

Harmonious Upbringing of Preschoolers: Physical and Neuropsychological Aspects

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Abstract: *The article shows that the cultivation of spirituality in preschoolers is closely related to their physical and neuropsychological development, as well as moral and aesthetic education. The article aims to determine the effectiveness of the implemented programme for harmonious upbringing of children in cultural and educational space of preschools by comparing levels of physical and neurophysiological components. Given the neurophysiological indicators inherent in this age, the control group (CG) included 178 children and the experimental group (EG) 180 children. The pedagogical experiment followed certain diagnostic methods, such as control tests on physical fitness and rhythmoplasty. Importantly, age-related neuropedagogical factors made it possible to use the following organizational forms of work based on rhythmoplasty: traditional (morning exercises, physical education classes, entertainment activities) and alternative (fairy-tale therapy, finger gymnastics, dance and movement therapy, health aerobics classes). All forms of work were previously tested for compliance with neuropsychological and neurophysiological parameters for the specified age. The programme aimed to form children's positive attitude towards themselves and their bodies, introduce various forms of physical activity, general physical culture, and, most importantly, cultivate "self-concept" that maximally corresponds to preschoolers' neuropsychological status. The obtained data prove that indicators of EG children are higher than in those of CG children due to the implementation of the proposed programme. The novelty of the article is as follows: for the first time, the above-mentioned indicators of children's harmonious upbringing in cultural and educational space of Ukrainian preschools have been comprehensively formed and measured. Finally, the article closely correlates with the leading trends in scientific-educational discourse.*

Keywords: *program, neuropsychology, neurophysiology, self-concept, value-bodily criterion, conditions, physical activity, conditions, motor activity.*

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Introduction

The issue of physical component in children's upbringing remains globally relevant. Current political and cultural development of society requires one to focus upbringing on personality, creativity, and culture. Consequently, this prioritizes a healthy lifestyle, spiritual and moral values and creates conditions for holistic human development. It affirms the superiority of childhood as the most responsible period of personality development. In turn, it implies forming a healthy personality of a child, fully capable of realizing his or her physical, intellectual, moral, and spiritual capabilities in cultural and educational space of preschools. Preschoolers' spirituality is closely related to their physical development, as well as moral and aesthetic education. A special neuropsychological prerequisite for preschoolers' development is their sensitivity to learning. Therefore, the child's attitude to the world around him or her becomes important evidence of forming his or her physical and spiritual sphere. French (2004) claims that it is natural for children to want to know the world. In this regard, it is essential to create a special educational space.

Ways to solve issues related to one's harmonious upbringing within the interaction of the physical and the spiritual convince that human consists of neuropsychological, spiritual-aesthetic, physical-aesthetic and external artistic essences. A study by Larimore (2020) on education reforms reveals the importance of natural sciences starting from preschool age. This will enable one to use a holistic approach to forming a child's personality, i.e., physical, socio-emotional, and cognitive development.

Therefore, one of the priority objectives society puts forwards before teachers and parents today is the formation and development of a harmonious personality. The harmonious development of preschoolers' personality is viewed as positive changes corresponding to individual abilities and needs, as well as neurophysiological and neuropsychological indicators of this age. The initial and main period of forming a harmonious personality is preschool age, so this objective is leading one in the system of preschool education. According to the international and state legal framework, one of the main objectives of preschools is to preserve and strengthen physical, mental, and spiritual health of the child. In the practice of the global educational system, some preschools focus on innovative technologies and alternative methods of teaching and learning. The educational process of today's preschools is defined as a set of material, spiritual and emotional-psychological conditions in which the educational process continues, as well

as the factors contributing or hindering its effectiveness. Özer and Polat (2019) single out socio-economic conditions among various groups of factors ensuring the educational process. They also highlight the importance of involving parents in the educational process.

The study by Karademir et al. (2020) substantiates the importance of the correct selection of methods, tools, and forms to organize the educational process in preschools. It involves the use of child-centred activities through the integration of educational material, which will improve the quality of education. According to Zamora (2019), play activity is the most favourable for the neuropsychological status of children aged between 3 and 5. The researcher proves that games allow one to feel different life situations and develop creativity when dealing with them.

Zych et al. (2016) consider play activity as common to preschool age. They reveal the influence of games, including movement games, on the formation of various aspects of the child's personality. As noted by Ernst and Burcak (2019), creating an educational environment based on games rather contributes to forming a harmonious personality. Obee et al. (2020) focus on physical component of personality development when analyzing the impact of high-risk games on physical development in preschool age. They used deductive data analysis to justify ways of using the surrounding environment to solve problems of children's physical development.

Play activity is mostly consistent with the lateral profile of children of preschool and primary school age, which can be proved by relevant empirical evidence. It is also important to note that the first neuropsychological and neuropedagogical observations date back to the 18th century when natural conformity was a topical issue of pedagogy (medical aspects of education were considered). However, close interaction between pedagogy and neurosciences was established only in the early 2000s. Becker (2014) claims that there is a common categorical and methodological apparatus for these areas.

Researchers have been studying the organization of cultural and educational space in preschools to optimize harmonious upbringing since the establishment of today's preschool education system (Melnyk, 2019; Melnyk et al., 2021). This is due to the need to arrange educational and developmental space to form a harmonious personality of the child (Halaidiuk et al., 2018; Komogorova et al., 2021; Maksymchuk et al., 2020a; Maksymchuk, 2020b; Palamarchuk et al., 2020; Sitovskyi et al., 2019). A child's holistic development is considered as the integration of his or her development, upbringing, and self-development. Together they enable harmonious upbringing, manifested in values and interest in the world of people, nature, art, and culture. Cutcher

and Boyd (2018) believe it necessary to create an educational space that will form aesthetic awareness, creativity, and critical thinking in children. According to the neuropsychology of preschool age, there are aspects contributing to a child's development (a game-based approach, spontaneity, curiosity). Besides, there are those which can cause resistance (coercion, afternoon sleep, daily routine). However, this resistance can be explained by low awareness of a child's neurophysiological needs.

In most studies, physical component of harmonious upbringing is justified by physical activity level. In particular, Yamaguchi et al. (2019) study the impact of a properly created educational environment in preschools on a child's psychomotor development. As found by Ng et al. (2020), creating the necessary conditions to boost physical activity prevents the risk of morbidity in children.

Although the issue of forming physical component in harmonious upbringing of preschoolers has practical significance, it remains insufficiently studied both theoretically and experimentally.

The research hypothesis is that the use of proposed organizational forms of work with preschoolers based on rhythmoplasty (during one academic year) should significantly improve physical and neurophysiological indicators of their development.

The article aims to determine the effectiveness of the implemented programme for harmonious upbringing of children in cultural and educational space of preschools by comparing levels of physical and neurophysiological components.

Materials & Methods

Research methods include theoretical analysis and generalization of scientific, methodical, pedagogical, and psychological sources, pedagogical experiment, methods of mathematical statistics.

The experiment involved 358 children aged between 4 and 6 who live in Kharkiv (Ukraine) and attend the following preschools: preschool educational institutions (day nursery and kindergarten combined) No 78, 441, 114 and 266 of Kharkiv City Council. The control group (CG) included 178 children and the experimental group (EG) 180 children. All ethical principles regarding the participants in the experiment were observed and followed. The children's parents agreed on their participation in the experiment. It must be noted that the experiment was also approved by the Ethics Committee of Family and Youth Department of Kharkiv Regional State Administration. It was conducted between 2018 and 2020.

The participants of the experiment were selected by continuous sampling method with random division into experimental and control groups (based on groups formed within the mentioned preschools)

Research methods are divided into three groups following the experiment stages: theoretical (preliminary determination of harmonious upbringing levels in children aged between 4 and 6 in cultural and educational space); formative (implementation of traditional and alternative organizational forms of educational work based on rhythmoplasty) and diagnostic (measurement of physical parameters and neurophysiological tests at the beginning, during and at the end of the experiment). The comparative method, quantitative in nature, was used at the beginning and the end of the experiment.

At the beginning of the experiment, it was necessary to determine the axiological-physical criterion, as integral physical and neurophysiological, to study physical component of harmonious upbringing. Experimental data were collected by measuring physical and evaluating neurophysiological (by observation) indicators at the initial, current, and final stages. The indicators of the axiological-physical criterion involve motor skills (speed, agility, endurance, strength, flexibility); movement skills (physical and dance movements). When testing changes in the child's development, some experts in preschool and primary school neuropsychology suggest comparing the response to numerous and various stimuli and determining the so-called "performance profile". They prove the significant advantage of learning new things in the mode of relationships and interpersonal interaction (Witt et al., 2020). In addition to measuring physical performance under the standards for this age, a group of these specialists used pedagogical observation on the following neurophysiological criteria: speed of response to stimuli; levels of looseness; interaction with the group; natural behaviour when playing; dynamics of adaptation to proposed activities. These indicators were evaluated subjectively by teachers on a 10-point criterion at the beginning, during and at the end of the experiment. At these stages, the formed and reflexive "self-image" of each child was tested neurophysiologically. It became possible by synthesizing the above-mentioned observed and fixed data and forming performance profiles in the form of questionnaires with specified levels of neurophysiologically relevant indicators. Subsequently, these indicators were quantitatively integrated with physical ones by deriving the average score as integral (a complex physical and neurophysiological indicator).

Relevant diagnostic methods were employed to identify levels of physical component in harmonious development of EG and CG children in cultural and educational space. Control tests were conducted on children's

physical fitness to identify levels of their motor skills (speed, agility, endurance, strength, flexibility). They were asked to perform several tasks that showed levels of their physical activity and movements. It allows one to determine the “nearest zone” to form vital motor skills and physical qualities.

The experimenters also examined physical fitness of EG and CG children to study initial levels of dexterity, accuracy, coordination of movements, and flexibility during exercises. The following indicators of physical fitness of 6-year-old preschoolers were considered: 10- and 30-metre dash; 4x9 shuttle run test; long jump, high jump; throwing 100-g sandbags; prone and angle position exercises.

Teachers must know the peculiarities of children’s motor development to plan and organize physical activities, considering their characteristics. Accordingly, it was important to form motor skills and harmonize neurophysiological parameters of preschoolers along with the implementation of the proposed *rhythmoplasty* complex during one academic year.

Both pedagogical monitoring and measurement of appropriate physical indicators allowed one to trace the dynamics of forming physical component in harmonious upbringing of children in cultural and educational space of preschools and justify positive qualitative changes.

The control stage of the experiment showed the levels of complex component of EG and CG children’s harmonious upbringing. It became possible due to similar diagnostic techniques used at the initial stage of the experiment with further comparative analysis of their changes and dynamics. Thus, the experimenters used a comprehensive approach to studying all its components based on certain criteria to determine positive dynamics in levels of physical and neurophysiological components of children’s harmonious upbringing in cultural and educational space of preschools. Also, they employed relevant diagnostic techniques to obtain data which were subsequently mathematically and statistically processed using Pearson’s chi-squared test, Student’s t-test, and correlation coefficient. Both qualitative and quantitative analysis of the obtained results was conducted by comparing experimental and control groups (see Results).

Results

A study of theoretical sources and initial indicators has made it possible to identify levels of physical component in harmonious upbringing of children in cultural and educational space of preschools. A high level is

characterized by well-developed motor skills and abilities characteristic of this age. Such qualities as dexterity, coordination, and flexibility, endurance and strength are at high levels. The child's posture is correct, too.

A sufficient level is characterized by sufficient development of physical qualities and motor skills, characteristic of this age. Physical qualities, such as agility, accuracy, coordination, strength, speed, endurance, and flexibility reach a sufficient level. The child's posture is correct.

An average level is characterized by a slightly reduced level of physical qualities and motor skills, emotional reaction to music, interest in new sounds, musical instruments, and toys. The child distinguishes the tempo and rhythm of music, its nature. Coordination of movements is developed not enough. Also, the child partially performs the simplest elements of gymnastics, shows interest in rhythmoplasty classes, and gladly participates in movement games and dancing. It must be noted that the above-mentioned levels also imply a high or sufficient level of social and gender self-identification. Neuropsychological research proves that, under the age of 3, the child has a relatively stable "self-concept" and acquires approximately 50% of practical adaptation skills.

A low level is characterized by low development of motor skills (the child stumbles while walking and running and clings to obstacles, not trying to get around or run around them). The child shows interest in new objects and wishes to perform actions with them and yet cannot repeat these movements after an adult. Physical qualities (agility, speed, strength, endurance) are poorly developed since the child cannot freely navigate in space. Besides, the child does not show an emotional and motor reaction to musical accompaniment, interest in exercises, games and rhythmoplasty classes.

The results of both qualitative and quantitative analysis of all indicators of physical and neurophysiological components are shown in Table 1.

Table 1. *Levels of physical component in harmonious upbringing of preschoolers based on the neurophysiological criterion (the ascertaining stage)*

Levels	Results			
	Experimental group (EG) (180 respondents – 100%)		Control group (CG) (175 respondents – 100%)	
	%	Respondents	%	Respondents
High level	-	-	-	-
Sufficient level	42.2	76	41.1	72

Average level	46.7	84	45.7	80
Low level	11.1	20	13.2	23

Therefore, a comparison of physical component levels in children’s harmonious upbringing based on the neurophysiological criterion shows that no respondent reached a high level. Only 42.2% of EG respondents and 41.1% of CG respondents are at a sufficient level of physical component. An average level is characteristic of 46.7% EG respondents and 45.7% CG respondents; a low level – of 11.1% of EG respondents and 13.2% CG respondents (see Fig. 1).

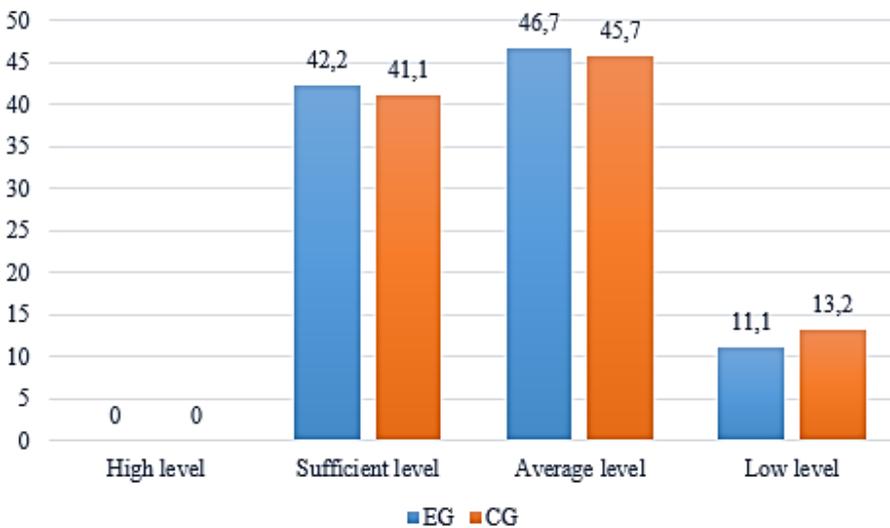


Fig. 1. *Analysis of initial levels of physical component*

After analyzing the obtained data, the experimenters proposed to organize activities provided for by the programme to increase levels of physical component. The formation of physical component in harmonious upbringing in preschools is based on systematic development of physical qualities in children by using methods, forms and means of educational influence on personality adapted to cultural and educational space of preschools and neurophysiological indicators of preschool age. In particular, the following organizational forms of work based on rhythmoplasty were proposed: traditional (morning exercises, physical education classes, entertainment activities) and alternative (fairy-tale therapy, finger gymnastics, dance and movement therapy, health aerobics classes). The program aimed to form children’s positive attitude towards themselves and their bodies,

introduce various forms of physical activity, general physical culture, and, most importantly, cultivate “self-concept” that maximally corresponds to preschoolers’ neuropsychological status.

A comparison of respondents’ results has allowed one to determine an average value of physical component levels in the structure of respondents’ harmonious upbringing in cultural and educational space of preschools before and after the formative experiment (see Table 2).

Table 2. *Analysis of physical component levels in harmonious upbringing of EG and CG children in cultural and educational space of preschools*

Levels	Before the experiment				After the experiment					
	EG (100% – 180 children)		CG (100% – 178 children)		EG (100% – 180 children)		dynamics (%)	CG (100% – 178 children)		dynamics (%)
	%	Number of respondents	%	Number of respondents	%	Number of respondents		%	Number of respondents	
High	-	-	-	-	30.2	55	+30.2	-		-
Sufficient	42.2	76	41.1	72	51.2	92	+9	41.7	74	0.6
Average	46.7	84	45.7	80	10.6	19	-36.1	45.4	81	-0.3
Low	11.1	20	13.2	23	8	14	-3.1	12.9	23	-0.3

The results of EG and CG indicate changes in levels of the complex (physical and neurophysiological) component. In particular, 30.2% of EG children reached a high level, even though this indicator was not available to any respondent at the ascertaining stage. A sufficient level increased by 9%. Also, there is a significant decrease in an average level of the axiological-physical component (by 36.1%) and a low level (by 3.1%).

There are almost no changes in the control group. One can observe no signs of a high level for complex component by the axiological-physical criterion. A sufficient level increased by 0.6%, whereas average and low levels decreased by 0.3%.

Complex component levels are shown in Figure 2.

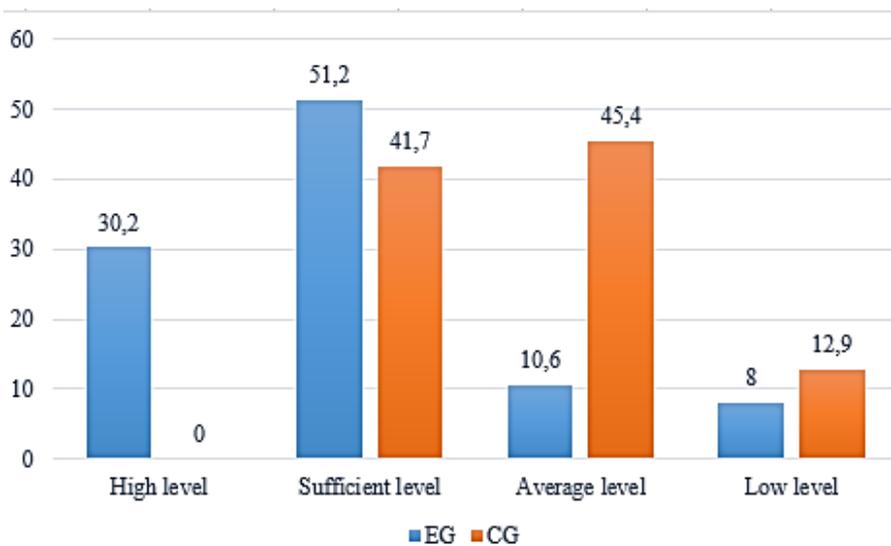


Fig. 2. *Physical component levels in EG and CG at the control stage of the experiment*

The results of the control experiment show changes in the complex (physical and neurophysiological) component of harmonious upbringing in EG and CG. There was a significant increase in the number of EG children with high and sufficient levels of harmonious upbringing, as well as some minor changes in CG. Thus, most EG preschoolers showed a fairly high level of physical component of upbringing due to the implemented programme. Thus, the research hypothesis has been confirmed.

The calculations prove that the difference in experimental data in EG and CG is caused by the experimental factor. In turn, this fact proves the effectiveness of the developed programme for preschool education in relevant cultural and educational space, as well as that of pedagogical conditions for its implementation.

It must be noted that EG results were influenced by the fact that the formative experiment with children adhered to the author's programme of preschool education in relevant cultural and educational space. Thus, its novelty can be considered proven.

The reliability of the obtained results lies in theoretical substantiation of conceptual provisions and systemic analysis of relevant sources; quantitative and qualitative analysis of the obtained data regarding the effectiveness of the author's programme; reproducibility of results and representativeness of experimental data obtained by methods of mathematical statistics.

Discussion

The international significance of the obtained results is determined by a) the first attempt to consider complex (physical and neurophysiological) criterion when modifying harmonious upbringing of children aged between 4 and 6 in cultural and educational space of Ukrainian preschools, which may encourage the implementation of such techniques in the country; b) the correlation of the considered issue with the latest trends presented below.

Nowadays, leading educators and psychologists warn against the thoughtless use of neuroscientific achievements in the educational process. Many neuropsychological studies have already led to the fact that the achievements of classical psychology and pedagogy are frequently neglected. When it comes to preschool age, however, neuropsychological and neurophysiological factors come first since it is the initial formation of personality (up to 3 years old). In the future (middle classes, adolescence) neuroscience can be effectively applied in such aspects as coaching and counselling (Voigt, 2019, p. 339). In this regard, this article applies neurophysiological and physical indicators integratively.

Nowadays, scientific justification of physical education and clarification of its role in the holistic development of preschoolers is seen as the specification of provisions on social conditionality of motor skills and their ability to influence a child's physical development. Bago et al. (2020) highlight the need to create appropriate conditions for preschool education. They highlight the importance of preschoolers' complex social and physical development under these conditions. Delaney et al. (2019) also prioritize the influence of specially created pedagogical conditions on physical activity. Tandon et al. (2019) study the influence of specially created and improvised conditions for increasing physical activity among preschoolers.

It is proven that folk traditions (some games, entertainment, folklore elements) largely influence the upbringing of preschool children. Therefore, it is essential to select appropriate traditional methods and forms. Neuropsychological diagnoses show that ethnocultural factors can have both positive and negative influence. Thus, one should rely on such facts as sensitivity to innovations, acceleration, delayed physical development when selecting development factors.

Berti et al. (2019) analyze the two leading thematic areas of the issue in question. The first one involves problem perception by adults and children. The second one covers behavioural, cognitive, and emotional aspects of development. Walker and Archibald (2006) note the role of motor skills in the development of communication skills.

It is possible, by implementing comprehensive and multifaceted methods of physical education, to form a healthy personality of a child with well-developed physical and volitional qualities, intellectual skills, and an adequate emotional-axiological attitude to life. It is organized forms of physical education and independent physical activities that meet children's biological need for movement and motivate them to lead a healthy lifestyle. Indeed, Kolk et al. (2019) view physical activity in close connection with a healthy lifestyle, which was partially implemented within the formative experiment.

Most researchers pay considerable attention to various factors affecting children's physical activity in the context of forming physical component in their harmonious upbringing. Tabacchi et al. (2020) disclose the interdependence between indicators of interactive ability and physical activity in preschoolers.

Jones et al. (2019) indicate a growing trend in the study of preschoolers' physical activity over the past two decades, which proves the relevance of this article. However, most research is aimed at children attending additional exercise classes. The justification of psycho-pedagogical conditions for forming preschooler's personality using physical activity in this article correlates with the views of Panhelova et al. (2020). They distinguish the complex development of cognitive, communicative, and physical activity of preschoolers, which depends on the created thematic-spatial environment.

Thus, it is essential and promising to create a comprehensive environment to improve physical component of children's harmonious upbringing in cultural and educational space of preschools, considering neuropsychological indicators, as noted by Toussaint et al. (2020). It is also viable to use the Orff system to create a special educational space that affects both physical and mental development of preschoolers (Kayili & Kuşcu, 2020; "Orff Schulwerk", 2021).

Finally, the article proves that one of the main functions of neurosciences (neuropedagogy and neuropsychology) is a significant potential for forming self-identification, namely self-concept, in preschoolers. Subsequently, self-concept turns into one's awareness of subjectivity when interacting with the world and other people. According to all neurosciences, a person is a neuropsychological actor with a certain but not fully known potential. As a result, the revelation of this potential helps the child to change themselves and the surrounding world (Della Sala & Anderson, 2012).

The obtained results confirm existing views of researchers and provide new experimental data. They show that compliance with all the conditions defined by the proposed programme helps increase the level of physical component in harmonious upbringing of children in cultural and educational space of preschools.

Conclusions

Given the topicality of the issue, the authors of the article suggest considering the formation of physical component in harmonious upbringing of 4 children in cultural and educational space of preschools. For this purpose, they define integral physical and neurophysiological criteria for such indicators as motor skills (speed, agility, endurance, strength, flexibility); movement skills (physical and dance movements) and, consequently, physical component levels (high, sufficient, average, low).

Research methods include theoretical analysis and generalization of scientific, methodical, pedagogical, and psychological sources, pedagogical experiment, methods of mathematical statistics, diagnostic methods (control tests, rhythmoplasty complex).

The results of the ascertaining experiment have encouraged the authors of the article to organize the measures provided by the programme to increase the level of physical component in harmonious upbringing of children and the level of self-concept, which is of neuropsychological nature. They are the following: traditional (morning exercises, physical education classes, entertainment activities) and alternative (fairy-tale therapy, finger gymnastics, dance and movement therapy, health aerobics classes). Besides, the programme aims to form children's positive attitude towards themselves and their bodies, introduce various forms of physical activity, general physical culture, and, most importantly, cultivate "self-concept" that maximally corresponds to preschoolers' neuropsychological status.

The control stage of the experiment shows that levels of physical component in harmonious upbringing of children in cultural and educational space of preschools have increased after the introduction of the pedagogical model with a set of educational activities. At the same time, the experimental group demonstrates better results than the control group due to the implementation of the proposed programme.

Further research should aim to study the peculiarities of ensuring the integration of motor, musical-rhythmic and artistic-aesthetic activities of preschoolers within the pedagogical process.

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Conflict of interest. The authors report that there is no conflict of interest.

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