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BODY SIZE, BODY COMPOSITION, AND SOME FUNCTIONAL PROPERTIES OF DEBRECEN GIRLS STUDYING AT HIGHER EDUCATIONAL INSTITUTES

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Abstract: *The authors carried out a longitudinal study in Debrecen (East-Hungary) girls. Out of the original sample 193 female students of different universities and colleges were studied recently. In this paper their body build and body composition as well as some of their functional abilities are presented. Differences of these characterestics in the different groups of female students were analyzed, too.*

Key words: *Female students; Longitudinal study; Differences of Body size; Functional properties.*

Introduction

The Debrecen longitudinal growth study included 259 girls born between 1965–68. We followed their growth and development between the age of 7 and 22 measuring them with the methods internationally applied, irrespective of whether they went in to higher education after secondary training, started to work or got married and become housewives. Choosing at random 100 individuals from this original mixed sample we have already reported about data obtained on the basis of longitudinal observations (Szöllősi–Jókay 1991, 1992).

Materials and Methods

The methods applied are described in our previous papers (Jókay 1982, Szöllősi–Jókay 1988). In the process of evaluation it became obvious and other publications referred to the fact as well as that the data of university and high-school students differ from the averages of the mixed sample (Gyenis–Till 1980, Szilárd 1978). Therefore we also worked up separately the parameters of 190 female students within the mixed sample and we found out the differences.

Later on differences between the students of several universities and high-schools were discovered therefore the sample was divided into four groups and the significance of differences between the first and the other groups was examined with *t*-test. The level of significance is recorded in the tables. In the sample investigated the first group was made up of students of Debrecen Medical University (DOTE), the second of those of Kossuth Lajos University of Sciences (KLTE), the third of those of Teachers' Training College (DTKF) whereas the fourth of those studying in Debrecen and other towns where we would have obtained low incidence rate the assessment of which would have been impossible.

Results

The averages of body measurements of *female students of 19–22* year are greater than those of the mixed sample. Their body weight only surpasses them significantly up to the age of 21–22. Despite this fact their lean body mass at all ages is greater than that of

Table 1. **Means and standard deviations of the body characteristics in Debrecen female students**

Age (year)	Hight (cm)		Weight (kg)		Lean Body Mass (kg)		Body Fat Content (%)	
	Mean ± SD	diff.	Mean ± SD	diff.	Mean ± SD	diff.	Mean ± SD	diff.
19	164.94 ± 5.59	+0.60	57.15 ± 7.70	+0.64	43.65 ± 5.14	+0.64	23.39 ± 2.95	+0.24
20	165.08 ± 5.70	+0.86	57.08 ± 7.50	+0.06	43.60 ± 4.91	+0.73	23.36 ± 2.90	–0.82
21	165.33 ± 5.68	+0.76	58.05 ± 7.46	+1.63	44.12 ± 4.66	+0.83	23.88 ± 3.06	+0.27
22	165.41 ± 5.30	+0.85	58.24 ± 7.71	+1.92	44.42 ± 5.15	+0.81	23.54 ± 2.81	–0.30

Age (year)	Chest circumference (cm) normal		inspiratory		expiratory		Vital Capacity (BTPS, l)		Mean hand strength* (N)	
	Mean ± SD	diff.	Mean ± SD	diff.	Mean ± SD	diff.	Mean ± SD	diff.	Mean ± SD	diff.
19	81.96 ± 4.74	+0.92	87.20 ± 4.82	+0.88	79.10 ± 4.94	+0.86	3.564 ± 0.440	+0.003	191.29 ± 40.27	+ 8.21
20	82.06 ± 5.35	+0.76	87.28 ± 5.16	+0.75	79.10 ± 5.22	+0.76	3.569 ± 0.468	–0.002	189.50 ± 44.60	– 0.65
21	82.73 ± 4.93	+1.04	87.74 ± 4.65	+0.86	79.56 ± 4.98	+0.79	3.562 ± 0.387	+0.045	191.52 ± 48.58	+ 6.80
22	82.74 ± 4.77	+0.39	87.90 ± 4.72	+0.84	79.77 ± 4.93	+0.55	3.505 ± 0.358	+0.001	171.66 ± 51.22	–19.27

*Calculated from averages of grip strength of the right and left hands

Table 2. **Differences among means (and SDs) of the body characteristics in Debrecen female students of different universities and colleges**

Age (year) / Group	1. DOTE (N=56)	2. KLTE (N=47)	3. DTKF (N=57)	4. Others (N=33)
Height (cm)				
19	166.50 ± 7.23	164.42 ± 6.54	163.94* ± 4.53	164.96 ± 2.55
20	166.61 ± 7.01	164.69 ± 5.20	163.74* ± 5.26	164.64 ± 4.46
21	166.21 ± 6.01	165.03 ± 4.92	163.19* ± 6.09	165.35 ± 4.79
22	166.99 ± 5.55	165.71 ± 3.98	164.17** ± 6.47	165.10 ± 3.48
Weight (kg)				
19	59.01 ± 7.86	56.50 ± 8.24	54.88** ± 6.97	59.43 ± 7.89
20	58.56 ± 8.52	57.79 ± 7.87	54.49** ± 6.81	57.10 ± 5.62
21	58.80 ± 8.45	57.18 ± 6.06	55.28** ± 5.09	60.00 ± 7.81
22	60.99 ± 7.99	56.84** ± 2.37	56.54** ± 7.87	56.63* ± 8.38
Lean body mass (kg)				
19	45.74 ± 5.39	42.57** ± 5.43	42.23*** ± 5.08	44.56 ± 4.31
20	45.14 ± 5.65	43.42 ± 4.87	42.00*** ± 4.60	43.19 ± 3.84
21	45.07 ± 5.11	43.35 ± 3.90	42.06*** ± 3.79	44.24 ± 5.00
22	46.49 ± 4.94	43.31** ± 2.03	43.31*** ± 5.84	43.96* ± 5.37

Table 2. **Continuation**

Age (year) / Group	1. DOTE (N=56)	2. KLTE (N=47)	3. DTKF (N=57)	4. Others (N=33)
Body fat content (%)				
19	22.58 ± 2.77	24.00* ± 2.78	22.94 ± 2.95	24.68** ± 3.58
20	22.67 ± 3.02	24.63*** ± 2.73	22.60 ± 2.80	24.11* ± 2.88
21	23.02 ± 3.55	24.10 ± 1.94	24.51 ± 2.82	26.08*** ± 2.46
22	23.50 ± 3.07	23.76 ± 2.93	23.35 ± 2.47	24.67 ± 2.81
Vital capacity (BTPS,l)				
19	3.698 ± 0.527	3.490* ± 0.361	3.531 ± 0.519	3.513* ± 0.260
20	3.696 ± 0.474	3.614 ± 0.492	3.452* ± 0.461	3.412* ± 0.440
21	3.580 ± 0.402	3.645 ± 0.370	3.536 ± 0.387	3.436* ± 0.365
22	3.507 ± 0.413	3.627 ± 0.207	3.493 ± 0.328	3.496 ± 0.288
Mean hand grip strength (N)■				
19	207.90 ± 49.20	171.91** ± 28.38	188.19 ± 42.81	201.33 ± 39.95
20	199.27 ± 42.46	184.76 ± 46.50	177.50* ± 42.76	195.74 ± 50.03
21	197.55 ± 47.41	174.51* ± 60.30	177.30* ± 33.62	207.66 ± 53.98
22	177.50 ± 52.27	164.85 ± 50.54	181.52 ± 46.94	214.18** ± 55.93

* Level of significance of deviation from the DOTE group's data

■ Calculated from the averages of the grip strength of the right and the left hands

DOTE: Debrecen University Medical School; *KLTE:* University of Sciences "Kossuth Lajos"; *DTKF:* Debrecen Teachers' Training-School; *Others:* other universities and high-schools

the mixed sample but their body fat content is lower at the age of 20 and 22. There is hardly any difference in vital capacity, except the fact that the decrease of values starts a year later that is only at the age of 22 as opposed to the age of 21 experienced in the mixed sample. The averages of hand strenght with the exception of the age group of 19 and 21 are lower than the data of the mixed sample despite the bigger lean body mass (*Table 1*).

Comparing means of the four students' groups it appeared that the *stature* of female students of DOTE is the highest at every age measured whereas that of the girls of DTKF is the shortest. The differences are significant. It can also be observed that students of KLTE grow continuously up to the age of 22. Regarding the *body weight* girls of DOTE are the heaviest except the age of 19 where the averages of the "others" group take the lead. The weight of students of DTKF is the least. The comparison of the *chest circumference* showed similar results to the body weight. Concerning the *lean body mass,* students of DOTE are again the first and they are followed by girls of the fourth group. The lowest values here, too, belong to the students of DTKF. As opposed to this fact the *body fat* content is generally the lowest in students of DOTE and DTKF, whereas it is the highest in those of the fourth group. The average *hand grip strenght* is the greatest in the girls of DOTE at the age of 19–20 but it decreases as the age is advancing thus they do not take the lead at 21–22. Results of the fourth group follow them in order surpass them at the age of 22. The data of KLTE and DTKF changing at various ages represent the lowest values. In *vital capacity* some differences can be observed in the rate of development between students of DOTE and other groups. At the age of 19–20 however, the values of the girls of DOTE are the highest, the decrease similarly to that in the mixed sample, begins already after the age of 20. In girls of other groups the decrease comes into being only later. In such a way, students of KLTE developing further, exceed the values of the girls of DOTE from 21 although theirs were the lowest at 19. Up to the age of 21 the averages of the other two groups are lower, too, but by 22 there is no significant difference between the groups (*Table 2*). The proportion of the overweight and obese female students differs from that of the original sample. The percentage division of the body fat content is demonstrated in *Table 3*. In the mixed sample it surpassed the values supposed to be normal between 20–25% in one quarter of girls of 19. From their age of 20, this proportion already made up 37%. Debrecen students show about the same results at 19, too, except the first group where this proportion is only 16.4%. From the age of 20 on, however, (with an exception of KLTE students) the proportion of fat does not grow a such a rate as that of the mixed sample: DOTE girls only make up 28.6% by the age of 22, that of the students of DTKF decrease from 19% to 15.7% while that of the girls of other high-schools is 30.3%. Within this there is difference in the proportion of the obese, too, which was 7% in the mixed sample and here it ranges between 0–3.6%. In girls of DTKF such a case did not occur at any age studied.

As a conclusion it can be said that Debrecen female students are taller (with the exception of DTKF) than the earlier average. They are 2 cm taller and more than 2.5 kg heavier than those measured by us one decade ago (Szöllősi–Jókay 1980). Girls of KLTE, however, grow up to the age of 22. The body composition is different from the average because up to the proportion of lean body mass the fat content is lower. It can particulary be experienced in DOTE and DTKF. Despite the bigger LBM the hand grip

Table 3. **Distribution of body fat percent (%)**

Group	Age (year)	Body fat percent					
		10—15	15.1—19.9	20—25	25.1—29.9	30—	25.1—30<
1. DOTE	19	—	9.1	74.5	16.4	—	16.4
	20	—	14.6	63.6	20.0	1.8	21.8
	21	1.8	16.1	53.6	26.8	1.8	28.6
	22	—	14.3	57.1	25.0	3.6	28.6
2. KLTE	19	—	4.3	69.6	26.1	—	26.1
	20	—	4.3	57.4	38.3	—	38.3
	21	—	4.3	55.3	38.3	2.1	40.4
	22	—	14.3	57.1	25.0	3.6	28.6
3. DTKF	19	—	16.7	59.2	24.1	—	24.1
	20	—	11.6	69.2	19.2	—	19.2
	21	—	7.7	76.9	15.4	—	15.4
	22	—	7.8	76.5	15.7	—	15.7
4. Others	19	—	12.1	63.7	21.2	3.0	24.2
	20	—	12.1	57.6	27.3	3.0	30.3
	21	—	9.1	60.6	27.3	3.0	30.3
	22	—	9.1	60.6	27.3	3.0	30.3

strength does not exceed the average, on the contrary, in girls of DOTE it shows decreasing tendency parallel with the years studied. It must be attributed to the intensive mental load because they do not have the time for doing sports. The bigger LBM value should mean the bigger volume of muscles, too. As it was already emphasized in our previous paper (Szöllősi–Jókay 1988) our hypothesis is that the reduced activity results some decrease in blood supply of the musculature and also in its hardiness. Due to the not proper way of life, declining of constitutional and functional parameters has already been experienced in students of Pécs and Budapest, too (Frenkl–Mészáros 1979, Szilárd 1978).

The VC is developed in accordance with the body measurements, moreover, the decrease of performance only starts later than the average. The proportion of the fat girls is much smaller compared to that of the mixed sample. In it the healthy way of nourishment may play an important role, since the students are more enlightened than the average youth. Supposing this we have to lay great emphasis on the necessity of intensive enlightenment of the youth in order to decrease the rate of risk factor of obesity in our people.

Summary

Debrecen female students (with the exception of those of Teachers Training College) are taller than the average. There is a group where they grow up to the age of 22. The body fat content is smaller up to the lean body mass but in spite of the bigger LBM the hand strength does not exceed the average. The VC is developed in accordance with the body measurements. The proportion of the fat is remarkably smaller compared to that of the mixed sample.

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