

# Actual problems of physical development of children in the age of digital technologies

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**Abstract.** The active spread of digital technologies all over the world, the mobile availability of high-speed Internet have caused a sharp increase in the time the population spends at the screens of smartphones, tablets, televisions and other media devices. In particular, this tendency influenced the model of behavior of the younger generation in relation to health, lifestyle, and the level of physical activity. The sedentary lifestyle of children and adolescents, associated with screen addiction, causes various diseases, social problems, poor academic performance, and negatively affects the indicators of their physical and mental health. The current study presents data that reflect the dynamic relationship of "screen time" with indicators of physical development of adolescents. The participants were children of primary school age from 6 to 10 years old (n=74). Measurements were carried out using fitness tests, anthropometry, questionnaires, self-report diaries of physical activity and time spent by the study participants with digital technology. The paper discusses the main effective means and methods to improve the motivation of young people for regular exercise. Actions for the formation of a strategy for the behavior of the younger generation in ways of interacting with digital technologies are outlined.

## 1 Introduction

The current situation of the rapid development of digital technologies all over the world, the replacement of physical activity of the population with online activity from an early age negatively affects the health of the younger generation.

An increase in the total time spent by people in the "digital space", dependence on video games, social networks, the Internet in general negatively affects the indicators of the physical development of children, causes various kinds of diseases, such as myopia, obesity, sleep disturbances, depression, etc. Over the past decades, the level of the usual physical activity of young people has significantly decreased, and minor physical activity has ceased to be an effective means of strengthening and maintaining health. An alarming trend requires active intervention of the public and the state, the introduction of extraordinary regulatory measures aimed at changing people's attitudes towards ways of interacting with digital technologies [1, 2].

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According to objective measurements of the health of children and adolescents from 6 to 19 years old, the proportion of a sedentary lifestyle is from 6 to 8 hours daily, while more than half of the respondents exceeded the current norms of "screen time" (more than 2 hours a day). Moreover, a causal relationship was found between the time spent in front of TV screens and other gadgets with an increase in blood pressure, the amount of cholesterol in the blood. Children and adolescents with screen addiction showed low self-esteem, problems of social behavior, poor academic performance, and low indicators of mental health [4].

According to the results of numerous monitoring studies, the total screen time of the younger generation over the past twenty years has increased by almost two hours a day, and the daily duration of a sedentary lifestyle has increased by an average of three hours. This is primarily due to the emergence of new digital media devices such as smartphones, tablets, laptops, and most importantly, their availability for all segments of the population. This negative trend is causing public health concern around the world [5].

It is important to note that the screen time of children and adolescents increases significantly between the ages of 10 and 14, however, it has significant differences in terms of gender with a large increase in boys (boys: +41.6, girls: +22.7 min / day) [6]. Also, young men prefer video games, and girls prefer mobile phones and computers. Especially long is the time when young people use electronic devices - televisions, computers, video games and mobile phones on weekends and holidays [7].

A study of 4,770 Lebanese schoolchildren proved that those children who exceeded the daily norm of staying at the screens had practically no opportunity to engage in physical activity and even read books [8]. A destructive feature of digital technologies in modern society should also be attributed to media multitasking, which is the simultaneous use of smartphones and computers by young people, listening to music and studying, watching TV and surfing the Internet. However, two-thirds of adolescents do not consider this factor limiting the fulfillment of important tasks and the quality of the educational process [9, 10].

One of the key factors determining a sedentary lifestyle and an increase in "screen time" should be attributed to the stay of children and adolescents alone. Thus, the results of studies by British scientists have shown that most of the extracurricular time for children 11-12 years old in the evening on weekdays was spent with relatives and friends, while even a slight social deprivation of young adolescents became the reason for the active use of the screen [11].

A decrease in physical activity and an increase in the "screen time" of adolescents and children in the modern digital world are also associated with the development and spread of mobile technologies, which have gradually replaced stationary and portable devices for communication, games and communication. Modern smartphones and the availability of the Internet allow you to stay online everywhere and around the clock. It is also important to note that, in comparison with previous generations, modern youth uses digital technologies in the context of grouped actions and a special model of behavior [12, 13]. It is likely that such models are becoming more significant factors influencing the health, physical development, physical activity of children and adolescents at a completely new level of interaction with information technologies [14].

Thus, it must be concluded that the digital revolution around the world has led to significant changes in relation to the use of modern technologies by the younger generation. Free access to high-speed Internet, the ubiquitous distribution of smartphones, the emergence of various mobile applications allowed young people to be online 24 hours a day. There is a trend towards combining digital technologies with personalities, social networks and everyday experience [14]. The current situation predetermined the behavior model of the younger generation in relation to health and the level of physical activity, which in turn affected the indicators of the physical development of young people.

## 2 Methods

The analysis of works on the research problem made it possible to determine the causal relationship between an increase in screen time and a sedentary lifestyle, a decrease in the level of physical activity with an increase in pathological states of physical and mental health of the younger generation in the modern world of digitalization. The main goal of our work was to analyze the correspondence of the degree of physical development of children to generally accepted age norms, as well as to reveal the relationship between the amount of time of their interaction with media technologies and indicators of physical activity.

The key indicators that determine the level of physical development include individual functional and motor capabilities of children: aerobic endurance, strength and speed-strength abilities, as well as the ratio of height-weight indicators expressed in body mass index (BMI). Their priority is due to the most significant correlation coefficients [15] with the main components of physical health.

The object of the research was 74 students of the elementary school of St. George's Orthodox secondary school of the city of Rostov-on-Don at the age of 6 to 10 years. Measurements were taken in grades 1-4 at the end of the academic year.

At the initial stage, through oral questioning of children and questioning the parents of the subjects, primary data were obtained on how much time each child spends in the school and weekend mode on interacting with digital technologies (smartphone, computer, tablet, TV, etc.) and on any physical activity (walks in the fresh air, visiting sports sections, outdoor games, etc.).

At the second stage, anthropometric measurements of children were made to further calculate the body mass index (BMI) according to the Adolphe Quetelet formula, which allows determining the correspondence of height and weight indicators to the age and sex of the subjects.

At the third stage of the study, primary school students involved in the experiment were tested for physical fitness using fitness tests in accordance with the educational standard [16]. There were evaluated: strength training (pull-up on the bar, squats, push-ups), aerobic endurance (running 1000 m), speed-strength training (long jump from a place). Fitness tests for basic physical qualities were carried out both at physical education lessons and as part of additional classes for three days.

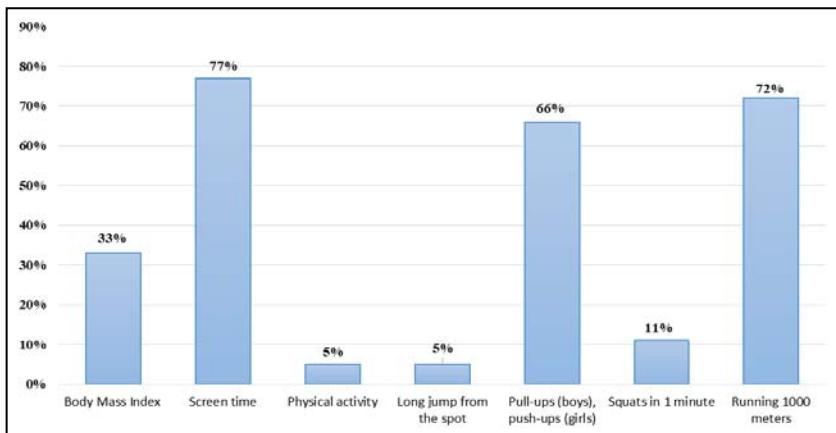
## 3 Results

The analysis of the test results of primary school students revealed some differences in the behavior patterns of schoolchildren in the daily routine, as well as in indicators of physical condition in four study groups of different ages.

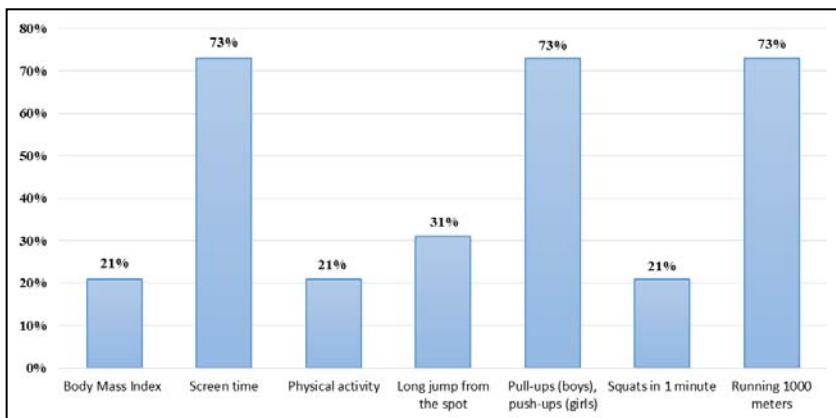
In particular, among 18 students of the first grade (6-7 years old) out of 18 people, the norm of "screen time" is exceeded by 14 people. Adequate physical activity of 60 minutes or more during the day was recorded in 17 children, while three first-graders were overweight, and three were first degree obese. The fitness tests showed sufficient readiness of the group based on the results of the assessment of speed-strength and individual strength abilities, however, only five schoolchildren were able to fulfill the standard in 1000 meters running (Figure 1).

Out of 19 second-grade students (7-8 years old), only 5 people observed the optimal mode of using digital devices, and four devoted less than 30 minutes to physical activity during the day. Weight impairment in this subgroup was found in four children, and two of them had second degree obesity. Six and four schoolchildren, respectively, did not

complete the minimum standard in the tests "long jump" and squats in one minute, while only five subjects passed the tests for general and strength endurance (Figure 2).



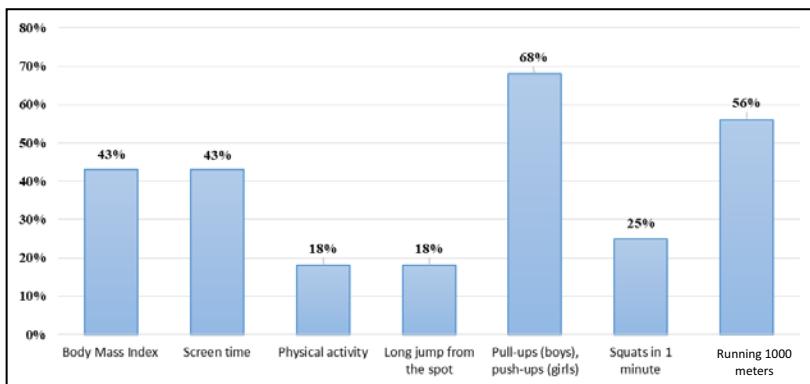
**Fig. 1.** Deviation from the standards of physical development of children 6-7 years old in the first grade, %



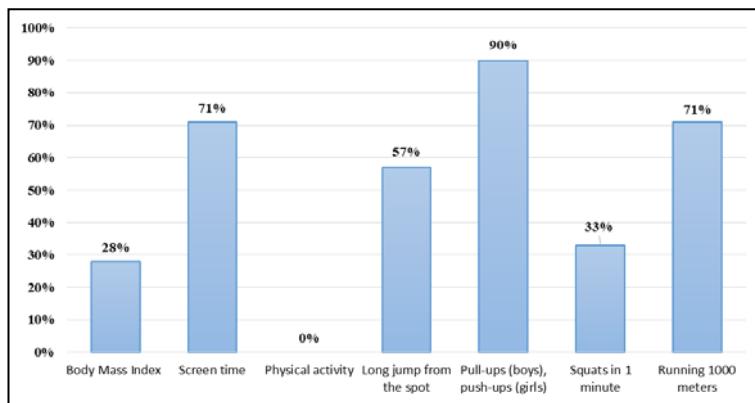
**Fig. 2.** Deviation from the standards of physical development of children 7-8 years old in the second-grade, %

In the third age group of students (8-9 years old), the maximum permissible norm of "screen time" is exceeded by 7 out of 16 children, while 13 of them devote 60 minutes to two and a half hours a day to physical activity. The calculation of the body mass index showed that two children are underweight, and two are overweight and three already suffer from first degree obesity. Out of the total number of schoolchildren of the 3rd grade, they did not fulfill the standard in the tests: three people for speed-strength readiness, 11 children for strength endurance of the upper shoulder girdle, 4 schoolchildren for the strength of the lower limb girdle, 9 children for aerobic endurance (Figure 3).

Of the fourth grade students (9–10 years old), 15 of them abuse "screen time", but all observe the optimal motor regime during the day. Overweight was recorded in six subjects. Significant gaps in physical fitness of schoolchildren are noted in tests for speed-strength training, strength and general aerobic endurance (Figure 4).

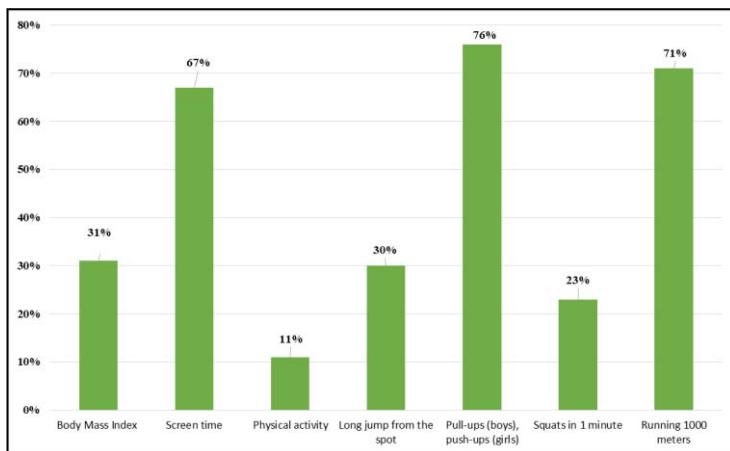


**Fig. 3.** Deviation from the standards of physical development of children 8-9 years old in the third - grade, %



**Fig. 4.** Deviation from the standards of physical development of children 9-10 years old in the fourth grade, %

The results of testing children of primary school age showed that the norm of "screen time" is exceeded on weekdays and on weekends by 67% of students. On average, the excess of the screen time norm is about two hours or more per day. 89% of children devote to physical activity of high and moderate intensity from 60 minutes and more, and the remaining 11% practically do not devote time to physical activity on weekdays and weekends. Calculation of height and weight indicators in the body mass index indicated the problem of insufficient, and especially overweight, already in early childhood. The deviation from the norm already at the age of 6-7 years was 37.5%, and at the age of 8-9 more than 40%. On average, weight problems as measured by baseline weight percentages represent 31% of total primary school students. Diagnostics of the physical fitness of children using fitness tests revealed clear deviations from the norm in the indicators of the strength abilities of the upper shoulder girdle and, in particular, aerobic general endurance, which is the main determinant of the physical health of the younger generation. Thus, only 23% and 30% of schoolchildren, respectively, did not fulfill the standard in the test for strength and speed-strength readiness, while only 29% of the subjects were able to overcome the distance of 1000 meters without taking into account time (Figure 5).



**Fig. 5.** Deviation from the standards of physical development of children 6-10 years old, %

## 4 Conclusion

The results of the study confirmed the existing fears about a decrease in the level of physical development and physical activity of children and adolescents in the world of technology "in favor" of "screen time". A promising solution in this situation can be the creation of an effective management system for the process of physical education, constant monitoring of the physical development of young people, data processing with the subsequent introduction of corrective measures. It is advisable to introduce new state standards necessary to establish a qualitative structure of the physical development of the younger generation.

The basis for the comprehensive development of children and adolescents, including physical, is the optimization of all means and methods of physical education with an emphasis on age characteristics and sensitive periods of the formation of a growing organism.

On the contrary, ignoring various aspects of physical activity can become indicators of potential risks associated with deteriorating health and the manifestation of various pathologies and diseases in the younger generation.

An important circumstance that determines the optimal physical development of children and adolescents is the full use of all organizational forms of physical culture in combination with standardized lessons of the lesson type. Among others, we note physical culture and health-improving activities that activate physical activity during the day, ensure the introduction of physical culture into the everyday life of adolescents, and contribute to the acquisition of knowledge and skills of independent training. These include: morning exercises, physical training and physical training pauses, classes in extended day groups.

Attracting young people to a healthy lifestyle is productive with the participation of specialized sports schools, fitness centers and clubs, the main task of which is to improve motor skills and abilities in the chosen sport with their subsequent demonstration in competitive activity.

However, out of all the variety of forms of physical activity, I especially wanted to note the advantage of physical education in the family. It is the joint activities of children with their parents, participation in sports events and competitions, walks, jogging, cycling and other types of outdoor activities that create an invaluable foundation for the physical development of the younger generation. Only a personal example of the participation of adults in physical activity contributes to the conscious involvement of young people in

regular physical exercise, optimizes their physical activity, being the main distraction and saving factor in the unequal battle with digital technologies.

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