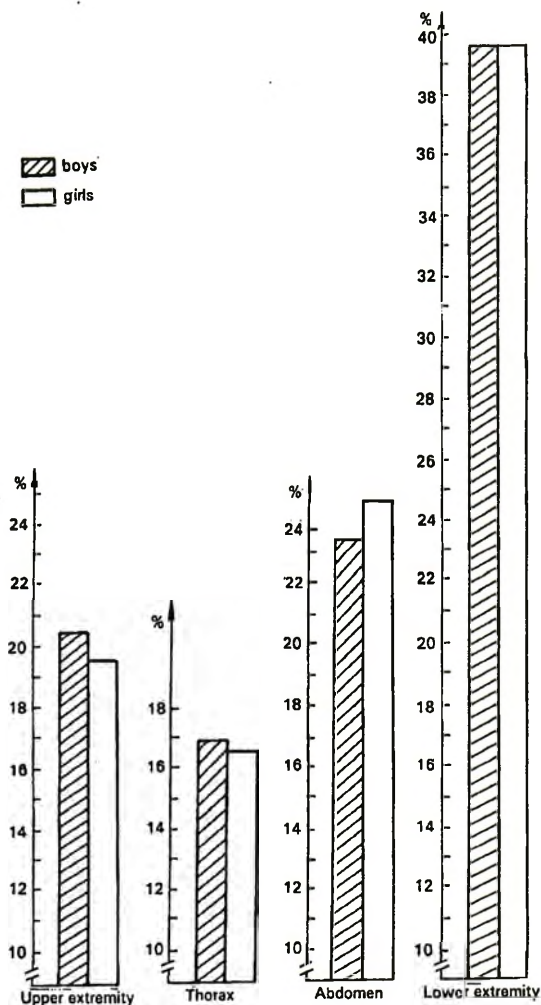
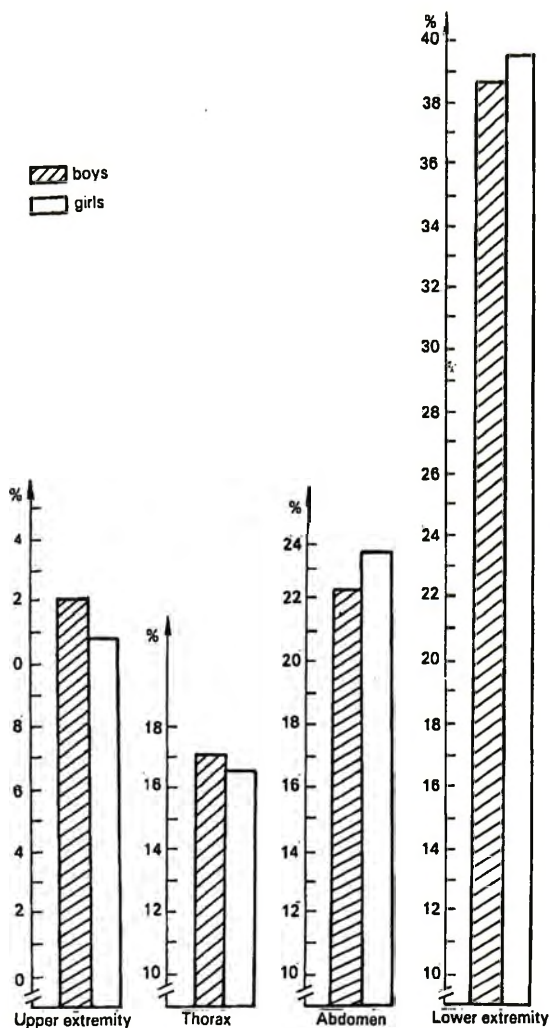


Fig. 2. Intersexual differences of the SFT relative share in 7 years old children

Fig. 3. Intersexual differences of the SFT relative share in 9 years old children

The formula about middle skinfolds' classification according to the SF-thickness in both sexes and both age groups is: lower limb > abdomen > upper limb > thorax. It shows that SFT has its biggest relative share on the lower limb, followed by the SF-abdomen, SFT-upper limb and SFT-thorax. (Figs 2 and 3).

According to the intersexual analysis for both age groups of children, the boys have more subcutaneous fat tissue on the upper limb and the thorax, and the girls - on the abdomen and the lower limb (Figs 4 and 5). The type of SFT-distribution according to the intersexual aspect resemble very much the type of SFT-distribution in adults. It shows that even at this age the quantitative distribution of subcutaneous fat tissue has a sexual-differentiative importance.

Conclusions

1. The skinfolds' thickness increase with the age in both sexes.
2. The girls have thicker skinfolds than the boys in both age groups.
3. The subcutaneous fat tissue has sexual-differentiative importance from an early age (7-8 years of age). Boys have relative more subcutaneous fat tissue on the upper limb and the thorax, and the girls - on the abdomen and the lower limb.

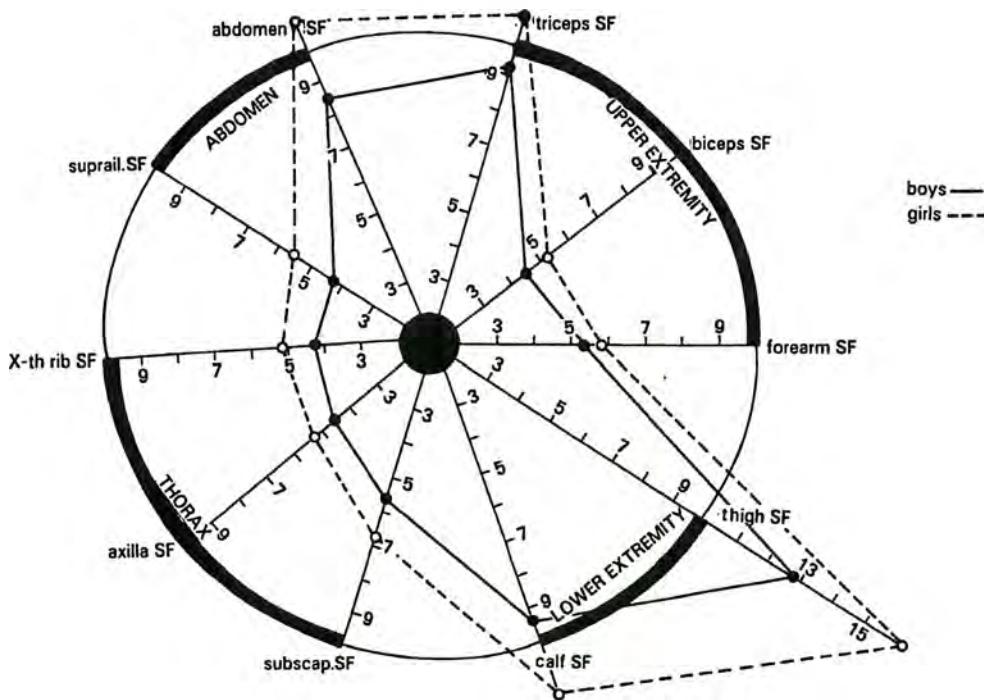


Fig. 4. Intersexual differences of the skinfolds' thickness in 7 years old children

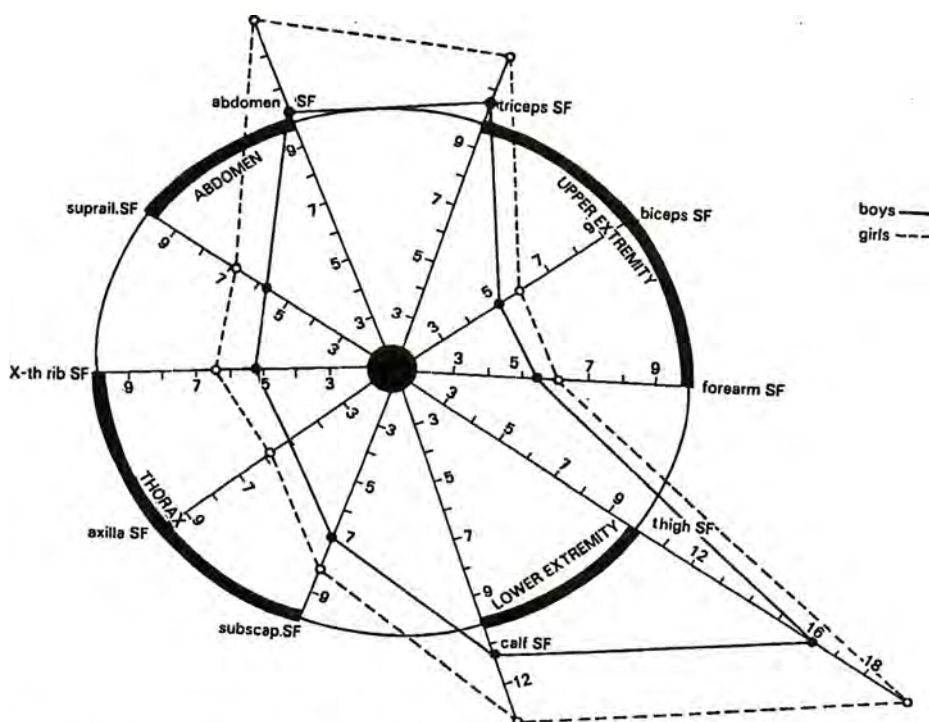


Fig. 5. Intersexual differences of the skinfolds' thickness in 9 years old children

References

1. Deurenberg, P., J.A. Weststrate, J.C. Seidel. Body mass index as a measure of body fatness: age- and sex-specific prediction formulas. - *British Journal of Nutrition*, 65, 1991, 105-114.
2. Каданов, Д., Ст. Мутафов, В. Чалманов. Таблици за телесните размери. Пропорции и индекси на българските деца и подрастващи от 3- до 18-годишна възраст, с различен и еднакъв ръст. С., БАН, 1979, с. 90.
3. Начева, А., Н. Кондова, В. Лъчева, Е. Лазарова. Преразпределение на подкожната мастна тъкан по тялото и крайниците при момчета в периода на растежа. - *Медико-биологически и педагогически аспекти на физическото възпитание*. В. Търново, УИ „Св. Св. Кирил и Методий“, 1994, 25-29.
4. Миклашевская, Н. Н., С. Соловьева, Е. З. Година. Ростовие процессы у детей и подростков. М., МГУ, 1988, 184.
5. Слънчев, П., Б. Янев, Ф. Генев, П. Щерев, П. Боев, Д. Сепетлиев, Б. Захариев. Физическо развитие, физическа дееспособност и нервно-психична реактивност на населението на България. С., Нац. спортна акад., 1992, с. 336.
6. Тотева, М. соматипология в спорта. С., нац. спортна акад., 1992.
7. Янев, Б., П. Щерев, П. Боев, Р. Семерджиева, Д. Сепетлиев. Физическо развитие и дееспособност на населението в България от раждане до двадесет и шест години. С., БАН, 1965, с. 261.
8. Янев, Б., П. Щерев, П. Боев, Ф. Генев, Д. Сепетлиев, Ф. Попов, Б. Захариев. Физическо развитие, физическа дееспособност и нервно-психична реактивност на населението на България от раждане до шестдесет години. С., Медицина и физкултура, 1982, 248.