

THE CHARACTERISTIC OF PHYSICAL DEVELOPMENT OF THE POPULATION UNDER INFLUENCE OF THE ANTHROPOGENIC FACTORS

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Summary: Having analyzed features of physical development of the teenagers in a zone of the radiation control and intensive agriculture, in comparison with the teenagers from ecologically clean regions, it is necessary to note, that the parameters of proportionality do not fall outside the limits of the established age norms. It is possible to explain their decrease (at the expense of reduction of weight in the majority examinees) by intensive growth of a skeleton in length and smaller rates of muscles development. We have not revealed essential differences of the parameters depending on the residence of the examinees. As to the adults, weight-growth parameters of the men from the zone of the radiation control exceed reference parameters (due to the greater height, weight and thorax measurements). All examinees of the control group and men, engaged in agrarian sector, belong to a normal type, and the women of the last group have the lowest weight and height parameters.

Key words: body mass indexes, teenagers, radiation, pesticides

A number of derivative indexes and figures are taken into account for the purpose of evaluation of body proportions and harmony of development. The indexes that were suggested during previous years had specified values of the figure for all children or definite age groups. Contemporary indexes do not limit the evaluation of the child development up to one figure. They are used on equal terms with regional standards built according to the sex and age, which made them more accurate and valuable (Калиниченко 2009, Романенко 2012, Сергиенко 2013, Cole et al 2007, Reiman et al. 2009) The comparison of the results of physical development and physical preparedness of the schoolchildren, which reside on the radiation polluted territory, as compared to the school children residing in relatively clean regions, shows the difference in favour of the "clean" territories (Данчук 1998 Москвіна 2006, Cherry et al. 2007)

Methods and materials. The experiment was carried out with the help of anthropometrical methods of the height, weight and thorax measurements evaluation. Indexes of physical development were evaluated on the basis of measurement data. 60 teenagers (30 males and 30 females) and 110 adults (55 males and 55 females) were examined. All the examinees were divided into three groups: 1) Control group - the inhabitants of the relatively clean ecological region; 2) Test group #1 (TG1) - the inhabitants of the region with the heightened radiation level; 3) Test group #2 (TG2) - the inhabitants of the agrarian regions.

Results. On the basis of our investigation, the body length of male-teenagers belonging to the victims of Chernobyl Tragedy of the 3d-4th categories and teenagers of the control group do not have statistically significant differences. The regularity of the same sort was revealed as to the height of teenagers residing in the rural regions. The body length of the female-teenagers, belonging to the TG1 is smaller than in the control group: $158,8 \pm 1,52$ cm $164,9 \pm 1,48$ cm (table 1).

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Tables: 4, **Figures:** 0, **References:** 11, **Full text PDF** www.hpc.edu.pl **Copyright** © Pope John Paul II State School of Higher Education In Biała Podlaska, Sidorska 95/97, 21-500 Biała Podlaska **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License (<http://creativecommons.org/licenses/by-nc/3.0>), which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license.

Table 1. Anthropometric indicators of teenagers victims of the Chernobyl accident n=40

№	Indicators	Boys (n=20)		Girls (n=20)	
		Test group #1	Control group	Test group #1	Control group
1.	Height (m), cm	163,70±3,24	164,40±4,24	158,8±1,52*	164,9±1,48
2.	Weight (h), kg	51,80±3,35	50,80±4,25	47,10±2,04	52,80±2,74
3.	Girth of thorax (y), cm	73,5±5,01	76,10±3,27	73,10±1,46	77,70±2,13
4.	Age, (q), years	15,00±0,26	14,4±0,43	15,4±0,22	15,3±0,26

Notes: * - significance of differences between boys I and control groups (p <0,05);

** - significance of differences between girls I and control groups (p <0,05)

The same situation was marked for the body length of the adults, the only exception is male examinees of TG2: their height is relatively bigger then in the control group: 181,00±1,6 cm and 177,75±1,79 cm accordingly with p>0,05 (table 2).

Table 2. Anthropometric indicators of teenagers living in rural areas n=40

№	Indicators	Boys (n=20)		Girls (n=20)	
		Test group #2	Control group	Test group #2	Control group
1.	Height (m), cm	164,50±2,63	164,40±4,24	166,4±2,65	164,9±1,48
2.	Weight (h), kg	50,40±3,63	50,80±4,25	55,10±2,29	52,80±2,74
3.	Girth of thorax (y), cm	70,75±2,25	76,10±3,27	78,40±1,47	77,70±2,13
4.	Age, (q), years	14,70±0,15	14,4±0,43	15,6±0,31	15,3±0,26

Notes: * - significance of differences between boys II and control groups (p <0,05);

** - significance of differences between girls II and control groups (p <0,05)

The body weight of the examinees teenagers TG1 and TG2 does not differ much from the control. But the body weight of the female-teenagers TG1 is relatively less 47,10±2,04 kg and 52,80±2,74 kg with p>0,05 (table 1, 2).

The body weight of women of the early reproductive age belonging to the TG1 and TG2 does not differ from the figures of the control group. Men of the TG1 have the tendency to the increase of this parameter as compared to the control group: 71,40±1,63 kg and 66,75±2,39 kg with p>0,05 (t=1,61). At the same time the body length does not differ from the control group (table 3, 4).

Table 3. Anthropometric indicators of adult victims of the Chernobyl accident n=80

№	Indicators	Mens (n=40)		Womens (n=40)	
		Test group #1	Control group	Test group #1	Control group
1.	Height (m), cm	177,9±1,24	177,75±1,79	162,80±1,51	163,4±1,19
2.	Weight (h), kg	71,40±1,63	66,75±2,39	57,15±2,62	55,10±1,86
3.	Girth of thorax (y), cm	96,25±1,26*	88,00±1,76	88,30±1,95*	80,10±1,91
4.	Age, (q), years	22,05±0,23	21,65±0,51	20,35±0,46	21,20±0,43

Notes: * - significance of differences between men I and control groups (p <0,05);

** - significance of differences between women I and control groups (p <0,05)

Table 4. Anthropometric indicators of adults who live in rural areas n=70

№	Indicators	Mens (n=35)		Womens (n=35)	
		Test group #2	Control group	Test group #2	Control group
1.	Height (m), cm	181,00±1,6	177,75±1,79	163,23±1,76	163,4±1,19
2.	Weight (h), kg	74,87±2,53*	66,75±2,39	56,40±2,54	55,10±1,86
3.	Girth of thorax (y), cm	93,07±2,26	88,00±1,76	74,13±1,88**	80,10±1,91
4.	Age, (q), years	21,47±0,42	21,65±0,51	21,73±0,81	21,20±0,43

Notes: * - significance of differences between men II and control groups (p <0,05);

** - significance of differences between women II and control groups (p <0,05)

The weight of the men residing in the rural regions is greater than in the control group: $74,87 \pm 2,53$ kg and $66,75 \pm 2,39$ kg ($p < 0,05$) (table 3, 4) (table 4).

We have not revealed the reliable differences in the thorax measurements between teenagers of all the groups. There were marked smaller values of this parameter among the female-teenagers residing in the radiation polluted regions: $73,10 \pm 1,46$ cm and $77,70 \pm 2,13$ cm with $p > 0,05$ ($t = 1,78$). For the thorax measurements of the male-teenagers from agrarian territories there was marked the same regularity: $70,75 \pm 2,25$ cm and $76,10 \pm 3,27$ cm with $p > 0,05$ ($t = 1,35$) (table 1, 2).

As to the adults residing in the radiation polluted regions, the thorax measurements are greater than in the control group. For males: $96,25 \pm 1,26$ cm and $88,00 \pm 1,76$ cm accordingly ($p < 0,05$). For females: $88,30 \pm 1,95$ cm and $80,10 \pm 1,91$ cm accordingly ($p < 0,05$) (table 3).

Among the men of rural residence the tendency to the increase of the chest measurement was revealed $93,07 \pm 2,26$ cm and $88,00 \pm 1,76$ cm. But the difference between the values is not reliable ($t = 1,77$). The value of the chest measurements of the TG2 women is less than in the control group: $74,13 \pm 1,88$ cm and $80,10 \pm 1,91$ cm accordingly ($p < 0,05$) (table 4).

The analysis of receiving results shows that for teenager's body any mass indexes differences which have a statistic value are absent. All teenagers which were examined drop a simple body mass index at the expense (in most cases) of the drop of mass of a body was noticed. Despite this, girls who live in a countryside have tendency to augmentation of this index in comparison with control group is marked: $33,03 \pm 0,96$ kg/m and $29,26 \pm 3,21$ kg/m at $p > 0,05$ ($t = 1,13$) (table 1, 2).

The parameters of body mass indexes of men TG1- and control group are normal though there is no authentic difference between them, but the tendency to augmentation of its parameter is observed: $39,99 \pm 0,72$ kg/m and $37,31 \pm 1,21$ kg/m at $p > 0,05$ ($t = 1,90$) (table 3).

The size of TG2-group men's body mass indexes is more than in control group: $41,31 \pm 1,23$ kg/m and $37,31 \pm 1,21$ ($p < 0,05$). Thus the size of an index in TG2 group slightly exceeds limits of norm (table 4).

Between body mass indexes of women of examinees groups and control group there is no revealed authentic differences. All examined females have the value of the elementary body mass index which is lower than norm (table 3, 4).

The size of men's Kettle index in TG1-group is more, than in control group: $22,48 \pm 0,35$ kg/m² and $20,98 \pm 0,64$ kg/m² ($p < 0,05$). A similar regularity is peculiar to men of TG2-group: $22,82 \pm 0,65$ kg/m² and $20,98 \pm 0,64$ kg/m² ($p < 0,05$).

The Rorer's index and body mass half index for men who live in the radioactive polluted districts, is greater in comparison with the control: $12,61 \pm 0,20$ kg/m³ and $11,82 \pm 0,37$ kg/m³ $p > 0,05$ ($t = 1,88$); $80,00 \pm 1,44$ kg/(kg*1/2h) and $74,61 \pm 2,58$ kg/(kg*1/2h) $p > 0,05$ ($t = 1,82$). Men from countryside have the last parameter also higher than in control group and is equal according to $86,62 \pm 2,46$ kg/(kg*1/2h) and $74,61 \pm 2,58$ kg/(kg*1/2h) at $p < 0,05$.

On the average, examined teenagers concern to narrow-chested (an index of proportionality less than 50 %). For IP examinees of the TG1-group belong to normosthenic type, and control group to asthenic. Thus the first can be ranked to wide-chested, and the others to normal type.

The men from a countryside have these parameters higher in comparison with control group, but anyhow $p > 0,05$. In both groups the value IP makes relative norm. The size of these parameters for women of TG2-group is lower, than in group of comparison ($p < 0,05$). According to IP women of TG2-group belong to asthenic type, and women of the control group - to normosthenic.

Discussion. Thus, all examined teenagers are asthenics. Adults who live in the radioactive polluted terrain, can be conventionally referred to hypersthenic type, whereas those under control to normosthenic type. Men who live in countryside belong to normosthenic, and women to asthenic. The results of the previous research (Козлова, 1998) testify as well, that there are no differences in the height of bodies of practically all schoolchildren's age-grades of Chernobyl zone and pure zone. At the same time, the inspections [Приймак et al. 1998] haven't revealed any probable difference between parameters of body height. We have not revealed probable deflections between body height of examinees.

The results of scientific research show, that children who live in Chernobyl zone have obviously smaller parameters of a thorax measurements (Данчук, 1998). And other researchers have not found any obvious difference behind this parameter (Чижик, 1994). The results of our research are also a proof of the last literary data.

References:

1. Данчук П.С. (1998), Исследование двигательной подготовленности младших школьников в зависимости от продолжительности их проживания в зоне повышенной радиоактивности. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 3:125-128.

2. Калиниченко І. (2009), Інформативність індексних способів оцінки соматотипів у дітей. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві: збірник наукових праць; 3: С. 72-75.
3. Козлова К.Ф. (1998), Сравнительная характеристика физического состояния школьников, проживающих в зоне радиоактивного загрязнения Украины. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 2: 158-166.
4. Москвіна, Т.П. (2006), *Наслідки Чорнобильської катастрофи: освітньо-оздоровчий аспект*. Вісник Житомирського державного університету імені Івана Франка; 29: 49-51.
5. Приймак С.Г., Ущенко З.Д., Гайова Н.В. (1998), Залежність функціональних показників від морфологічних ознак дітей та підлітків, що мешкають в зоні радіоактивного забруднення, внаслідок аварії на ЧАЕС. Фізична культура, спорт та здоров'я нації: Збірн.наук. праць; 3: 197.
6. Романенко В.А. (2012), Генетические детерминанты физического статуса человека на различных этапах онтогенеза. Педагогіка, психологія та медико-біологічні проблеми фізичного виховання і спорту; 8: 74-78.
7. Сергиенко В.Н. (2013), Морфологические показатели студенток 17–20 лет высших учебных заведений. Фізическое воспитание студентов; 6: 73-77.
8. Чижик В.В. (1994), Особливості фізичного розвитку 14-15-річних хлопчиків-підлітків на забруднених радіонуклідами територіях Волинської області. Матеріали міжнародної науково-практичної конференції „Фізична культура, спорт та здоров'я нації; 1: 397-398.
9. Cherry DC, Huggins B, Gilmore K (2007) *Children's Health in the Rural Environmen*. Pediatric Clinics of North America; 54(1): 121–133.
10. Cole TJ, Flegal KM, Nicholls D, Jackson AA (2007), *Body mass index cut offs to define thinness in children and adolescents: international survey*. BMJ ; 335:194.
11. Reiman M. P., Manske R.C. (2009), *Functional Testing in Human Performance*; Champaign, IL: Human Kinetics: 308.

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