

## THE PECULIARITIES OF PHYSICAL DEVELOPMENT OF PUPILS AND STUDENTS

Menshikh E.E.

Cherkasy National University

**Annotation.** Presented results of physical development of young people. 965 pupils and 438 students participated in research. One measured length and mass of the body, registered cardiorespiratory indexes – cardiac rate at peace and after 20 squats, vital capacity of lungs, breath-holding on inhalation and exhalation. The coefficient of physical development was calculated on a formula taking into account actual and middling population indexes. Gradual development of morphofunctional indexes is set for pupils and students from 7 to 20 years old. Rates of such changes were different both in age-old and sexual groups. It is educed that for boys and girls 7-8 years middling the statistical values of coefficient of physical development exceeded standard indexes. In 9-13 years on a background of further increase of morphofunctional parameters the rates of increase of physical development diminished a bit. From 13 to 16 years the index of coefficient of physical development changed a little, except for an insignificant increase in 14 years. It is shown that in an age-old period 17-20 years a mesosomia prevails for the inspected students. It is educed reliable differences between the values of coefficient of physical development in the groups of boys and girls 17 and 19 years.

**Keywords:** physical, development, pupils, students, morphofunctional.

### Introduction

The investigations of young generation's health in Ukraine are associated with the problem of decreasing pupils' and students' health [1, 9]. Study at school is both the period of intensive development of an organism and the stage of extremely sensitive reaction to surrounding stimuli that may have a negative influence upon a schoolboy's individual development. The tendency of decreasing health state is also characteristic for students: the indexes of physical and nervous-psyche development decrease; the number of acute and chronic diseases increases; new diseases that have not been specific to adolescence appear [3]. Many authors distinguish social-economic and ecological factors as well as reduction of physical activity among the reasons of such negative processes [2]. The major cause of young people's health deterioration is the increase of education loading in modern educational institutions.

These facts cause the need to find and develop new modern approaches to dynamic health surveillance being adequate to modern requirements [10, 11]. The topicality of the research is stipulated by the lack of the problem information in national scientific sources [4].

The study is conducted according to the research plan of Cherkasy B. Khmelnytsky National University.

### Research goals, tasks, materials and methods.

*The goal of the research* is to investigate the peculiarities of physical development of pupils and students.

*Research methods and organization.* 965 pupils and 438 students took part in the research. Methodical approach proposed by G.V. Korobeinikov (2001) was used for the assessment of physical development; the coefficient is integral morpho-functional index [7].

Body length (BL) and body weight (BW) were measured; cardio-respiratory indexes at rest and after 20 squats, vital lungs capacity (VLC), breath-hold at inhalation (BH<sub>in</sub>) and exhalation (BH<sub>ex</sub>) were registered. The coefficient of physical development (CPD) was calculated according to a formula with factual and average population indexes. The obtained data were processed with Microsoft Excel computer program.

### Research Results.

The analysis of physical development results shows the gradual development of morpho-functional indexes among individuals aged 7-20. However, the rates of such changes were different both in age and gender groups. The research results of physical development level of pupils aged 7-16 are presented at Fig.1. The coefficient of physical development (CPD) among boys and girls is from 1.016 cu till 1.148 cu; however, it is higher among the girls than the boys in all age groups being from 1.048 cu till 1.148 cu.

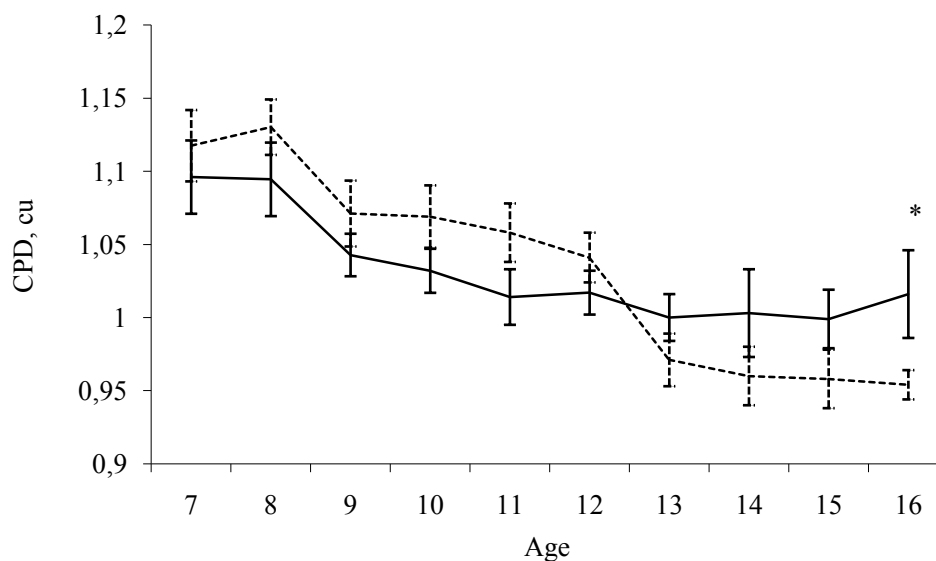


Fig. 1. Age Dynamics of Physical Development Coefficient at Boys and Girls aged 7-16; \* - probability of differences ( $p < 0.05$ ) of average indexes at girls and boys.

CPD is  $1.093 \pm 0.025$  at boys aged 7; it is higher at girls being  $1.117 \pm 0.024$  cu. It increases at children aged 8 being  $1.094 \pm 0.025$  cu at boys and  $1.094 \pm 0.025$  cu at girls respectively. This index decreases at both boys ( $1.042 \pm 0.014$  cu) and girls ( $1.071 \pm 0.022$  cu) aged 9. The decrease of average indexes is found at children aged 10. The CPD is  $1.031 \pm 0.015$  cu among the boys aged 10 and  $1.069 \pm 0.021$  cu among the girls of the same age. The lowest CPD of boys if compared with the same index of girls is associated with the great growth of morpho-functional indexes of physical development of girls that is confirmed by other investigations [6].

The analysis of CPD according to Student's t-criterion shows the lack of reliable differences of CPD average values between boys and girls in all age groups ( $p > 0.05$ ). The obtained indexes of boys' and girls' CPD correspond to the average level of physical development determined by this method that shows the correspondence of factual and proper indexes. The results of our research add Y.A. Yermolaev's data (2001) that pointed out minor gender differences of physical development among boys and girls aged under 5 [5]. The differences in the average CPD values at boys were reliable in the age groups of 10, 7 and 8; this index was lower among the children aged 10 than children aged 7 and 8. Similar dynamics of CPD change was found among girls, however, with some peculiarities. The highest CPD values were found at the age of 8; however, they decreased gradually at the age of 9 and 10. The reliable differences were found between the groups of children aged 8 and 9-10 ( $p < 0.05$ ). There were no reliable differences among the groups aged 7 and 8, 7 and 9, 7 and 10, 9 and 10. The presented results show the preservation of schoolchildren's CPD level during the whole investigated period. The obtained results agree with G.P. Salnikova's data [8].

CPD of boys and girls aged 11-14 was within 0.96 and 1.058 cu. The high values of CPD were among the girls aged 11 - 1.058 cu; the low ones were among the girls aged 16 - 0.95 cu. The high CPD level was among the boys aged 11 - 1.025; the low one - at the age of 15 - 0.99 cu. CPD at the age of 12 decreased from  $1.058 \pm 0.02$  cu among girls aged 11 and  $1.025 \pm 0.019$  cu among boys of the same age till  $1.041 \pm 0.017$  among the girls and  $1.017 \pm 0.015$  among the boys. The decrease of CPD average values was among the investigated children aged 13. Significant changes were found among the girls. CPD was  $0.971 \pm 0.018$  cu among the girls and  $1.000 \pm 0.016$  among the boys. CPD of the boys aged 14 increased till  $1.003 \pm 0.022$ ; it continued to decrease till  $0.96 \pm 0.019$  among the girls. CPD at the age of 15 decreased a little among both boys ( $0.99 \pm 0.02$  cu) and girls ( $0.958 \pm 0.02$  cu). 16-years-old boys were characterized with a slight increase in the values of CPD -  $1.016 \pm 0.03$  cu with almost no changes among the girls -  $0.952 \pm 0.01$  cu. CPD analysis according to Student's t-criterion shows the lack of reliable differences of CPD average values in all age groups between boys and girls ( $P > 0.05$ ), except 16-years-old boys where the CPD is reliably higher than among the girls ( $P > 0.05$ ).

Thus, we can draw an inference that the coefficient of physical development (CPD) of junior and senior schoolchildren is within the average population standards. Girls have slightly higher values of CPD than the boys aged 11-12; reverse trend is observed at the age of 13-14. The reliable differences of CPD values are found only among the girls aged 13-14 if compared with the age of 11 and 12. There are no such differences between the age groups of boys. There are no reliable differences of CPD between gender groups in any age period.

The result analysis of the next age period shows that the CPD indexes of girls and boys aged 17-20 change slightly (Fig. 2). The CPD of 17-years-old boys is  $1.08 \pm 0.03$  cu. The same level is found at the age of 18 -  $1.083 \pm 0.04$  cu. Minor increase of CPD values is found at the age of 19-20 being  $1.09 \pm 0.02$  cu and  $1.092 \pm 0.03$  cu respectively.

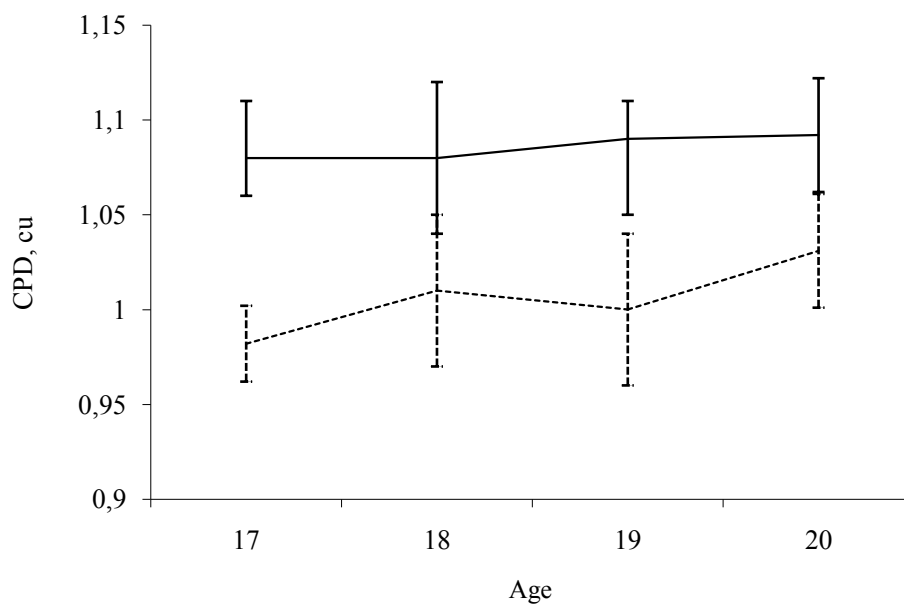


Fig.2. Age Dynamics of Physical Development among boys and girls aged 17-20;

\* - reliable differences of CPD values between boys and girls ( $p < 0.05$ );

\*\*\* - reliable differences of CPD values between boys and girls ( $p < 0.01$ ).

CPD values among the girls are lower than boys being  $0.982 \pm 0.02$  cu at the age of 17. Minor increase of CPD is found at the age of 18 being  $1.01 \pm 0.03$  cu. CPD of the girls aged 19-20 is found to be  $1.00 \pm 0.04$  and  $1.031 \pm 0.03$  respectively. CPD analysis according to Student's t-criterion shows the lack of reliable differences of CPD average values between all age groups of both boys and girls ( $P > 0.05$ ). Reliable differences are found between CPD values in the groups of boys and girls aged 17 and 19 ( $P < 0.05$ ).

#### Conclusions.

The result analysis of physical development shows the gradual development of morpho-functional indexes among the pupils and students aged 7-10. The rates of such changes differ in both the age and gender groups. CPD average values prevail standard indexes among the boys and girls aged 7-8. The rate of physical development growth decreases within the further increase of morpho-functional parameters at the age of 9-13. CPD index changes slightly at the age of 13-16 except minor increase at the age of 14. The average level of physical development prevails among the investigated students aged 17-20. Reliable differences are found between CPD values in the groups of boys and girls aged 17-19.

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**Information about the author**

**Menshikh E.E.:** ORCID: <http://orcid.org/0000-0002-6875-2343>;  
intolen@mail.ru; Cherkasy National University; Shevchenko Boulevard  
81, Cherkassy, 18031, Ukraine.

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