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**Original Article**

# Evaluation of the effectiveness of integrated psychomotor development of children in the age from 2 to 4

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**Abstract:**
*The aim* is theoretical justifying and experimental confirming of the effectiveness of the use of innovative technologies for the development of psychomotor skills in physical education of children in the age from 2 to 4. *Materials:* there were 322 children involved in the study. Among them were 164 children (52 children who are 2 and 3 years old, 56 children who are 3 and 4 years old and 56 children who are 4 and 5 years old) in verifying experiment and 158 children in forming experiment. Among them were 56 children who are 2 and 3 years old (28 were in control group and 28 were in experimental group), 52 children who are 3 and 4 years old (24 were in control group and 28 were in experimental group), 50 children who are 4 and 5 years old (23 were in control group and 27 were in experimental group). *Results.* There was revealed the presence of integrated development of physical preparedness and psychophysiological features of children in the age from 2 to 4. We have shown that by the transition from the age group of children who are 2 and 3 years old to the age group of children who are 3 and 4 years old increases the role of physical preparedness and psychophysiological capabilities in the complex training of children. We developed the innovative technologies for integrated psychomotor development of children in the age from 2 to 4. It was with the use of complexes of exercises performed in an integrated method, use of poetry and technical devices with elements of basketball (patent № 23504 Ukraine), children's tourism (patent № 23501 Ukraine), M. Montessori's modified technique (patent № 23503 Ukraine). *Conclusions.* It revealed the positive impact of the use of integrated innovative technologies of development of the psychomotor skills on the performance of physical preparedness and psychophysiological capabilities of children in the age from 2 to 4. We observed (in the group of the children who are 3 and 4 years old) not only the rates acceleration of physical development, but also development of physical qualities and psychophysiological capabilities. This period can be considered sensitive for preschoolers with relation to development of physical qualities and psychophysiological capabilities.
**Key words:** psychomotor, development, child, innovation, innovative technologies, physical preparedness, psychophysiological capabilities, technical devices, basketball, tourism.

## Introduction

At preschool age child gets essential knowledge and skills, creates the individual experience, system of values, interests and aspirations. At this age he or she forms the first holistic representation and worldview (Cools W., De Martelaer K., Vandaele B., Samaey C., Andries C. 2010; Georgiadis G., and G.P. Nassis, 2007; A. Kambas, F. Venetsanou, D. Giannakidou, I.G Fatouros, A. Avloniti, A. Chatzinikolaou, D. Draganidis, R. Zimmer 2012) [15; 18; 21]. Current trends in preschool education is its focus on implementation in teaching practice a holistic approach to personal development and the formation of a preschooler's holistic picture of the world (understanding of environment and inner spiritual life) (Zh.L. Kozina, O.G. Lahno, T.V. Moskalets, N.M. Kondak 2011, G.V. Korobeynikov, Zh.L. Kozina, O.G. Lahno 2011, Zh.L. Kozina, V.Yu. Kozin, 2009) [3; 6; 9].

However, deterioration of functional and somatical condition of the young generation causes particular concern among experts of various branches. It exists because of small moving activity, compared with children of the same age in the period of 70-80 years of XX century. [1; 2; 4; 5; 11; 13; 14]. It is worth noting that specialists in the sphere of physical education have the greatest arsenal of methods for diseases prevention [16; 19; 20; 24; 28; 30]. Scientists are always interested in studying of the problem of holistic approach to child development (Livingstone M.B.E., in 2001, Lopes V.P., L.P. Rodrigues J.A.R. Maia and R.M. Malina 2011; Obeid J., T. Nguyen, L. Gabel and B.W. Timmons 2011; Pate R.R., J.R. O'Neil and J. Mitchell, 2010) [26; 27; 33; 34]. In addition, this problem is very topical at the beginning of human life when we can see the forming of the bases of organism functioning for all your life (Reilly J.J., 2008; Vandrope B., Vandendriessche 2011; Venetsanou F., Kambas A., 2010) [35; 37; 38]. They become particularly acute now. On the one hand, sport is


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close to the peak of human's ability, and on the other, the achievements of civilization lead to inactivity of the population (Kozina Zhanneta, Sobko Irina, Bazulyk Tatyana, Ryepko Olena, Lahno Olena, Ilintskaya Anna, 2015; Kozina Zh.L., Iermakov S.S., 2015; McNamara, E.Z. Hudson and S.J.C. Taylor, 2010; Sobyanin F.I., Scherbin D.V., 2012; Venetsanou F., Kambas A., Aggeloussis N., Fatouros I., Taxildaris K., 2009) [22; 23; 31; 36; 39]. Because of this, the psychomotor development will contribute to opportune physical and intellectual child's development. (Lam M.Y., Ip. M.H., Lui P.K., Koong M.K., 2003; Manios Y., V. Costarelli, M. Kolotourou, K. Kondakis, C. Tzavara and G. Moschonis, 2007; Williams H. G., Pfeiffer K. A., O'Neill J. R., 2008; Waelvelde H., Peersman, W., Lenoir, M., Smits-Engelsman, B., Henderson S., 2008; Venetsanou F., Kambas A., Aggeloussis N., Serbezis V., Taxildaris K., 2007) [25; 29; 40; 42; 43].

Scientists in the sphere of psychophysiology established the connection between the development of psychophysiological capabilities and the intellect rates of people of different age groups (Venetsanou F., Kambas A., Ellinoudis T., Fatouros I., Giannakidou D., Kourtessis T., 2011; Yushina I.A., Nekipelova E.V., Sirotina S.S., Sobyanin F.I., Zhernakova N.I., 2014) [41; 44], and the need for conscious perception of information for realization of an individual approach with improving of the motor skills and development of the motor qualities (Kozina Zhanneta, Sobko Irina, Bazulyk Tatyana, Ryepko Olena, Lahno Olena, Ilintskaya Anna, 2015; Kozina Zh.L., Iermakov S.S., 2015) [22; 23]. Specialists in the sphere of preschool physical education studied the development of psychomotor skills and the effectiveness of different approaches to learning movements in interrelation of mental, motor and psychomotor development of preschoolers [10; 12; 32].

After the analyzing of scientific literature we can say that the authors pay attention to the physical, intellectual, speech and other areas of early childhood development [1; 2; 12; 32]. These published studies of complex children's development are stressing that teachers use different directions of development during the lessons of physical culture. It is possible due to selection and use of outdoor games and training exercises which contain intellectual and moral components [11; 15; 17].

However, we should note about an insufficient number of publications where we can find the identifying of physiological characteristics of preschoolers, studying the age peculiarities of children who are 2 and 3 years old, proposing the technologies for the integrated psychomotor development of preschoolers.

In addition, the problem of the need to work out the innovative technologies for the integrated psychomotor development becomes topical by the fact that early childhood is time for intensive exploration of the world, when a child wants to interact with various objects of surrounding world [1; 3; 5; 25].

**Materials and methods**

*The aim* is to evaluate the effectiveness of integrated psychomotor development of children in the age from 2 to 4.

*Methods of the research:* analysis and synthesis of scientifically-methodological and special literature; pedagogical experiment; methods of pedagogical testing (running 10 m (s.), throwing sandbags weighing 40 g. (m.), broad jump from a place (m.), static balance on one leg (s.)); method of anthropometry (body length and weight); methods of psychophysiological testing; method of technical and artistic design (using this method we developed the author's technical devices); methods of mathematical statistics with use of comparisons of the samples according to criteria of Student (t-test) with the help of computer, mathematical and statistical program «SPSS». There are 322 children involved in the study. Among them were 164 children (52 children who are 2 and 3 years old, 56 children who are 3 and 4 years old and 56 children who are 4 and 5 years old) in verifying experiment and 158 children in forming experiment. Among them were 56 children who are 2 and 3 years old (28 were in control group and 28 were in experimental group), 52 children who are 3 and 4 years old (24 were in control group and 28 were in experimental group), 50 children who are 4 and 5 years old (23 were in control group and 27 were in experimental group). During the experiment in the kindergarten-nursery № 309 "Zernyatko" in Dnipropetrovsk the control group was working in accordance with the basic program. And in the experimental group we were using the author's innovative technology of the development of psychomotor capabilities. Among them are activities with basketball elements on the device "Smart Ring"; relay-races with the help of "Happy corners" and a game with the tourism elements "Pairs" [4; 5; 9].

These lessons were three times a week for both groups. The duration of them was the same. Children who are 2 and 3 years old had from 10 to 20 minutes; who are 3 and 4 years old had from 20 to 25 minutes; who are 4 and 5 years old had from 25 to 30 minutes. Exercises and games with the developments (in the experimental group) were carried out in the main and final part of the lesson. The duration of the pedagogical experiment was 6 months.

**Results**

We developed the innovative technologies for integrated psychomotor development of children in the age from 2 to 4. It was with the use of complexes of exercises performed in an integrated method, use of poetry and technical devices with elements of basketball (patent № 23504 Ukraine), children's tourism (patent № 23501 Ukraine), M. Montessori's modified technique (patent № 23503 Ukraine).

The basis for innovation of worked out technologies is their integrated impact on the child's development. We proposed the technologies that functionally, holistically and integrally unite the various

elements of training and education: the development and formation of motor skills, combined with colours studying (technical device "Smart Ring" (Fig. 1), teaching to count and match shape and size of objects (a set of geometrical figures with stands "Happy corners"), development of the ability to classify and organize, development of some motor skills (a set of soft toys "Pairs"), imagination, creativity and communication skills (exercises with the help of poems) (Zh.L. Kozina, W.Yu. Kozin, 2009) [3] (Fig. 1).

In the preparatory part of the lesson we used some gymnastic exercises with the help of poems. It was made for the integral development of children. In the main part we used exercises performed on a technical device "Smart ring", relay-races, games with geometric figures "Happy corners" and soft toys "Pairs" (Fig. 2).

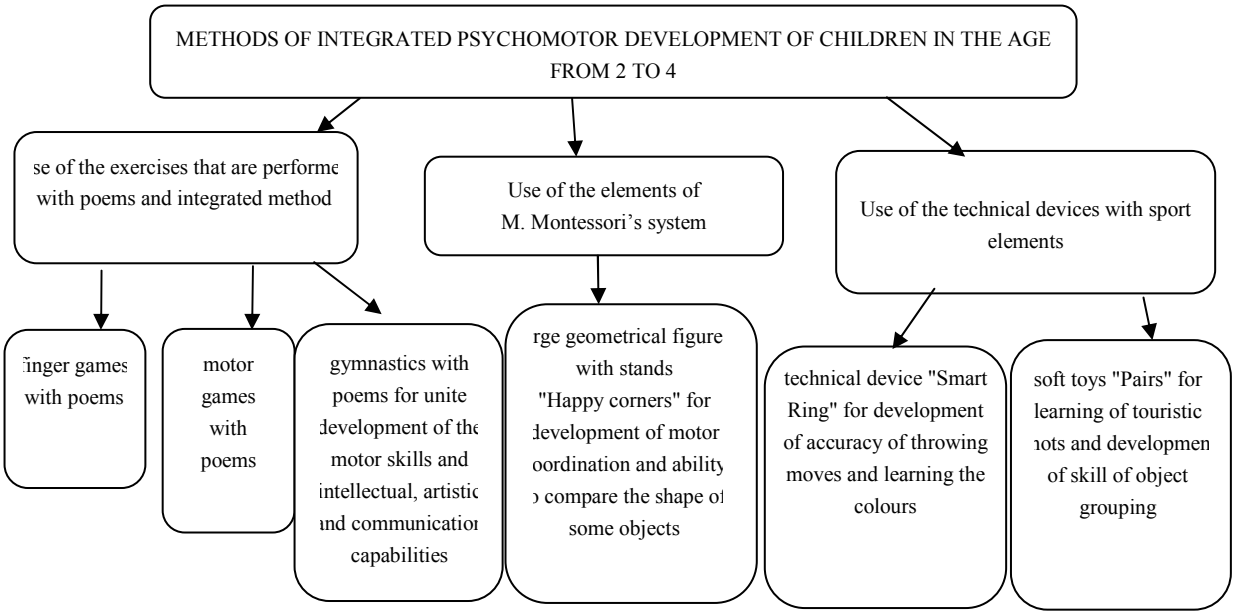


*Fig. 1. Methods of integrated psychomotor development of children in the age from 2 to 4*

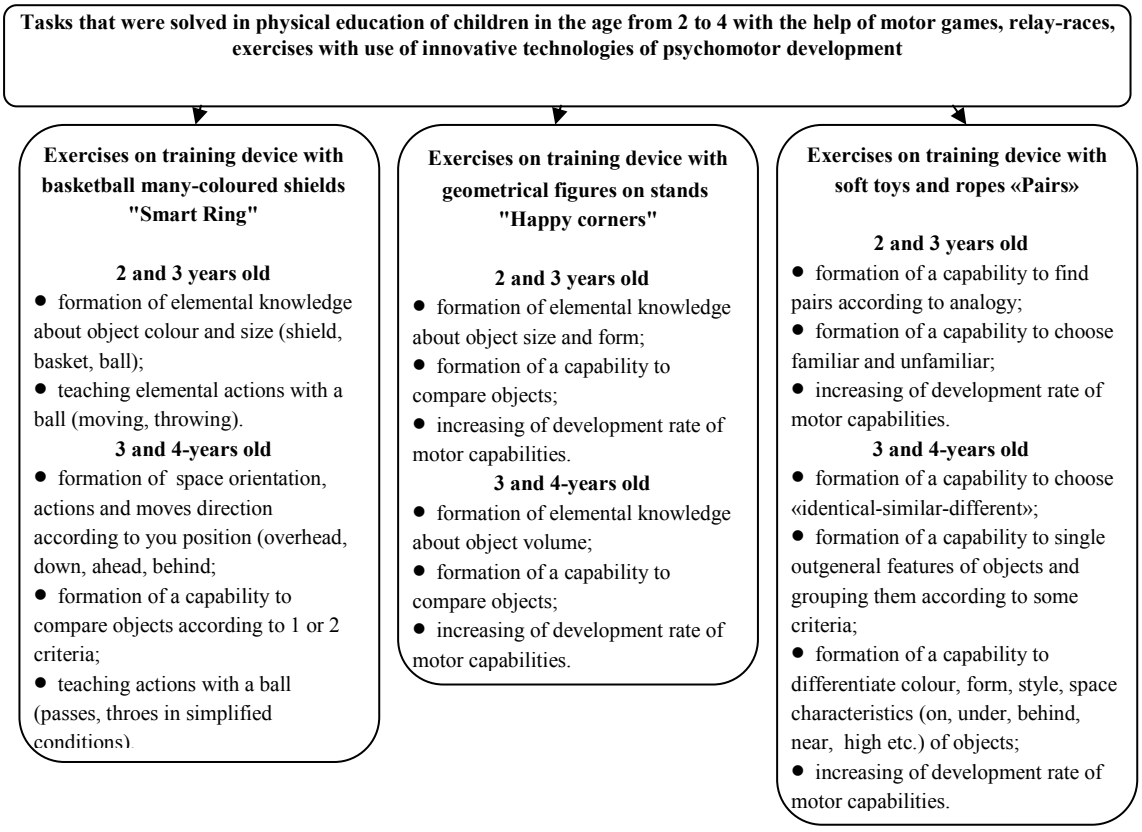


*Fig. 2. Tasks that were solved in physical education of children in the age from 2 to 4 with the help of motor games, relay-races, exercises with use of innovative technologies of psychomotor development*

The use of the innovative technical devices contributed to rates increasing of physical preparedness and psychophysiological capabilities of preschoolers. In addition, there is deepening of integral development of motor skills and psychophysiological capabilities according to correlation and factor analysis.

Table 1. The characteristics of physical, psychophysiological development and physical capabilities of the children (2 and 3 years old) of control and experimental groups before the experiment (n=28)

| Characteristics | Group | Statistical denotations of characteristics | | | | |
|---|---|---|---|---|---|---|
| | | $\bar{x}$ | S | m | t | p |
| Body weight, kg | exp. | 14,85 | 1,54 | 0,02 | 0,01 | >0,05 |
| | contr. | 16,6 | 1,24 | 0,02 | | |
| Body length, m | exp. | 0,93 | 0,054 | 0,01 | -1,66 | >0,05 |
| | contr. | 0,95 | 0,039 | 0,007 | | |
| Time for reaction on light irritant, ms | exp. | 1463,93 | 85,65 | 11,70 | 0,01 | >0,05 |
| | contr. | 1452,79 | 83,89 | 10,37 | | |
| Reaction stability on light irritant, cV, y.o. | exp. | 53,46 | 18,97 | 3,59 | 0,08 | >0,05 |
| | contr. | 53,07 | 18,55 | 3,51 | | |
| Time for reaction on sound irritant, ms | exp. | 1273,89 | 53,34 | 5,12 | -0,04 | >0,05 |
| | contr. | 1278,64 | 42,51 | 3,08 | | |
| Reaction stability on sound irritant, cV, y.o. | exp. | 0,48 | 0,02 | 0,01 | 0,14 | >0,05 |
| | contr. | 0,47 | 0,01 | 0,010 | | |
| Running 10 m, s | exp. | 4,11 | 0,55 | 0,10 | 1,77 | >0,05 |
| | contr. | 3,92 | 0,15 | 0,03 | | |

We revealed the positive impact of the use of integrated innovative technologies of the psychomotor skills development on the rates of physical preparedness and psychophysiological capabilities of children in the age from 2 to 4.

We observed (in the group of children who are 3 and 4 years old) not only the rates acceleration of physical development, but also development of physical qualities and psychophysiological capabilities. This period can be considered sensitive for preschoolers with relation to development of physical qualities and psychophysiological capabilities.

In the age group of 2 and 3 years old most significant changes occurred in terms of the time of a simple reaction to light and sound. In the experimental group we can observe a significant decrease of the time latency reaction to light from 146,65 ms to 1110,25 ms, $t = 2.67$ (t-test), $p < 0.01$ in the control group. These changes are not reliable. Time of 10 meters running also decreased.

Table 2. The characteristics of physical, psychophysiological development and physical capabilities of the children (2 and 3 years old) of control and experimental groups after the experiment (n=28)

| Characteristics | Group | Statistical denotations of characteristics | | | | |
|---|---|---|---|---|---|---|
| | | $\bar{x}$ | S | m | t | p |
| Body weight, kg | exp. | 15,74 | 1,72 | 0,32 | 0,39 | >0,05 |
| | contr. | 15,56 | 1,72 | 0,32 | | |
| Body length, m | exp. | 0,97 | 0,056 | 0,01 | -1,93 | >0,05 |
| | contr. | 0,99 | 0,036 | 0,006 | | |
| Time for reaction on light irritant, ms | exp. | 1110,25 | 40,62 | 7,49 | -2,09 | <0,05 |
| | contr. | 1448,21 | 89,74 | 6,59 | | |
| Reaction stability on light irritant, cV, y.o. | exp. | 0,48 | 0,08 | 0,03 | -2,09 | <0,05 |
| | contr. | 0,52 | 0,08 | 0,03 | | |
| Time for reaction on sound irritant, ms | exp. | 1030,36 | 38,27 | 6,60 | -2,09 | <0,05 |
| | contr. | 1242,57 | 45,10 | 8,78 | | |
| Reaction stability on sound irritant, cV, y.o. | exp. | 40,21 | 6,99 | 3,21 | -2,09 | <0,05 |
| | contr. | 47,61 | 7,52 | 3,31 | | |
| Running 10 m, s | exp. | 3,75 | 0,44 | 0,08 | -0,87 | >0,05 |
| | contr. | 3,83 | 0,18 | 0,03 | | |

The most significant changes after use of developed technologies were in the age group of 3 and 4 years old.

Thus, we revealed real rates increasing of a simple reaction on light and sound irritants. Time for reaction on the light decreased from 907,00 ms to 735,79 ms, $t=4,17$, $p<0,001$. In turn, time for reaction on the sound decreased from 840,93 ms to 611,18 ms, $t=4,00$, $p<0,001$) (fig.6). We also can see reliable imperfection of sandbags throwing (from 2,56 m to 2,90 m, $t=2,92$, $p<0,05$) (fig.3), running speed of 10 meters distance (from 3,53 to 3,06 s, $t=4,46$, $p<0,001$), broad jump (from 0,64 m to 0,73 m, $t=2,67$, $p<0,01$).

We observed (in the group of children who are 3 and 4 years old) not only the rates acceleration of physical development, but also development of physical qualities and psychophysiological capabilities. This

period can be considered sensitive for preschoolers with relation to development of physical qualities and psychophysiological capabilities.

**Discussion.**

The study confirmed the results of studies of the integrated exercise impact on motor and intellectual aspects of child's development [1; 3; 5; 10].

Derived data confirm and expand the studies of I.A. Arshavsky [1], E.S. Vilchkovsky [2] G.V. Korobeinikov, Zh.L. Kozina, A.G. Lahno [6] and other researchers [8; 11; 17; 33; 34]. It was in terms of children physical development of different age groups, physical preparedness, study of psychophysiological functions in various external and physiological conditions of the human body functioning.

The results of this study confirm, extend and experimentally prove the physiology classics' views [1]. They deal with the effect of exercises impact, in the presence of simultaneous work of the various centers of consciousness.

This study clearly showed the high efficiency of the innovative technologies of development of psychomotor abilities of the child on physical education lessons in kindergartens, their complex effect on physical preparedness, psychophysiological development of children (from 2 to 5 years old). So, it makes advisable to use extensively these technologies during physical education classes of preschoolers.

We also should note that the problem of integral psychomotor development of children during physical education classes is not practically studied. There are separate educational systems aimed primarily at the mental development of children. In this regard, derived innovative technologies of development of psychomotor skills of children in the age from 2 to 5 are new and topical both in terms of theory and methodology of physical education. It is also useful for practical work with toddlers and preschoolers.

The use of innovative technologies (with the use of technical devices) of development of psychomotor skills of children in the age from 2 to 4 contributed to rates increasing of physical preparedness and psychophysiological capabilities.

It was found that using the innovative technologies of integral psychomotor development of children in the age from 2 to 4 as they grow older we can observe more clear changes in the structure of their complex preparedness. It is the transition from domination of physical development to the benefits of motor readiness, psychophysiological capabilities and stability.

The high efficiency of the integrated psychomotor development system of the child on physical education classes in kindergartens, their complex effect on physical preparedness, psychophysiological development of children (from 2 to 4 years old). So, it makes advisable to use extensively these technologies during physical education classes of preschoolers.

**Conclusions.**

1. We developed the innovative technologies for integrated psychomotor development of children in the age from 2 to 4. It was with the use of complexes of exercises performed in an integrated method, use of poetry and technical devices with elements of basketball (patent № 23504 Ukraine), children's tourism (patent № 23501 Ukraine), M. Montessori's modified technique (patent № 23503 Ukraine).

2. It was revealed the positive impact of the use of integrated innovative technologies of development of the psychomotor skills on the performance of physical preparedness and psychophysiological capabilities of children in the age from 2 to 4.

3. We observed in the group of the children who are 3 and 4 years old not only the rates acceleration of physical development, but also development of physical qualities and psychophysiological capabilities. This period can be considered sensitive for preschoolers with relation to development of physical qualities and psychophysiological capabilities.

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