

Cherkasy National University, Ukraine*
Politechnika Opolska, Opole, Poland**

IVAN GLASYRIN*, JÓZEF WOJNAR**, VALENTYNA GLASYRINA*,
BOGDAN KHMELNYTSKY*

Peculiarities of the physical development of present pubertal girls

Charakterystyka rozwoju fizycznego współczesnych dziewcząt w okresie dojrzewania

INTRODUCTION

One of the most important educational tasks for the coming generation is to prepare them for the family life, providing the reproductive function [5]. The basic problem is the constant evaluation of the physical development of children, which is influenced by inner and outer factors, which can either accelerate or decelerate it and lead to other effects, e.g. certain pathology of physical, sexual, neurological and psychic development [1,4]. Among these pathologies are some especially important for the development of woman's organism as, reported by Arabska [2], partial or premature pubescence as well as dysgenesis of gonads in girls born with increased ratio of radionuclides in their placenta. Thus the investigation of physical development of girls aged 11 – 13 will be crucial to establish its contemporary tendencies.

MATERIAL AND METHODS

Physical and somatic development as well as pubertal period were assessed using the methods described by Glazyrin [5]. 210 healthy girls aged 10 – 13 from Cherkasy, Ukraine were studied.

RESULTS

Analysis of the development of the girls showed certain regularities of their formation. The height of girls aged 10 – 13 has considerably increased during the mentioned period from 140.24 cm to 154.75 cm, so girls grew 14.5 cm higher during 3 years (tab. 1). Analysis of the age dynamics of body length shows, that from 10 to 11 years, there is a noticeable increase of height up to 5 cm among the teenage girls. At the age of 11 – 12 years girls grew rather slowly, the length increased just by 1 cm. But the most intensive increase of the length (8.5 cm) was noticed in 12 – 13 years old girls.

Table 1. Physical development of girls aged 10 – 13 years, mean values ($M \pm m$)

Age	N	Height of body (cm)	Mass of body (kg)	Breast girth (cm)
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10	52	140.24±1.54	32.51±2.00	61.35±1.77
11	51	145.20±2.46	37.20±2.05	66.80±2.43
12	55	146.25±2.74	38.42±1.92	67.33±1.58
13	52	154.75±2.01	43.75±2.80	71.00±2.43

Reviewing the total increase of weight in the evaluated group, remarkable changes in the period from 10 to 13 yrs are observed, all girls gained more than 11 kg. From 10 to 11 yrs and from 12 to 13 yrs the increase of weight was more intensive (up to 5 kg), than in period from 11 to 12 yrs, when it was smaller (up to 1 kg). Total changes of thoracic circumference (TC) in girls of 10 – 13 years old were also considerable, up to 10 cm, during the study. The main physical dynamics of TC preserve the appropriateness of the previous indices, as from 10 to 13 and from 12 to 13 the total size of the body grew up to 5.5 and 4.5 cm, while from 11 to 12 it grew slower, only 0.5 cm. Comparing the contemporary data concerning development of total body size among the girls aged 10 – 13 years, with the corresponding data, reported by Vlastovsky [3] in the middle 1960-ties, one can admit that the present girls are considerably lighter and have smaller TC than those of the past century. The height of compared children didn't differ significantly (tab. 1 and 2).

Table 2. Physical development of 10 – 13 years old girls by Vlastovsky V.I.

Age	Height (cm)	Weight (kg)	Thoracic circumference (cm)
10	136.47±0.38	32.63±0.36	64.26±0.29
11	142.88±0.45	36.38±0.44	67.80±0.33
12	149.23±0.46	41.34±0.46	70.85±0.33
13	154.81±0.43	46.77±0.53	75.00±0.33

Up to 13 years both groups of girls presented equal length of the body, but the present ones are rather lighter (5 kg) and have smaller TC. The difference is statistically significant. One should point to the escalating dynamics of age changes of total sizes among the 10 – 13 years old girls at the beginning of the 21st century as well as more even progress of the growth parameters compared to the predecessors of the 1960-ties. Analysis of the pubescence process among the 10 – 13 years old girls, evaluated according to the forming stages of the secondary signs of puberty, showed that at the beginning of the age of 10 4,17% presented signs of forming signs of puberty, then the development progressed fast up to 13 years (56.46%). Thus up to 13 years more than 50% of present girls are already sexually mature (table 3).

Table 3. Parameters of puberty in girls aged 10 – 13 years

Age	N	Indices of puberty									
		P	% shaping	Ax	% shaping	Ma	% shaping	Me	% shaping	Point of puberty	% shaping
10	52	0.5	4.17	0.5	4.17	0.5	4.17	0.5	4.17	2.0	4.17
11	51	1.5	12.50	1.5	12.50	1.5	12.50	1.5	12.50	4.0	8.33
12	55	3.2	26.70	3.2	26.70	3.2	26.70	4.5	37.50	13.2	27.5
13	52	7.1	59.17	7.1	59.17	4.9	40.83	8.00	66.67	27.1	56.46

In present 10 years old girls, sexual maturity starts (for 4.17%) with the appearance of the secondary puberty signs. The following development of the sexual functions continues with the even dynamics and until 11 years the rate of formation doubles. At 12 years intensity of sexual maturity escalates threefold, especially it relates to menarche, where the highest pace was noticed and the rate rises to 37.50%. Till 13 years the same tendencies of sexual maturity are preserved, but with considerable slowing down of the formation of breast. For example the pubic and axillary hair appear in 59.17% of formation, menarche in 66.67%,

respectively the breasts were formed only in 40.83%. Our data oppose the data of Salnicova [6], that were gathered 25 – 30 years ago and suggested that puberty of girls starts at the age of 11 – 12 (appearance of pubic and axillary hair, beginning of breast formation) and the age of 13 is the midterm for the menarche appearance. We were also interested in the somatic development of 10 – 13 years old girls (table 4). It's remarkable that the development of muscles, bones and fat tissue is also accelerated. Thus the thigh circumference increased by 2 – 2.5 cm, the length of the arm by 3.0 cm, the length of the leg by 5.5 cm, the width of the shoulder became larger about 1.0 cm and of the thigh for 2.0 cm, the fat layer over different parts of the body also became thicker (1–4 cm). The difference in the most somatic parameters is statistically significant. At the same time we have to admit that in every year acceleration of the examined girls is significant but mostly even.

Table 4. Somatic development parameters of girls aged 10 – 13 years

Age	N	Parameters of somatic development								
		High circumference (cm)	Shoulder circumference (cm)	Length of the arm (cm)	Length of the leg (cm)	Width of shoulders (cm)	Width of thigh (sm.)	Fat layer on the abdomen (cm)	Fat layer on scapula (cm)	Fat layer on the triceps (cm)
10	52	38.07±0.83	19.09±0.95	60.10±1.02	80.77±1.00	5.89±0.58	7.11±0.72	12.47±0.69	8.77±0.97	12.00±0.81
11	51	38.80±0.90	20.00±0.68	61.00±1.16	82.50±1.69	6.05±0.20	7.80±0.30	13.63±1.21	9.13±0.85	13.38±0.62
12	55	39.92±1.15	20.83±0.77	63.67±1.43	85.17±2.19	6.54±0.45	8.10±0.06	14.70±1.38	8.40±0.85	14.60±1.25
13	52	40.17±1.31	22.67±0.89	63.17±2.06	86.25±2.13	6.91±0.31	9.00±0.85	15.11±1.57	9.56±0.84	16.22±1.29

Comparison of somatic development of the present 10 – 13 years old girls and those who lived 35 – 40 years ago, noted by Vlastovsky [3], reveal certain differences in the outer characteristics and the formation dynamics of the given parameters (table 4,5).

Table 5. Somatic development parameters of girls aged 10 – 13 years by Vlastovsky V.G [3]

Age	N	Parameters of somatic development								
		Thigh circumference (cm)	Shoulders circumference (cm)	Length of the arm (cm)	Length of the leg (cm)	Width of the shoulder (cm)	Width of the thigh (cm)	Fat layer on the abdomen (cm)	Fat layer on the scapula (cm)	Fat layer on the triceps (cm)
10	52	43.70±0.28	21.21±0.15	59.15±0.20	73.63±0.26	-	-	17.55±0.59	-	-
11	51	45.26±0.31	21.51±0.17	61.87±0.23	77.87±0.31	-	-	17.29±0.66	-	-
12	55	47.84±0.32	22.53±0.15	64.92±0.23	81.65±0.30	-	-	22.50±0.59	15.26±0.32	-
13	52	50.45±0.34	24.02±0.17	67.32±0.21	84.42±0.30	-	-	23.17±0.65	15.93±0.42	-

Although our 10 years old girls present rather smaller thigh (5.6 cm) and shoulder (2.0 cm) circumference as well as the thinner fat layer over the abdomen (5.0 cm), at the same time the length of arm (1 cm) and leg (7 cm) is larger than in those of the past century. The difference of indices is statistically significant. Up to 13 years the following of the somatic signs formation among the girls are preserved, except the length of the arm. Thus during the last 35-40 years the structure and the shape of the body of 10 – 13 years old girls changed, resulting in lengthening of the legs and the shortening of the trunk as well as in decreasing of the girth indices, because of the decreasing of the fat layer in the examined girls.

CONCLUSIONS

In the development of the height, weight and the thoracic circumference in the girls aged 10 – 13 yrs certain regularity is observed as well as its acceleration in the period of 10 to 11 and 12 to 13 years together with the stabilization of growth at the age of 11 – 12 years. Be-

sides, present girls aged 10 – 13 do not differ in height but present smaller parameters of weight and TC, when compared to girls of the same age, who lived 35 – 40 years ago

Among the 10 – 13 years old girls puberty develops evenly with acceleration of menarche and slower development of breasts. The pubescence begins at 10, which is 1 – 2 years earlier, than of those in the seventies of the past century. 56 % of girls at the age of 13 reach complete sexual maturity. Somatic development of present girls aged 10 – 13 progresses evenly and gradually, but with some differences as compared to girls of the same age in the 60-ties of the past century. Changes in the structure and shape of the bodies during the last 35 – 40 years resulted in lengthening of the legs and shortening of the trunk as well as decreasing of the fat tissue continece in the examined girls.

LITERATURE

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SUMMARY

The authors investigated physical development of pubertal girls. It was determined, that the girls at the age of 10 – 13 years do not actually differ in height from those who lived 35 – 40 years ago but their weight and their thoracic circumference is smaller. Their puberty develops evenly but the acceleration of menarche and smaller size of breasts is observed. Pubescence starts at the age of 10, which is 1 – 2 years earlier then in the girls in the seventies of the past century. It was observed that during the last 35 – 40 years the girls at the age of 10 – 13 years showed lengthening of legs, shortening of trunk as well as decreasing fat component in their bodies.

STRESZCZENIE

Autorzy badali rozwój fizyczny dojrzewających dziewcząt. Stwierdzono, że wzrost dziewczynek w wieku 10 – 13 lat nie różni się wyraźnie od wzrostu dziewczynek sprzed 35 – 40 lat, ale ich masa ciała i obwód klatki piersiowej (biustu) jest mniejszy. Ich dojrzewanie przebiega tak samo, natomiast obserwuje się wcześniejsze występowanie pierwszej miesiączki i mniejszy rozmiar biustu. Dojrzewanie rozpoczyna się w wieku 10 lat, czyli o 1 – 2 lata wcześniej niż u dziewcząt w latach siedemdziesiątych XX wieku. Stwierdzono, że w trakcie ostatnich 35 – 40 lat u dziewczynek w wieku 10 – 13 lat doszło do wydłużenia kończyn dolnych, skrócenia tułowia oraz zmniejszenia objętości tkanki tłuszczowej.