

## Problems of Pediatrics

# Effect of Modern Students' Lifestyle on their Physical Development

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## Abstract

The study of the physical development of pupils over the last 50 years has established some features regarding the formation of morphological and functional parameters of schoolchildren. The studies were conducted using longitudinal and cross-sectional methods, which contribute to a more detailed analysis of the results. The lifestyle of students in Moscow and the factors influencing the physical capacity of the adolescents were studied, employing the questionnaire method.

**Key words:** children and adolescents, physical development, longitudinal monitoring, dynamometry, lifestyle of schoolchildren.

## Introduction

Currently, studying the dynamics of the physical development of children and adolescents during the first decade of the 21<sup>st</sup> century, against the background of the socio-economic transformation, has gained special interest. According to several authors in different regions of Russia and abroad, new trends in the physical development of the children population is emerging: there is an increase in total body size, earlier onset of puberty, and an increase in the thickness of the fat folds and circumference size [1,2,3]. A significant reduction in the functional parameters was revealed, in particular, muscle strength in the hands was noted first of all [4].

According to foreign studies there is a causal link between the time children spend on the computer and watching TV and obesity. For example, the prevalence of obesity in adolescents

between 12 and 17 years of age was found to increase by 2% for every additional hour of watching TV per week [5]. Subsequent studies confirmed the presence of such a link [6].

Children appear to have very little time for physical education and sports during their free hours: According to O.A. Kislitsyna (2009), 40% of schoolchildren between 7 and 13 years have never played sports, including action games, before and after their lessons [6]. However, the link between physical activity and the health of children and adolescents has not been sufficiently studied.

Therefore, the aim of this study was to investigate and analyze the morphological and functional indicators based on the lifestyles of children and adolescents in the Moscow region, at the present stage of longitudinal observations of the physical development of schoolchildren.

## Material and Methods

The physical development of children has been studied using individual (longitudinal observations) and general (cross-sectional studies) methods with a standardized anthropometric technique, employing standard tools [7]. We evaluated the somatometric and physiometric indicators of physical

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development and the biological development of children and adolescents. In an eight-year dynamic, 703 pupils were examined annually in 11 educational institutions in Moscow (longitudinal studies), as well as 1500 schoolchildren aged between 7 and 15 years of age (cross-sectional studies).

The lifestyle of 15-year-old schoolchildren was studied using the questionnaire developed at the Research Institute of Hygiene and Health Care for Children and Adolescents, including the following sets of questions: the time spent on the computer and watching TV, physical activity (circles, sections), bad habits (smoking, alcohol).

We calculated the averages (M), errors of averages (m), minimum and maximum values (min and max), and the standard deviation ( $\sigma$ ) of the main anthropometric and functional parameters. The findings were compared with similar studies conducted during the 1960s and '80s.

Statistical processing was performed using the Statistica 6.0 statistical package (StatSoft, USA).

## Results and Discussion

The results of the longitudinal studies for the period between 2003 and 2010 show a significant ( $p < 0.01$ ) increase in body length in all age-sex groups of schoolchildren (excluding girls aged 8 years) compared with their peers of the 1960s and '80s. A comparison of the body weight in boys of different decades found that 9 to 15-year-old modern schoolchildren significantly outperformed their peers of the 1960s and the 9 to 13-year-olds their peers of the '80s. Similar differences were found for 10-year-old girls.

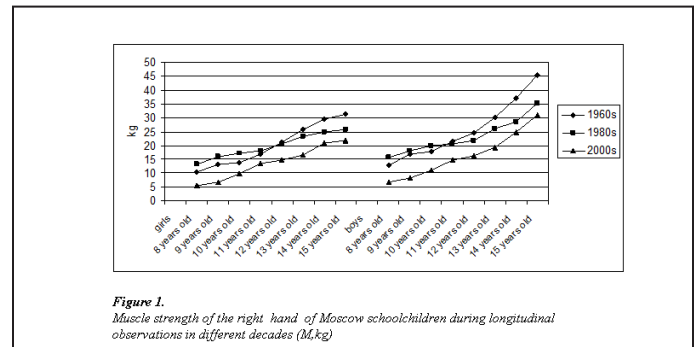
The chest circumference of the Moscow schoolchildren in the 1980s was less than in those recorded in the 1960s, which indicated the "gracilization" of stature. The observations for the period 2003 to 2010 in all age-sex groups of schoolchildren present a significant ( $p < 0.01$ ) increase in the chest circumference when compared with the peers of the 1980s and the 1960s. These findings correspond with the rates of the physical development of children and adolescents in other regions of Russia [1].

The studies recorded the change in the body proportions of today's students. The increase in body length is accompanied by a significant ( $p < 0.05$ ) and highly prominent ( $p < 0.001$ ) increase in leg length in the boys and girls of modern times, combined with that of boys and girls between the ages of 8 and 13 years, and in girls between the ages of 8 and 11 years, with the increase in body length. These findings are of great interest for the development of goods for children (clothes, shoes, school furniture).

The study conducted on the biological development in children has established that the rate of the development of secondary sexual characteristics of modern boys is somewhat more pronounced than that of their peers between the ages of 11 and 13 years of the 1960s and '80s and girls at the age of 9 years, i.e. the development of secondary sexual characteristics in today's schoolchildren begins at earlier ages. The development of secondary sexual characteristics in boys begins at 10 years of age, while 18.7% of boys at the age of 14 years had 0 degrees of the secondary sexual characteristics, the average degree of the secondary sexual characteristics being 1.3 points. In girls, however, the first signs appeared at the age of 8 years. At this age, 4.8% of schoolgirls showed the first degree of mammary

gland development. No girls aged 14 years were identified with 0 degrees development of the secondary sexual characteristics, the average degree of development being 2.5 points. Moreover, the presence of menstruation was reported by 9.1% of the girls from Moscow aged 11 years and 82.9% of the girls at 14 years of age. According to the longitudinal observations in 2010, the average age of menarche was 12.7 years of age. These data are comparable with the results of the European scientists [3].

Between 2003 and 2010, the longitudinal observations established a significant reduction in the functional indicators in



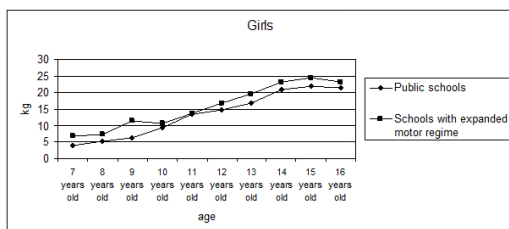
all age groups ( $p < 0.001$ ) (Figure 1).

The study of the lifestyle of modern students revealed that 100% of the girls and 99.1% of the boys had a computer at home and used it regularly. It was found that 39.8% of the girls and 36.4% of the boys spent between 6 and 15 hours per week on the computer, while 6.2% and 13.1%, spent more than 30 hours a week, respectively. However, schoolchildren spend less time watching TV: 8% of adolescent girls and 10.1% of young men do not watch television programs and films at all; 42.5% of the girls and 45.5% of the boys watch TV about 5 hours per week; whereas 39.8% and 31.3%, respectively, watch TV 6-15 hours per week.

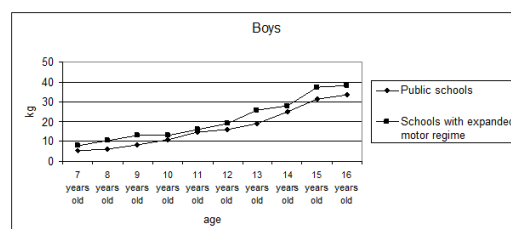
It was interesting to note that 66.4% of the girls and 63.2% of the boys attended extra classes not related to physical activity, between 2 and 3 times a week, on average. The study showed that 40.7% of the girls and 66.7% of the boys indicated the sport and dance sections. In general, modern schoolchildren spend 1 to 5 hours per week on the sections involving a motor component.

The survey on the behavioral risk factors revealed that among the adolescents 15 years of age, 12.7% of the girls and 15.1% of the boys smoked regularly, while 54.6% of the girls and 48.1% of the boys had tried smoking. The most common age of onset of smoking among young men is 14 years of age, while among the girls - 13 years of age, the earliest age being - 6 and 8 years old, respectively. While 32.0% of the boys and 29.1% of the girls reported having used alcohol once a month and less, 64.1% of the young men and 58.1% of the girls surveyed did not consume alcohol at all.

We arrived at statistically significant associations between a reduced strength of the hands and smoking ( $p < 0.01$ ), as well as the time spent on the computer ( $p < 0.05$ ). The study of hand muscle strength in students from various types of different educational institutions (public, gymnasium, specialized) revealed that the organization of the educational process and the implementation of additional programs with a motor component significantly affected the health of children and adolescents. It



**Figure 2.**  
Muscle strength of the right hand of girls aged 7-16 years in institutions with different motor regime



**Figure 3.**  
Muscle strength of the right hand of boys aged 7-16 years in institutions with different motor regime

has been convincingly proved that the average muscle strength of the hands of children in schools with an extended motor regime is higher than that for children in the normal schools ( $p < 0.05$ ) (Figure 2&3) [8].

## Conclusion

Thus, a comparative analysis of the physical development of the Moscow schoolchildren between 8 and 15 years of age, over the past decades has shown that modern schoolchildren outperform their peers in basic anthropometric measures and their increase in size is synchronous. Changes in the proportions of the body structure of modern students are most clearly evident in the increase in leg lengths. The features of biological development of the modern Moscow schoolchildren include the following: the development of secondary sexual characteristics in boys occurs from the age of 10, whereas in girls it is from the age of 8. The average age of menarche is about 12.7 years.

The findings on the change in the total body sizes of the Moscow schoolchildren and the production of the indicators of biological development show positive changes in physical development, and probably, a "new stage" in the activity of acceleration.

In spite of the increase in somatic sizes in all the age groups (8-15 years of age), a significant reduction in the functional indicators (carpal dynamometry) was noted when compared with the peers of the 20th century. However, this phenomenon is observed to be associated mainly with the lifestyle of modern students.

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