

## EFFECTIVENESS OF METHODIC SYSTEM OF MOTOR FUNCTIONING'S PREVENTIVE DEVELOPMENT IN SIXTH YEAR OF CHILDREN'S LIFE IN THEIR PHYSICAL CONDITION'S IMPROVEMENT

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**Abstract.** *Purpose:* to determine effectiveness of simulated system of motor functioning's preventive development of pre-school children for improvement of their physical (motor) qualities at physical culture classes. *Material:* In research 5 years old children participated. In control groups they were 75 girls and 75 boys (25 with ambidexterity, 25 with right and 25 with left manual asymmetry). Experimental groups consisted of 60 girls and 60 boys (20 with every variant of manual motor asymmetry). *Results:* we registered positive influence of symmetric approach to training of children to main movements. It implies realization of all form of physical exercises' practicing in certain day of working week through creation of motor environment with aerobic mode of children's motor functioning. It is recommended to use breathing exercises with accent on relaxation and activation of functioning for regulation of mental state in required direction. *Conclusions:* for achievement of positive results it is important to take measures, oriented on home physical exercises. Interaction with parents for formation of children's conscious attitude and further practical realization of offered by us means and methods ensure more effective solution of this problem.

**Key words:** experimental, system, effectiveness, motor, asymmetry, qualities, children, pre-school age children.

### Introduction

In pre-school period motion is the main function of a child [2; 4]. At present stage physical culture classes do not facilitate achievement of required physical condition and other important qualities and functions by children before starting learning at school [10, 17, 18, 21-23]. In this connection children's social and psychological adaptation to new conditions of life activity in learning can not be adequate [7]. It results in worsening of health [14], functional potentials [5], appearing of tiredness from mental functioning even in free from this work days of week [6].

On the other hand theory and practice of physical culture accumulated social values, usage of which facilitates positive changes of external and internal (mental) characteristics of individual, development of his (her) abilities and skills, formation of world-vision settings, motives, interests [13]. But considering the above mentioned such social values are not effective enough. One of reasons of this is not adequate scientific-methodic provision of physical culture classes as pedagogically organized process. In other words there is certain contradiction between accumulated social-historical experience in sphere of physical culture on the one hand and practice of its realization in pedagogic theory and practice of pre-school children's teaching. This contradiction shall be eliminated as quickly as possible.

### Purpose, tasks of the work, material and methods

*The purpose of the research:* is to determine effectiveness if simulated system of preventive motor functioning's development for pre-school children in order to improve their physical (motor) skills at physical culture trainings. The tasks of the research were the following: determine orientation of manual motor asymmetry (MMA) and output indicators of motor skills; carry out one-year forming experiment; determine summarizing indicators of motor skills; conduct comparative analysis of changes in the tested groups.

The following *methods of the research* were used: general scientific (analysis, generalization of literature sources' information); pedagogic (testing, experiment); oral questioning, hand dynamometry and methodic of M.M. Bezrukikh [3] for determination of children's MMA orientation, mathematical statistic. In experiment 5 years old children participated: 60 girls and 60 boys [20 with ambidexterity (AMA), 20 with left (LMA) and 20 with right (RMA) motor orientation]. These children composed experimental groups (EG). 75 girls and 75 boys (25 for each variant of MMA) composed control groups. In all EG the worked out methodic system of children motor functioning's preventive development was realized at physical culture classes. In all CG approach to physical culture trainings was traditional. Pedagogic testing was conducted in September and in April. We used commonly used tests, which required metrological requirements.

In most general aspect distinction of experimental factor was in detailing of pedagogic process's components (purpose, tasks, principles, means, methods, forms) and determination of methodic principles of their realization in practice. In applied aspect (depending on changes of the tested indicators during using of experimental factor) distinctions were the following: in EG we used symmetric approach to training of main movements. It stipulated training of a movement in several stages: at first and second - by passive arm (leg, direction); then - by active; at third stage - alternating fulfillment by every limb or in different directions. We did not influence on the studied motor skills intentionally. Indirectly we rendered influence by outdoor games for perfection of main movements' skills, mastered by children at previous training. Through realization of all physical exercises' forms in certain day of working week we created "motor environment" with aerobic mode of children's functioning. We used affirmations, breathing exercises with accent on relaxation and activation of functioning for regulation of mental state in required direction. At methodic seminars and consultations we improved knowledge and skills of instructors in conducting of physical exercises. In

common with instructors we formed parents' conscious position concerning importance of children's practicing physical exercises at home. With it, we considered the mentioned methodic principles. Parents conducted such trainings of their children during one year at days off; significant quantity of parents directly participated in fulfillment of the exercises.

### Results of the research

Before experiment it was detected that boys and girls of EG and CG with certain MMA orientation did not differ by the tested indicators. At the end of academic year we received quite different results.

**G i r l s.** By criterion of indicators' quantity, values of which were registered during all year there were substantial changes ( $p$  at level from  $<0.05$  to  $<0.001$ ). The tested groups distinguished by certain features. For example in *girls' EG with AMA* all indicators of the tested motor skills improved. In CG the following indicators improved: explosive power of lower limbs' muscles (increment 6.6 %); coordination in throws for distance by right (14.3) and left (26.8) arms and for accuracy (accordingly by 16.6 and 10 %). Thus, during academic year in EG all motor skills improved. In CG – only 5 from 9 tested indicators.

By quantity of indicators, value of which was much better in one group than in other, results of EG were much higher than in CG. Development of mobility in lumbar spine and in coordination in throws for accuracy became practically equal. The other results were not equal. In particular, in EG and CG the picture was as follows:

- absolute muscular strength by data of hand dynamometry was accordingly  $8.5 \pm 0.5$  and  $7.1 \pm 0.3$  kg,
- speed power (20 meters' run from walking) at level  $6.7 \pm 0.06$  and  $7 \pm 0.1$  sec,
- coordination in cyclic motions (shuttle run 3x5 meters) –  $7.7 \pm 0.09$  and  $8.2 \pm 0.2$  sec.,
- throw for distance by right arm –  $7 \pm 0.13$  and  $6.4 \pm 0.17$  meters ( $p < 0.05$ ),
- explosive power (long jump from the spot) –  $98.1 \pm 1.3$  and  $92.2 \pm 1.2$  cm,
- coordination in throws for distance by left arm –  $6 \pm 0.19$  and  $5.2 \pm 0.16$  m ( $p < 0.01$ ).

Thus, results of EG, in comparison with CG girls with AMA were higher in 6 indicators from 9 tested.

In tested groups of *girls with RMA* we received result, which witnessed about the following: during academic year mobility in lumbar spine in EG girls remained on unchanged level. The same concerned coordination in throws for accuracy by left (passive) and right (active) arms. At the same time in CG coordination in throws for accuracy [accordingly by active and passive arms] worsened by 13.7 and 22.1% ( $p$  was from  $<0.01$  to  $p < 0.001$ ). The rest of the tested motor skill substantially improved.

Generalizing the received results we noted that in EG 6 from 9 tested indicators improved. In CG only 3 indicators improved with simultaneous worsening of 2 other motor skills.

As per other used criterion we received the following result: in EG all motor skills (except mobility in lumbar spine) improved by the end of academic year in comparison with CG. It was witnessed by the following data:

- in EG indicator of absolute muscular strength was  $10.2 \pm 0.3$  kg. In CG - only  $8.9 \pm 0.5$ ,
- speed power – accordingly  $6.1 \pm 0.07$  and  $6.6 \pm 0.2$  sec,
- coordination in cyclic motions –  $7.1 \pm 0.09$  and  $7.6 \pm 0.18$  sec ( $p < 0.05$ ).

Still higher differences were detected in the following indicators:

- coordination in throws for accuracy by active and passive arms: in EG at level  $52.3 \pm 1.7$  and  $48.1 \pm 2.6$  cm accordingly. In CG –  $61.6 \pm 1.9$  and  $69.5 \pm 2.3$  m;
- coordination in throws for distance – by passive arm ( $5.7 \pm 0.13$  and  $4.9 \pm 0.13$  m), by passive - ( $7.8 \pm 0.12$  and  $6.6 \pm 0.11$  m),
- explosive power of lower limbs' muscles –  $101.2 \pm 0.62$  and  $96.1 \pm 1.1$  cm ( $p < 0.001$ ).

Generalizing the above mentioned we received the following result: from all 9 indicators of motor skills in EG 8 were much higher. In CG no indicator improved.

In EG *girls with LMA* at the end of academic year we detected improvement of all motor skills. Their increment was within 7.7–55.2 %. In CG such improvements were only in the following:

- absolute muscular strength (increment 21.5%),
- coordination in throes for distance by active left arm (increment 23.4 %), and by passive right arm (11.8 %),
- coordination in throws for accuracy by passive arm (28.5 %) ( $p$  from  $<0.01$  to  $p < 0.001$ ).

At the same time we noted that increment of such motor skills in EG was accordingly 45.5 %, 44.4, 38 and 55.2 %.

Thus, in EG, during academic year all motor skills improved. In CG only 4 from 9 tested skills.

By criterion of indicators' quantity, value of which in one group was much better than in other: in EG all indicators (except mobility in lumbar spine) were better than in CH (8 from 9).

**B o y s.** In tested groups of boys with different MMA orientation we obtained results, analogous to the mentioned above. In generalized form they witnessed the following: in EG of *boys with AMA* all indicators substantially improved. In CG – only 5 indicators (see table 1). Values of indicators at the end of academic year were as follows: in EG in all indicators (except coordination in throws for accuracy by right and left arms) their values were substantially better than in CG boys. In CG no indicator improved.

Table 1

*Change of motor skills' indicators in tested groups of boys with AMA in the course of forming experiment*

Indicator	Group	At the beginning		At the end		Change		Confidence of difference, <i>t</i>	
		$\bar{x}_1$	<i>m</i>	$\bar{x}_2$	<i>m</i>	Abs.	%	$\bar{x}_1 - \bar{x}_2$	EG-CG
Active hand's dynamometry, kg	EG	5.9	0.17	9.4	0.12	3.5	59.3	16.8***	9.6
	CG	5.7	0.15	7.9	0.1	2.2	38.6	12.2***	***
Forward bent from sitting position, cm	EG	8.0	0.9	10.8	0.4	2.8	35.0	2.84*	2.5
	CG	8.2	0.7	9.1	0.55	0.9	11.0	1.01	*
20 meters' from walking, sec.	EG	6.9	0.12	5.7	0.09	-1.2	17.4	8.0***	2.38
	CG	6.8	0.18	6.2	0.19	-0.6	8.8	2.29*	*
Long jump from the spot, cm	EG	94.1	1.7	110.1	1.0	16.0	17.0	8.11***	2.41
	CG	94.7	1.8	104.5	2.1	9.8	10.3	3.54**	*
Shuttle run 3x5 meters, sec.	EG	7.9	0.15	7.1	0.11	-0.8	10.1	4.3***	3.36
	CG	7.9	0.14	7.6	0.1	-0.3	3.8	1.74	**
Throw for distance with right arm, meters	EG	7.0	0.14	8.8	0.12	1.8	25.7	9.76***	4.69
	CG	7.1	0.22	7.9	0.15	0.8	11.3	3.0**	***
Throw for distance with left arm, meters	EG	5.7	0.19	8.1	0.12	2.4	42.1	10.7***	6.0
	CG	5.6	0.15	6.7	0.2	1.1	19.6	4.4***	***
Error in throw for accuracy with right arm, cm	EG	35.2	2.4	26.1	2.9	-9.1	25.9	2.42*	0.81
	CG	34.1	2.7	29.2	2.5	-4.9	14.4	1.33	
Error in throw for accuracy with left arm, cm	EG	28.1	2.2	19.4	1.8	-8.7	31.0	3.06**	1.29
	CG	27.4	2.1	22.5	1.6	-4.9	17.9	1.86	

Notes: *abs.* – absolute, hereinafter confidence of difference between two mean values is noted at level: «\*» –  $p < 0.05$ , «\*\*» –  $p < 0.01$ , «\*\*\*» –  $p < 0.001$

In EG of boys with RMA all motor skills, except coordination in throw for accuracy by active and passive arms, improved. In CG – only 4 indicators improved with simultaneous worsening of the mentioned above coordination (accordingly by 16.4 % ( $p < 0.05$ ) and 18.5 % ( $p < 0.01$ )). With it, at the end EG boys had much better all indicators Than CG boys (see table 2).

Analogous results were received in boys' groups with LMA, except certain features. For example, in EG 8 indicators improved (except mobility in lumbar spine). In CG – only 7 with exception of mobility in lumbar spine and speed power (see table 3). With it, at the end in EG all indicators were much better than in CG.

Table 2

*Change of motor skills' indicators in tested groups of boys with RMA in the course of forming experiment*

Indicator	Group	At the beginning		At the end		Change		Confidence of difference, <i>t</i>	
		$\bar{x}_1$	<i>m</i>	$\bar{x}_2$	<i>m</i>	Abs.	%	$\bar{x}_1 - \bar{x}_2$	EG-CG
Active hand's dynamometry, kg	EG	7.8	0.18	10.9	0.16	3.1	39.7	12.9***	13.3
	CG	7.6	0.2	8.4	0.1	0.8	10.5	3.58**	***
Forward bent from sitting position, cm	EG	9.7	0.49	12.1	0.13	2.4	24.7	4.73***	2.56
	CG	9.9	0.55	10.9	0.45	1.0	10.1	1.41	*
20 meters' from walking, sec.	EG	6.4	0.13	5.4	0.12	-1.0	15.6	5.65***	3.84
	CG	6.4	0.11	6.0	0.1	-0.4	6.3	2.69*	**

Long jump from the spot, cm	EG	98.5	1.2	110.9	1.3	12.4	12.6	7.01***	2.52
	CG	99.2	1.6	105.1	1.9	5.9	5.9	2.38*	*
Shuttle run 3x5 meters, sec.	EG	7.6	0.14	7.0	0.1	-0.6	7.9	3.49**	2.56
	CG	7.6	0.17	7.4	0.12	-0.2	2.6	0.96	*
Throw for distance with right arm, meters	EG	7.1	0.17	9.2	0.12	2.1	29.6	10.1***	7.9
	CG	7.1	0.15	7.9	0.11	0.8	11.3	4.3***	***
Throw for distance with left arm, meters	EG	4.9	0.16	8.1	0.14	3.2	65.3	15.1***	10.9
	CG	4.8	0.14	5.7	0.17	0.9	18.8	4.09***	***
Error in throw for accuracy with right arm, cm	EG	41.1	2.3	36.9	2.4	-4.2	10.2	1.26	3.23
	CG	40.2	2.5	46.8	1.9	6.6	-16.4	2.1*	**
Error in throw for accuracy with left arm, cm	EG	48.9	1.9	39.8	2.4	-9.1	18.6	2.97**	5.99
	CG	49.7	1.6	58.9	2.1	9.2	-18.5	3.48**	***

Note: *abs.* – absolute

Table 3

*Change of motor skills' indicators in tested groups of boys with LMA in the course of forming experiment*

Indicator	Group	At the beginning		At the end		Change <i>Abs.</i>	Confidence of difference, <i>t</i>		
		$\bar{x}_1$	<i>m</i>	$\bar{x}_2$	<i>m</i>		%	$\bar{x}_1 - \bar{x}_2$	EG-CG
Active hand's dynamometry, kg	EG	7.0	0.3	9.5	0.19	2.5	35.7	7.04***	5.5
	CG	6.8	0.2	7.9	0.22	1.1	16.2	3.7**	***
Forward bent from sitting position, cm	EG	9.4	0.4	10.1	0.3	0.7	7.4	1.4	2.06
	CG	9.3	0.6	8.9	0.5	-0.4	4.3	0.51	*
20 meters' from walking, sec.	EG	6.3	0.11	5.4	0.12	-0.9	14.3	5.53***	3.2
	CG	6.2	0.16	5.9	0.1	-0.3	4.8	1.59	**
Long jump from the spot, cm	EG	105.8	1.3	117.2	1.0	11.4	10.8	6.95***	2.67
	CG	107.1	2.1	112.6	1.4	5.5	5.1	2.18*	*
Shuttle run 3x5 meters, sec.	EG	8.5	0.16	6.6	0.09	-1.9	22.4	10.4***	3.32
	CG	8.5	0.2	7.0	0.08	-1.5	17.6	6.96***	**
Throw for distance with right arm, meters	EG	6.1	0.18	8.5	0.19	2.4	39.3	9.17***	4.94
	CG	6.2	0.16	7.1	0.21	0.9	14.5	3.41**	***
Throw for distance with left arm, meters	EG	6.7	0.17	9.2	0.16	2.5	37.3	10.7***	5.4
	CG	6.6	0.15	7.9	0.18	1.3	19.7	5.55***	***
Error in throw for accuracy with right arm, cm	EG	41.4	2.2	19.7	2.1	-21.7	52.4	7.13***	3.04
	CG	40.7	2.1	28.1	1.8	-12.6	31.0	4.56***	**
Error in throw for accuracy with left arm, cm	EG	22.1	1.7	11.2	1.3	-10.9	49.3	5.09***	2.83
	CG	21.8	1.6	16.2	1.2	-5.6	25.7	2.8*	*

Note: *abs.* – absolute

### Discussion

The data received in boys' and girls' tested groups were connected with complex of reasons. In the most general form better results of EG were conditioned by application of the worked out methodic system. This system is oriented on preventive development of pre-school age children's motor functioning during physical culture classes in different forms. Concerning specifying of the mentioned reasons, one of them was connected with application of symmetric approach to training of main movements in EG; in CG children fulfilled movement in comfortable for them manner [by active arm, leg or in convenient direction]. The mentioned is proved by works of other researchers [1, 11, 15, 16, 19, 20]. Improvements are conditioned by involving of both semi-spheres in functioning. As it is noted in works by V.A. Moskvina B.A. [8] and V.M. Orzhekhovska [12] with any orientation of MMA the necessary condition of high activity and successful training of a child is development of his (her) interaction between brain semi-sphere: coordinated movement of left and right arms increase degree of such interaction.

Other reason was ensuring of aerobic mode of children's functioning by all available means: consideration of sensitive period in development of such energy supply mechanism facilitated more intensive development of organism's different systems, in particular, nervous-muscular, breathing, cardio systems. Such changes made positive effect on manifestation of motor skills [2].

At the same time measures, oriented on home practicing of exercises, were also important. Interaction with parents for formation of their conscious position and further practical realization of the offered means and methods by them ensure more effective solution of this problem [9].

### Conclusions

1. Application of the offered system of preventive motor functioning's development in 6<sup>th</sup> year of child's life ensures improvement of most indicators of motor skills in comparison with traditional approach: from 9 indicators girls with AMA showed improvement of 9 and 5 accordingly; girls with RMA – 6 and 4 with simultaneous worsening of the rest 2 indicators; girls with LMA demonstrated improvement of 9 and 4 indicators; boys with AMA – 9 and 5, with RMA – 7 and 5 with simultaneous worsening of the last two indicators; boys with LMA showed improvement of 8 and 7 indicators.

2. At the end of academic year experimental groups reach higher values of indicators than control groups with the exception: in all girls – mobility in lumbar spine; girls with AMA – additionally coordination in throw for accuracy; exception of boys with AMA – coordination in throw for accuracy.

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*The further researches* imply determination of effectiveness of the worked out system in formation of main movements' skills, in prevention from adverse to required functional potentials, adaptation to learning functioning of children with different MMA orientation.

### Conflict of interests

The author declares absence of any conflict of interests.

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