

## INFLUENCE OF DIFFERENT APPROACHES TO TRAINING OF MAIN MOVEMENTS ON PHYSICAL FITNESS OF 4 YEARS BOYS WITH VARIOUS MOTOR ASYMMETRY

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**Abstract.** *Purpose:* determination of effectiveness of different training main movements' methods in physical fitness improvement of boys with different manual motor asymmetry. *Material:* 50 boys with ambidexterity (4 years old age) took part in the research. There was used the following: oral questioning, dynamometry and methodic by M.M. Bezrukikh. *Results:* usage of one of variants of "symmetric" approach determines specificities of motor qualities' development: among boys with ambidexterity in motor asymmetry variant "first with passive hand, then with active one" and variant "first with active and then with passive hand" ensure improvement of all tested qualities (except flexibility and quickness). Boys with right orientation of manual motor asymmetry demonstrated improvement of all qualities (except coordination in ballistic movements for accuracy, fulfilled by right arm) in the first variant. In the second variant all qualities (except already mentioned quickness) are improved. *Conclusions:* with any orientation of manual motor asymmetry the necessary condition of high activity and successful child's training is development of interaction between cerebral semi-spheres. Coordinated movements by left and right arms strengthen such interaction. That is why it is purposeful to consequently fulfill every movement by every arm and by two arms simultaneously.

**Key words:** motor, asymmetry, qualities, boys, pre-school age children.

### Introduction

In the process of teaching and educating of pre-school age children it is necessary to consider orientation of functional asymmetry of their brains, in particular manual motor asymmetry (MMA) [2; 4; 9; 11–13; 15]. In aspect of the above mentioned it is important to know similar trends and specificities of functional potentials' changes, development of physical (motor) qualities of such children in pre-school period. At the same time these data are practically absent [1; 10], that conditions demand in appropriate researches.

The data of special literature on problems of brain's functional asymmetry witness about existence of the following: distribution and duplicating of functions in semi-spheres; specific character of information processing in semi-spheres; disordering of behavior reactions and their specificities in case of change of semi-spheres' functional state; dependence on emotions, memory, type of adaptation [12; 15]. The recent data [2; 6; 14; 16–19] witness about existence of serious discrepancies between psycho-physiological indicators of children with left (LMA) and right (RMA) orientation of MMA. For example they differ: by level of semi-spheres' autonomy; by interaction of interaction of cortex structures (in this connection by choice of variants of functioning's strategy); by creative abilities; by development of optical-space and visual functions, ability to concentrate attention at certain object; by quickness of distribution and re-switching of attention; by scope of short-term, long-term, instant and image memory.

Besides, development of will qualities is also asynchronous (it is more intensive among children with left LMA), psycho-motor qualities and space perception (they are better developed in children with RMA) [7; 19]. The carried out by us research [5] showed the following: statistically confident differences between indicators of cognitive function of 4-6 years boys with different MMA orientation; peculiarities of changing of physical fitness of girls when using different variants of main movements' training. At 3-5 yrs. age development of manual fitness of boys and girls with different MMA orientation is characterized by hetero-chronia [1].

At the same time we found that studies of such children's motor qualities are random and fragmentary [1; 10]. There are no data, received by longitudinal method. Effectiveness of offered [1; 8] variants of 3-6 yrs children's training to motor actions in comparison with traditional approach (considering only child's preferences) have not been studied. The above mentioned condition demand in such research.

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

*The purpose of the research* is to determine effectiveness of different variants of main movements' training for improvement of physical fitness of 4 years age boys with different MMA orientation. The task of the research is to determine MMA orientation and output values concerning development of motor qualities; to conduct one-year forming experiment; to determine summarizing values concerning development of motor qualities; to fulfill comparative analysis of changes in the tested groups.

The following *methods of the research* were used: general scientific (analysis, generalization of information from literature sources); pedagogic (testing, experiment); oral questioning; dynamometry and methodic by M.M. Bezrukikh [3], for determination of MMA orientation, mathematical statistic. Experiment covered 50 boys with ambidexterity (12 in first, 13 in second experimental groups (EG1, EG2) and 25 – in control group – CG; 67 boys with RMA (accordingly 21, 21 and 25) and 61 – with LMA (18, 18 and 25). In all EG 1 we used first variant of "symmetric" approach to main movements' training. It implied training of movement first with passive arm (leg) up to established skill; after this – by active limb. In all EG2 we used second variant of approach, which implied reverse sequence of training. Boys of every CG were trained with traditional approach: movements were trained by chosen by them limb.

With it there was no influence on the tested motor skills; organization of trainings and the used methodic did not differ. Pedagogic testing was conducted in September and in May.

**Results of the research**

All boys from EG1 and EG2 demonstrated significantly (at level from  $p < 0.05$  to  $< 0.001$ ) improvement of most of motor qualities. Exception was mobility in lumbar spine and quickness, condition of which remained unchanged. In CG the latter also remained unchanged. Additionally – coordination in ballistic movements for accuracy by left and right arms (see table 1). It was found that EG members showed better dynamic of motor qualities than CG. It pointed at higher effectiveness of “symmetric” approach to training of boys with ambidexterity in motor asymmetry, than traditional one. It was proved by other result – indicators at the end of experiment. For example in EG1 and EG2 absolute muscular strength, coordination in cyclic movement, ballistic movements for distance and accuracy, fulfilled by right and left arms, were substantially better than in CG; in the latter improvements were found in no indicators.

Table 1

*Indicators of motor qualities in groups of boys with AMA during 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>	Absolute value	%	<i>t</i>	EG1-CG	EG2-CG	EG1-EG2
Hand dynamometry of active hand, kg	EG1	3.9	0.1	5.7	0.11	1.8	46.2	12.1***	2.63*	2.14*	0.61
	EG2	4.1	0.14	5.6	0.12	1.5	36.6	8.13***			
	CG	4.1	0.1	5.1	0.2	1.0	24.4	4.47***			
Forward bending, sitting, cm	EG1	6.1	0.5	6.6	0.71	0.5	8.2	0.58	0	0.12	0.11
	EG2	6.0	0.14	6.7	0.58	0.7	11.7	1.17			
	CG	6.1	0.7	6.6	0.6	0.5	8.2	0.54			
20 meters' run from walking, sec.	EG1	7.6	0.18	7.3	0.19	-0.3	3.9	1.15	0.41	0	0.4
	EG2	7.6	0.21	7.4	0.16	-0.2	2.6	0.76			
	CG	7.6	0.2	7.4	0.15	-0.2	2.6	0.8			
Long jump from the spot, cm	EG1	70.3	1.42	83.1	1.45	12.8	18.2	6.31***	1.34	1.15	0.25
	EG2	71.1	1.75	82.6	1.32	11.5	16.2	5.25***			
	CG	70.6	1.7	80.3	1.5	9.7	13.7	4.28***			
Shuttle run 3x5 m, sec.	EG1	9.0	0.11	7.7	0.07	-1.3	14.4	9.97***	3.28**	3.28**	0
	EG2	8.9	0.13	7.7	0.07	-1.2	13.5	8.13***			
	CG	8.9	0.12	8.1	0.1	-0.8	9.0	5.12***			
Throw for distance by right arm, m.	EG1	3.7	0.14	6.6	0.16	2.9	78.4	13.6***	1.95	1.29	1.0
	EG2	3.7	0.17	6.4	0.12	2.7	73.0	13.0***			
	CG	3.8	0.15	6.1	0.2	2.3	60.5	9.2***			
Throw for distance by left arm, m.	EG1	3.7	0.18	5.1	0.11	1.4	37.8	6.64***	4.49***	3.37**	1.29
	EG2	3.6	0.15	4.9	0.11	1.3	36.1	6.99***			
	CG	3.6	0.17	4.3	0.14	0.7	19.4	3.18**			
Error in throw for accuracy by right arm, cm	EG1	36.2	1.9	27.2	1.7	-9.0	24.9	3.53**	3.25**	3.03**	0.34
	EG2	36.0	2.2	28.0	1.6	-8.0	22.2	2.94*			
	CG	35.4	2.1	36.5	2.3	1.1	-3.1	0.35			
Error in throw for accuracy by right arm, cm	EG1	34.7	1.9	23.0	1.3	-11.7	33.7	5.08***	3.13**	2.93*	0.05
	EG2	35.1	2.1	23.1	1.5	-12.0	34.2	4.65***			
	CG	34.1	2.4	30.2	1.9	-3.9	11.4	1.27			

Data of boys with RMA witnessed that in EG1 all motor qualities (except coordination of ballistic movements for accuracy by right and left arms) significantly improved. The mentioned coordination remained unchanged (see table 2). In EG2 such unchanged indicator was the same. Besides, quickness also unchanged; other qualities improved within 14.1–53.5 % ( $p < 0.01$ – $0.001$ ). In CG quickness remained unchanged. Coordination of ballistic movements for accuracy by right and left arms worsened accordingly by 22.3 and 23.9 % ( $p < 0.05$ ).

Besides, at the end of experiment in EG1 and EG2 all indicators (except flexibility, quickness and speed power) were much better than in CG. At the same time, at the end of academic year in EG1 and EG2 absolute muscular strength, coordination of cyclic movements, ballistic movements for distance and accuracy were developed much better than in CG. It witnessed about higher effectiveness of variants of “symmetric” approach to training than traditional in development of motor skills of boys with RMA.

Concerning boys with LMA we received the following results: in EG1 all motor skills substantially improved (except coordination of throws for accuracy by right arm); in EG2 – except the same quality and mobility in lumbar

spine, quickness – they showed only positive trend (see table 3). In CG such trend was noticed in quickness and coordination in ballistic movements for accuracy by left arm. At the same time, coordination of ballistic movements for accuracy by right arm worsened by 30.4% ( $p < 0.01$ ).

Table 2

*Indicators of motor qualities in tested groups of boys with RMA during 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>	<i>absolute</i>	%	<i>t</i>	EG1-CG	EG2-CG	EG1-EG2
Hand dynamometry of active hand, kg	EG1	5.5	0.16	7.7	0.12	2.2	40.0	11.0***	3.09**	2.82*	0.61
	EG2	5.3	0.15	7.6	0.11	2.3	43.4	12.4***			
	CG	5.4	0.2	6.7	0.3	1.3	24.1	3.61**			
Forward bending, sitting, cm	EG1	6.6	0.51	9.3	0.39	2.7	40.9	4.21***	0.16	0.16	0.36
	EG2	6.7	0.48	9.1	0.4	2.4	35.8	3.84**			
	CG	6.9	0.6	9.2	0.5	2.3	33.3	2.94*			
20 meters' run from walking, sec.	EG1	7.3	0.15	6.7	0.18	-0.6	8.2	2.56*	0.43	0	0.4
	EG2	7.2	0.13	6.8	0.17	-0.4	5.6	1.87			
	CG	7.2	0.18	6.8	0.15	-0.4	5.6	1.71			
Long jump from the spot, cm	EG1	71.1	1.4	89.2	1.6	18.1	25.5	8.51***	0.24	0.34	0.52
	EG2	72.4	1.6	87.9	1.9	15.5	21.4	6.24***			
	CG	71.5	1.5	88.7	1.4	17.2	24.1	8.4***			
Shuttle run 3x5 m, sec.	EG1	8.5	0.1	7.3	0.07	-1.2	14.1	9.83***	3.28**	3.12**	0
	EG2	8.5	0.09	7.3	0.08	-1.2	14.1	9.97***			
	CG	8.5	0.11	7.7	0.1	-0.8	9.4	5.38***			
Throw for distance by right arm, m.	EG1	4.3	0.18	6.8	0.19	2.5	58.1	9.55***	3.06**	2.17*	0.71
	EG2	4.3	0.15	6.6	0.21	2.3	53.5	8.91***			
	CG	4.1	0.12	6.0	0.18	1.9	46.3	8.8***			
Throw for distance by left arm, m.	EG1	3.2	0.13	4.8	0.14	1.6	50.0	8.37***	4.88***	4.3***	1.12
	EG2	3.1	0.12	4.6	0.11	1.5	48.4	9.21***			
	CG	3.0	0.11	3.9	0.12	0.9	30.0	5.5***			
Error in throw for accuracy by right arm, cm	EG1	32.0	1.9	28.1	2.1	-3.9	12.2	1.38	3.11**	3.83**	0.24
	EG2	31.5	1.7	27.5	1.4	-4.0	12.7	1.82			
	CG	30.9	1.8	37.8	2.3	6.9	-22.3	2.36*			
Error in throw for accuracy by right arm, cm	EG1	33.9	1.9	29.6	2.1	-4.3	12.7	1.52	3.86**	3.59**	0.16
	EG2	34.4	1.6	30.1	2.3	-4.3	12.5	1.53			
	CG	34.8	1.9	43.1	2.8	8.3	-23.9	2.45*			

Besides, at the end in Eg1 and EG2 development of most of motor skills was better than in CG. Exception was mobility in lumbar spine, quickness and speed-power. Their level was practically equal in all boys. The mentioned above permitted to make the same conclusion, like in case with boys with AMA and RMA.

### Discussion

Results of all EG boys with different MMA were connected with involvement of both brain semi spheres in main movements training (movements were fulfilled both by active and passive arms or legs in any direction). With traditional approach one semi-sphere activated to larger extent, videlicet depending on boy's preference in fulfillment of movement by certain arm or leg, in certain direction. It is proved by conclusions of other researchers [6; 9; 11; 12]: with any MMA orientation the necessary condition of high activity and success of training is development of child's interaction between semi-spheres; coordinated movements by left and right arms increase such interaction, that is why it is purposeful to fulfill movements by each arm in sequence as well as by two arms simultaneously.

Table 3

*Indicators of motor qualities in tested groups of boys with LMA during 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>	Absolute value	%	<i>t</i>	EG1-CG	EG2-CG	EG1-EG2
Hand dynamometry of active hand, kg	EG1	5.0	0.18	6.9	0.12	1.9	38.0	8.78***	4.69***	3.53**	1.13
	EG2	5.3	0.15	6.7	0.13	1.4	26.4	7.05***			
	CG	5.2	0.2	6.0	0.15	0.8	15.4	3.2**			
Forward bending, sitting, cm	EG1	6.4	0.71	8.9	0.41	2.5	39.1	3.05**	0.2	0.09	0.39
	EG2	6.3	0.95	8.6	0.65	2.3	36.5	2.0			
	CG	6.1	0.8	8.7	0.9	2.6	42.6	2.16*			
20 meters' run from walking, sec.	EG1	7.0	0.16	6.5	0.08	-0.5	7.1	2.8*	0.62	0	0.69
	EG2	7.0	0.19	6.6	0.12	-0.4	5.7	1.78			
	CG	7.0	0.2	6.6	0.14	-0.4	5.7	1.64			
Long jump from the spot, cm	EG1	78.8	2.1	94.8	2.3	16.0	20.3	5.14***	0.19	0.21	0.4
	EG2	77.9	1.9	93.6	1.9	15.7	20.2	5.84***			
	CG	80.8	1.8	94.2	2.2	13.4	16.6	4.7***			
Shuttle run 3x5 m, sec.	EG1	8.0	0.13	7.1	0.06	-0.9	11.3	6.29***	2.77*	2.77*	0
	EG2	7.9	0.11	7.1	0.06	-0.8	10.1	6.38***			
	CG	7.9	0.14	7.4	0.09	-0.5	6.3	3.0**			
Throw for distance by right arm, m.	EG1	3.6	0.16	5.4	0.12	1.8	50.0	9.0***	3.24**	2.91*	0.64
	EG2	3.5	0.19	5.3	0.1	1.8	51.4	8.38***			
	CG	3.6	0.2	4.7	0.18	1.1	30.6	4.1***			
Throw for distance by left arm, m.	EG1	4.0	0.11	6.1	0.12	2.1	52.5	12.9***	5.3***	4.48***	1.28
	EG2	3.9	0.3	5.9	0.1	2.0	51.3	12.2***			
	CG	4.0	0.1	5.2	0.12	1.2	30.0	7.7***			
Error in throw for accuracy by right arm, cm	EG1	42.1	2.1	38.9	1.2	-3.2	7.6	1.32	5.96***	5.15***	1.29
	EG2	41.6	2.3	41.0	1.1	-0.6	1.4	0.24			
	CG	40.1	2.5	52.3	1.9	12.2	-30.4	3.89**			
Error in throw for accuracy by right arm, cm	EG1	25.8	1.4	16.9	1	-8.9	34.5	5.17***	3.64**	2.99**	0.81
	EG2	26.8	1.6	18.1	1.1	-8.7	32.5	4.48***			
	CG	26.2	1.5	24.4	1.8	-1.8	6.9	0.77			

On the other hand the received data are not in agreement with results of some researchers [4]. In particular, they are the data about advantage of “symmetric” approach, used in EG2 in comparison with approach used in EG1. We think that one of reasons of this is different age of the tested and the fact that this author studied only changes in coordination.

Concerning specificities of development of motor qualities of boys with different MMA during 4<sup>th</sup> year of life we note concordance with information of other researchers [4; 8]. It witnesses about significant conditioning of manifestation and age dynamic by individual morphological functional development. Such development forms individual motor profile of a person, in which one of advanced places is engaged by motor asymmetry. Ignoring of this fact is inadmissible, as far as the latter is a determining one for body and limbs' sizes, internal organs, sectors of central nervous system (CNS), asymmetry of functional activity of all systems of organism.

The latter is proved by data, received by Ye.D. Khomska (1997): existing specific neuro-dynamic psychological profile is in interconnection with type of functional profile of brain's lateral organization. Such type is a factor, which ensures individual specificity of motor function. It reflects distribution of domination of brain's functioning in its functioning and in sensor function. The type of lateralizing of semi-spheres is a neuro-physiological basis of psycho-physiological individuality. But they are combined in typological groups by complex of such characteristics [7]. In connection with the latter it is noted [4]: representatives of LMA and RMA samples differ by manifestation of quickness, speed-power, coordination features of upper and lower limbs; value and orientation of motor parameters are different and depend on age, coordination complexity of task, requirements to accuracy and direction, lever of urgency of choice.

**Conclusions**

1. Independent on approach to main movements' training of 4 years boys with different MMA they demonstrate substantial improvement of absolute muscular strength, speed-power quality, coordination in cyclic movements, in ballistic movements for distance and accuracy by each arm. Besides, increment of most of them (except

speed-power, coordination in ballistic movements for distance by right arm) was significantly higher in case of one of “symmetric” approach, effectiveness of which is practically equal.

2. Usage of one of variants of “symmetric” approach determines peculiarities of development of motor qualities: concerning boys with ambidexterity in motor asymmetry AMA, variant “first by passive then by active arm” and variant “first by active then by passive arm” ensure improvement of all tested parameters, except flexibility and quickness. Concerning RMA boys with first variant all parameters improve except coordination in ballistic movements for accuracy by right arm, with other – all parameters except the a.m. one and quickness. LMA boys demonstrated the same results, except flexibility and quickness.

*Further researches* imply working out of methodic system of influence of indicators of pre-school age children at physical culture classes, considering the obtained data.

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#### **Conflict of interests**

The author declares absence of any conflict of interests.

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