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Physical Activity of Preschoolers in the Age of Digitalization in Education

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Abstract

Modern education set priorities in the formation of a wide range of projective settings, the achievement of which, according to the developers of new education programs, including programs on physical development, will help to create a physically strong child having an individually-acceptable level of morphological development and motor preparedness, and ready for systematic assimilation of general educational programs in elementary school. The authors have incentives to answer the question: is there a direct or inverse linear relationship between preschoolers' physical and intellectual development, i.e. is the development of regulatory functions a consequence of the great physical activity. With all this, the technologization and digitalization of the surrounding developing subject-spatial environment of the preschooler is also a significant characteristic that determines their cognitive, as well as physical development. Based on the foregoing, the aim of the research is to study the dependence of preschoolers' physical development on the surrounding digital educational space. The leading method applied in the research is the questionnaire method; parents of one hundred 3-6-year-old preschool children were interviewed in preschool educational institutions of the city of Kazan. It allowed us to identify the tendency to advance children's development since modern parents give emphasis to cognitive activities, while less attention is paid to children's motor and physical development. The findings provided in the paper suggest that physical development and children's ability to regulate their behavior depends on the content of curricula aimed at educating parents and educational staff in order to increase children's readiness for schooling and healthy lifestyles, as well as the promotion of a healthy lifestyle; all this should not be negatively affected by digital educational space.

Key words: physical activity, preschooler, self-regulation, digitalization of education, healthy lifestyle.

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Introduction

New technologies impact the lives of our contemporaries introducing changes to various spheres. Some of these technologies have become timely: their application has simplified the functioning of some systems, e.g. the introduction of the personal data electronic system in the economic sphere has significantly increased the quality of life; though there are other examples not so much positive.

At present, we are witnessing a profound transformation of Russian education, which is being performed in accordance with the foresight projects “Education 2030”, “Education 2035”; the ultimate goal is to “eliminate traditional models of the educational system” and to replace them with “digital education”. The national project "Education" is a vivid example of this tendency; it was approved in September 2018 and has gained the priority (Chetverikova, 2018).

Hence, the digitalization process is becoming one of the most sought-after and controversial new phenomena. First, it was associated with economic phenomena, business processes and public administration, then it permeated into education and communication processes. Andrei Kurpatov, a psychiatrist, aptly remarked that “we are now undergoing a fundamental transformation – we are leaving the Gutenberg galaxy for the Zuckerberg galaxy. From the civilization of texts and systemic thinking, we are moving into the civilization of visual images, where there is neither analytical nor systemic thinking” (Kurpatov, 2017).

Purpose and objectives of the study

The aim of the research is to study the dependence of preschoolers’ physical development on the surrounding digital educational space.

Literature review

Modern Russian society is experiencing a trend towards accelerating children's development: parents focus on cognitive activities, while much less attention is paid to motor and physical development of children (Starostina, 2017). Preschoolers’ motor activity during their stay in kindergarten makes up less than 50% of their wakefulness period; it does not fully satisfy their biological need for movement and, as a result, physiological immaturity is observed in 60%, functional deviations in 70%, and chronic diseases in 50 % of children (Kirpichenkov, 2012). The formation of a wide range of projective settings, the achievement of which, according to the developers of new education programs, including programs on physical development, will help to create a physically strong child having an individually-acceptable level of

morphological development and motor preparedness, and ready for systematic assimilation of general educational programs in elementary school is becoming the priority (Alekseeva, 2012). However, there is still no exact information whether there is a linear or inverse relationship between preschoolers' physical and intellectual development, i.e. whether the development of regulatory functions is the consequence of high physical activity (Finn, Johannsen, & Specker, 2002; Sirard, Trost, Pfeiffer, Dowda, & Pate, 2005; Gushchina, Kichko, & Smirnova, 2017), or, conversely, children with more developed regulation are more likely to participate in active games and sports (McNeill, Howard, Vella, Santos, & Cliff, 2018). At the same time, the technologization and digitalization of the surrounding developing subject-spatial environment of the preschooler is also a significant characteristic that determines not only cognitive, but also their physical development (Plowman & Stephen, 2003).

"We are what we eat". According to various sources, the authorship of this phrase is attributed to Hippocrates, Confucius, Pythagoras, and even Feuerbach, but the essence is always the same – a person will consist of those chemical elements that are consumed with food. The absence of even one of the necessary chemical elements can lead to serious illnesses. For example, the lack of iodine in the body may lead to cretinism and dwarfism; an insufficient amount of copper is one of the causes of cancer. The list can be extended.

The same postulate – "we are what we eat" – is also suitable for the mental sphere according to Kurpatov (2017), i.e. "we are what information we consume." Therefore, the digital educational space surrounding the child should be aimed at developing not only their cognitive sphere, but also physical development, and promote a healthy lifestyle.

At present there is no data on how the digitalization of preschool education affects the physical development of a child. Digital space has just begun penetrating into Russian preschool education; there is no convincing long-term research on large samples of children to draw an unambiguous conclusion about advantages or disadvantages of the way digitalization impacts health. We can only analyze some positive and negative aspects of digitalization in preschool education that affect a preschool child's physical development. Analysis of scientific psychological and pedagogical Russian and foreign literature, as well as the data provided in medical journals, identifies the following trend: the vast majority of negative comments given by scientists on this problem are related to the issue that harmful effects on health arise due to the fact that digital technologies dislodge other types of activities considered more useful and developing for preschoolers, namely, physical exercises, communication with parents or teachers, reading books, etc.

For example, Dr. M. Davy (2019) from the Royal College of Pediatrics and Child Health noted that overpassion for screen media leads to overweight: "First and foremost, a sedentary lifestyle".

Genc (2014), an assistant professor from the University of Firat (Turkey), emphasizes in his researches that parents' perceptions of mobile technologies used by preschool children are greatly exaggerated in favor of these very technologies. The works pay much attention to the study of harmful factors that modern gadgets produce on children.

Researchers at the University of California (Department of Education), with Professor J. Hubert at the head, conducted an experiment that investigated physical activity of preschool children. Analysis of the results showed that 15 minutes of active exercise improves assimilation of the academic discipline by preschoolers up to 62%, compared with the group that did not participate in the experiment. We can infer from this experiment that physical activity has a direct impact on the cognitive abilities in preschool children (Sallis, Prochaska, & Taylor, 2000).

Another, a 60-day experiment was conducted at the University of California. A group of children was completely isolated from multimedia devices; the experiment was monitored by scientists, teachers, and various medical services. The experiment showed that children improved their socio-communicative and behavioral skills and the level of their physical component increased: instead of "sitting out" in front of the monitor, children began to spend more time playing outdoor games (this indicator increased by 78% compared to the second subgroup, where children had the opportunity to use smartphones and tablets, and were also given the access to the Internet).

Let us turn to the bulletin of the Russian Ministry of Health for the reporting period of 2019. It states that "the contribution of genetic factors to the development of non-hereditary diseases is about 20%, the remaining 80% is due to epigenetic factors, i.e. environmental factors ...".

The World Health Organization (WHO, 2019) is updating the requirements in the document "Global recommendations on physical activity for health" for the population by 2022. Children of preschool age will be included into this category, since the document has a separate section devoted to children aged 5 to 17 years. This document regulates the national policy of all states at national and regional levels in the field of health. Physical activity for children and young people of this age group involves games, competitions, sports, trips, recreational activities, physical education or exercises within the family, school and their place of living. The following practice of physical activity to strengthen the cardiovascular system, musculoskeletal tissue and to reduce the risk of non-infectious diseases is recommended: the time of daily physical activity - from moderate to high intensity - should make 60 minutes in total for children and young

people aged 5-17; physical activity lasting more than 60 minutes a day will bring additional benefits to their health; most of the daily physical activity should be aerobic. High-intensity physical activity, including musculoskeletal tissue development exercises, should be performed three times a week, at least. With regard to the interconnections of world national policies, the healthcare field is based on a dose-response relationship between the frequency, duration, intensity, type and total volume of physical activity necessary to promote children's physical activity.

Methodology

The following methods were used in the research: theoretical (analysis; synthesis; specification; generalization); diagnostic (questionnaire; interviewing; testing); empirical (the study of educational institutions experience, normative and educational documentation; pedagogical observation); experimental (stating, formative, and control experiments); methods of qualitative and quantitative research result processing and graphic representation of results.

Analysis of experimental studies showed that teachers of preschool educational environment have a problem in planning physical activity and raising physical qualities due to the increasing influence of preschoolers' surrounding space computerization. In this case, such principles as the principle of unity, gradualness and utmost in increasing physical loads on preschoolers are affected.

Scientists of the Department of Preschool Education at the Institute of Psychology and Education at Kazan Federal University conducted a study among parents of children of three age groups: 3-4-year-olds, 4-5-year-olds and 5-6-year-olds. The study covered parents of 100 preschool children. All children attended pre-school educational institutions in the city of Kazan. A questionnaire of two series of questions was drawn up for parents: digitalization and physical development of the child.

Results

The first series of questions for parents was aimed to help find out how much parents are aware of the concept "digitalization" of educational and social environments. Parents were asked to choose answers and argue them independently:

1. Digitalization is good!
2. Digitalization is bad!
3. I do not know what "digitalization" is.
4. I refrain from answering.

The vast majority of parents of 3-4-year-old children voted in favor of the fact that "Digitalization is good!" when they answered the first question. They are optimistic about the use of digital technologies in the educational and social space and believe that new technologies will help their children to develop harmoniously in a kindergarten. A slightly smaller number of parents whose children were 4-5 years old supported this statement. This group considered the process of digitalization of education in a preschool organization with a bit of wariness. They held the view that innovations applied to their children should be safe. Only a little more than 50% of parents with 5-6-year-old children expressed their positive attitude towards digitalization. Most likely, they have already experienced the negative manifestation of digitalization in their children.

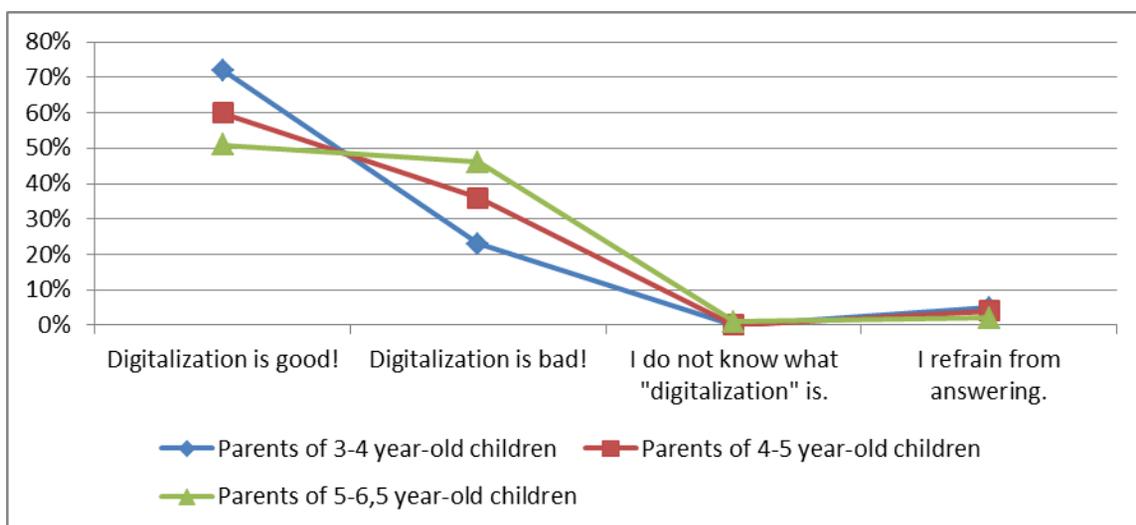


Figure 1 - A survey of parents whether they know the definition of "digitalization".

The following questions concerned the physical development of preschoolers:

1. Does your child attend a sports section? (yes/no)
2. Did exercises in a sports section contribute to improving (strengthening) of your child's health? (yes/no)
3. Do you often do physical exercises with your child at home, out-of-doors? (often / occasionally (not regularly) / do not do)
4. Does your child spend more free time with gadgets or is the child involved in active rest?

The diagram (Figure 2) shows the results of the second part of the survey. Most children from each age group attend sports sections: various types of martial arts, rhythmic gymnastics, hockey, figure skating, tennis, badminton, football, swimming, synchronized swimming, chess and even billiards. Parents want their children to develop harmoniously. Some children attend several sports sections.

Analysis of parents' answers to the second question allowed us to note that, though not immediately, but after some time, parents noticed the positive influence of classes in sports sections on their child health improvement. Moreover, it should be mentioned that those 3-4 year-old children who began to do sports before attending kindergarten, adapted to a preschool institution better, and were not sick as much. In contrast, the answers of senior preschoolers' parents made us alert. There were such answers, though few, that "after computer games their child experiences emotional stress"; or "there are finger cramps after a child sits long in a fixed position", "posture worsened", "the child constantly yawns when playing with the gadget, becomes lethargic, complains of a persistent headache" - all signs that brain is starved of oxygen. The negative attitude of older preschoolers' parents is explained by the fact that 43% of children are diagnosed with myopia, while only 15% of 3-4 year-old children are diagnosed with it; furthermore, in most cases, early myopia is already a hereditary disease. The diagnosis of "myopia" corresponds to the more common concept - "short-sightedness". This suggests that parents themselves notice deterioration in their children's health and provide preventive measures visiting doctors.

The third question (the third, fourth and fifth answer options in the diagram) allowed us to understand how much time parents spend with their children at home or out-of-doors doing sports, whether they walk in parks at weekends in spring and summer, skate and sledding in winter. The answers showed that parents of 4-5 year-old children spend most of their time together performing dynamic activities.

The fourth question (the sixth and seventh versions of the answer on the diagram) made it clear to us whether parents are attentive to the time which the child spends with gadgets. Here we can see that 3-4 year-old children spend more time with gadgets. This survey revealed that 89% of parents allow their preschool child (3-4 years) to use various kinds of gadgets: a smartphone, tablet, and even a computer. Only 11% of parents denied this fact. Parents should think about the correctness of their choice, because joint active rest with the child during this period lays down not only trusting relationships between adults and children, but also fosters independence, determination, and volitional processes.

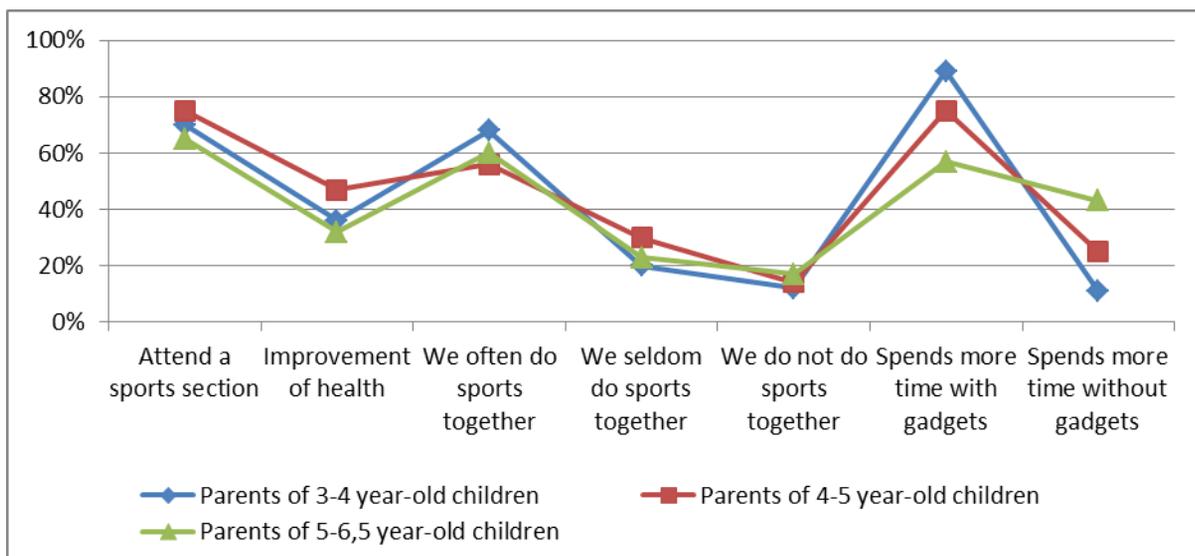


Figure 2 - A survey of parents' awareness of their child physical development.

We consider it important to analyze the digital developing object-spatial environment of the preschool institution. At present, new equipment can help to organize a digital subject-spatial environment. We are aware that new equipment for the digital educational environment is expensive, but we offer the following separation.

One group deals with the center of projections. Equipment - an interactive curbstone "Smart floor". Interactive floor for educational group lessons in kindergartens and elementary schools. It contains more than 180 game assignments for such disciplines as "Ecology", "Mathematics" and "The Russian language". It allows you to adapt built-in game tasks and create your own ones, including an expandable library. It corresponds to GEF requirements.

STEM education is provided in the second group. Equipment - "Logorobot Smart Bee" kit. This kit is designed to involve children in science, technology, engineering and mathematics from an early age. The kit promotes the development of step-by-step programming, mathematical abilities, thinking skills and logic. The kit consists of the robot Bee, 4 playing fields on which the robot walks.

In the third group a digital laboratory is arranged. Equipment – a digital laboratory for preschoolers and primary school students "Naurasha in the country of Naurandi"; netbooks with a network connection

program (available at a preschool organization); digital microscope; Interactive mobile laboratory for the study of weather and nature.

A cartoon studio can be set up in the fourth group. Equipment: SCAF-33 cartoon-studio with an HD camera and software. It is also possible to use the equipment which is included in the STEM education manual - the educational module "Cartoon-Studio" "I create the world." The main goal of this module is to create author cartoons through the development of ICT, digital technology, logical and mathematical thinking.

The fifth group should have the center of knowledge and movement. Equipment: interactive whiteboard Smart Board 480 SB, Epson EB-X05 projector for ceiling mounting, interactive complex Play and Develop with Kinect.

Software and methodological support should be developed for the successful integration of ICT into the daily educational activities in a kindergarten; these should include a bank of computer training programs, didactic and methodological materials on the use of information technologies in the work of a preschool institution, comprehensive thematic planning of a preschool institution, a collection of educational activity constructs for a preschool institution, expert cards to analyze educational activity.

Interaction with parents in the electronic space can be ensured through the introduction of distance learning technologies and creation of joint groups of parents, teachers, experts, kindergarten administration in existing and popular social networks (Vkontakte, WhatsApp) and through the kindergarten website.

Some types of equipment for the digital educational environment in the kindergarten in which the study was conducted are available. These are manuals for STEM-education: the Logorobot Smart Bee kit and the cartoon-studio educational module. Many of pre-school educational institutions cannot afford to have other above-mentioned types of equipment for the digital environment due to their high price.

Analysis of the digital developing object-spatial environment suggests that technological means of information and communication technologies should be placed in different groups of the kindergarten. This will make the group a resource center for other groups of children at the level of the educational institution. At the same time, a network interaction between teachers is organized and the teacher carries out cognitive and research activities using digital equipment with different groups of children to realize all available opportunities of the digital space of a preschool institution at a higher level.

It should be noted that among the variety of new digital equipment offered by manufacturers for kindergartens, there is almost no digital equipment that would develop physical activity in preschool children.

Discussions

Does a long pastime with gadgets affect the incidence of children and general physical activity of preschool children? Sure. Physical activity is directly related to child health. Nevertheless, the influence of computer technology on the human body is not fully understood, but at present, its negative effect on the body has already been proven.

Nowadays, physical investigation of the surrounding reality is being replaced by virtual cognition, therefore, possibilities of cognition are dramatically limited. As a result, the child's brain does not receive necessary food - experience, without which it cannot develop. Consequently, the most important parts of the brain responsible for concentration, empathy, self-control, decision making do not develop, living brain tissue atrophies, and the child is degrading.

Studies show that brain grows precisely in those areas that are most intensively used. If brain is not used, it decreases in size. According to Spitzer (2014), digital technologies save us from mental work, and an organ that is not used dies.

Computer training leads to a loss of cognitive functions and thinking skills, a decrease in mental performance, and the ability to critically evaluate facts and orientate oneself in information flows.

Kulebyakina (2018) concludes that "the substitution of the natural transfer of knowledge from the older generation to the younger generation by digital technologies will inevitably lead to the loss of independent thinking skills. As a result, the younger generation will become just part of the matrix controlled by the force that already monitors digital and information flows. And this threatens not only the sovereignty of the country, but also each specific individual."

There are scientific works that describe positive impact of digital technology on child development. But they are all associated with a beneficial effect on children's cognitive development.

The importance of globalization in the process of educational space digitalization is indisputable. However, preschool educational standards or any other ones do not explain how digitalization can be applied in practice, for example, in the system of preschool education.

We found only one suggestion made by the scientists of the Higher School of Economics and the Center for Strategic Research in the report “Twelve New Education Solutions”, compiled under the leadership of Y. Kuzminov and I. Frumin; they stated that in order to ensure accelerated digitalization of education there should be provided: “aid for preschool education by creating a support service for physical, mental and social development (patronage) for all children from 0 to 3 years old, and for children with disabilities; development dynamics will be monitored with the help of individual electronic cards.” (Kuzminov & Frumin, 2018, p.55).

A look into the distant future makes us see the perspectives of preschool education in a different way, and also admit that the modern system of preschool education is not even something that does not meet the needs of society, moreover, it does not even ask this question. It requires a deep reorganization with a clear statement of a preschool education goal – to educate children to master outer space to preserve humanity, the value of which is undeniable (Komarova & Krotova, 2017). The last addition is not accidental, since the religion has already appeared where artificial intelligence is recognized as God. At present, the declared goal is not supported by any education system in the world and not a single program, except for several educational programs of NASA (2018) (Efremova, 2017).

Schneider Education gives the following definition of the concept "digitalization" – this is the process of converting information into a digital (i.e. machine-readable) format in which information is organized into bits. The result is a representation of an object, image, sound, document or signal (usually an analog signal) by creating a series of numbers that describe a discrete set of its points or samples. Digitalization has also some other definitions. Digitization simply means converting the analog source material into a numerical format; decimal or any other number system that can be used instead. Digitization is crucial for data processing, storage and transmission as it “allows the transference of information of all kinds in all formats with the same efficiency”. Thus, digitalization is one of the numerous processes that ensure the development of technology, education, economy, etc.

The impact of digital technology on preschool children physical activity is a poorly studied area. However, Guriev (2003) wrote about the use of new information technologies in the process of physical education of preschool children in 2003. He noted that "the significant potential opportunities of new information technologies (NIT) in the system of preschool education, in particular in the field of physical education, have not yet been properly applied. One of the reasons for NIT limited use is the insufficient development of methodological conditions for their application in physical education of older preschool children, and the lack of appropriate techniques".

Physical activity has a positive effect on the mental regulation of preschoolers, and it is a self-regulating activity. This means that physical activity can eliminate psychological and pedagogical problems that children encounter during pre-school childhood.

Digitalization of education, especially preschool education, which is presented as a modern breakthrough and safe system, in fact has all the signs of a dangerous experiment on children, which is carried out without parents' voluntary consent. It launches unproven technologies the consequences and effects of which on children's health have not been studied. We will repeat once again – no comprehensive research results, conclusions, documents from health care system, psychologists, experienced teachers about the safety and effectiveness of e-learning for children have been presented to the parental public.

Conclusion

The findings of the study suggest that the ability of children to regulate their behavior in emotionally significant situations depends on the content of programs aimed at educating parents and educational staff in order to increase children's readiness for schooling and a healthy lifestyle, and promote a healthy lifestyle. The diagnostic methods applied in the study allow modern practicing psychologists and educators to effectively assess the development of modern preschool children in Russia; they will also provide an opportunity to compare results obtained during the research with the data presented by the world scientific community. The findings reported in the study can be applied in the development of curricula, work programs of practices realized in higher education, implementation of comparative studies to work out a methodology for teachers' practical training.

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