

EFFECTIVENESS OF EXPERIMENTAL SYSTEM IN CHILDREN'S MASTERING OF MAIN MANUAL MOTOR SKILLS

Galamandjuk L. L.

Lesya Ukrainka Eastern European National University

Abstract. *Purpose:* determine effectiveness of simulated system of pre-school age children motor functioning's preventive development for mastering of main movements for manual skills. *Material:* in the research five years' children (control group n=150 and experimental group n=120) participated. *Results:* it was determined that transition from uncomfortable to comfortable for a child conditions of exercises' fulfillment facilitates quicker formation of required motor program. It is connected with the fact that, independent on orientation of manual motor asymmetry progressing of semi-spheres' interaction takes place. This interaction is an important condition of increasing of child functioning's effectiveness in different aspects. Achievement of such result was also facilitated by physical exercises, which children practiced at home. Functioning of physical culture instructor and kindergarten teachers was also important: they formed parents' conscious position concerning importance of such trainings; recommended effective means and methods. *Conclusions:* application of the offered system ensures much better result than traditional approach to this problem. It is one of keys to prevention of negative tendencies in development of pre-school age children.

Key words: motor, stereotype, asymmetry, children, pre-school age children.

Introduction

In pre-school period motion is the main function of a child [2; 4]. At present, physical culture trainings do not facilitate achievement of required physical condition by children; development of other important qualities and functions before starting learning at school [10]. In this connection, children's social and psychological adaptation to new conditions of life activity is inadequate [7; 16]. As a result – worsening of health [14; 20], functional potentials [5; 15; 21], strong tiredness from mental functioning even in working week [6].

On the other hand, theory and practice of physical culture have accumulated social values, usage of which facilitates positive changes of individual's internal and external characteristics, development of his (her) beliefs, formation of world vision, motives, interests [13]. But, considering the above said, we can conclude that such values are not sufficiently effective. One of reasons is inadequate scientific-methodic provisioning of physical culture lessons as pedagogically organized process. Thus, there has appeared a contradiction between accumulated social-historic experience in sphere of physical culture and its actual realization in practice of pre-school children's training. It proves the need in solution of the mentioned problem.

Purpose, tasks of the work, material and methods

The purpose of the research is to determine effectiveness of simulated system of pre-school age children motor functioning's preventive development for mastering of main movements for manual skills. The tasks of the research implied the following: determination of manual motor asymmetry (MMA) and output indicators of motor stereotype; conducting of one-year experiment; determination of motor stereotype in movements for manual skills final indicators in the tested groups.

We used the following *methods of research*: general scientific (generalizing of information from scientific sources); pedagogic (experiment) and testing, which stipulated assessment of mastered movements); oral questioning, hand dynamometry and methodic of M.M. Bezrukih [3] for determination of children's MMA; mathematical statistic methods.

In experiment five years' old children took part: 60 girls and 60 boys [20 with ambidexterity (ADA), 20 with left asymmetry (LMA) and 20 with right asymmetry (RMA) – in experimental group (EG)]; 75 girls and 75 boys [25 with every variant of MMA] – control group (CG). In all EG we realized the worked out methodic system; in CG – only traditional approach to pre-school program of physical culture. Pedagogic testing was at the end of academic year. Concerning characteristics of experimental factor, this information was delivered in previous works [17–19]. Assessment was conducted in the following way: “0” points – absence of formed motor stereotype; “1” point – understanding of movement is present; “2” – motor skill is formed; maximal mark – “3” points motor skill has been formed completely. Mean value of sample was interpreted in the following way: points from 0 to 1,4 – formation of motor stereotype at level of idea; 1.5 - 2.4 – at level of habit; 2.5 – 3 – at level of skill. Participation of children in the offered experiments was verified by parents' permissions.

Results of the research

Before experiment motor stereotype in EG and CG was assessed as “0”. It was conditioned by the fact that in previous years of life children did not train movements, chosen for assessment. At the end of academic year results were quite different.

G i r l s. In EG girls with ADA fulfilled all movements (except “throw object to moving target”) at level of skill (points within 2.5–3). The mentioned as exception movement was fulfilled at level of habit. In CVG skill did not form in any movement, but habit – practically in all movements. Exception was “throw of ball upward and catching of it 10 times”: fulfillment was at the lowest level - 1.4 ± 0.14 points.

The determined advantage of EG over CG was also proved by comparing of received points (see table 1). In EG the highest mark was received by girls for “catching of ball from different initial positions”; in CG “throw ball from one hand to other with different temp” (accordingly 2.8 ± 0.13 and 2.2 ± 0.15 points). In EG the lowest mark was for “throw of object to moving target” (2.4 ± 0.22), other received the lowest mark for “throw of ball upward and catching of it 10 times” (1.4 ± 0.14).

Table 1

Level of manual motor skills of girls with different MMA orientation during all experiment (points)

Description of movement	Group	ADA		<i>t</i>	RMA		<i>t</i>	LMA		<i>t</i>
		\bar{x}	<i>m</i>		\bar{x}	<i>m</i>		\bar{x}	<i>m</i>	
Throw of ball upward and catching of it 10 times minimum	EG	2.5	0.15	5.36	2.5	0.14	4.81	2.8	0.17	1.98
	CG	1.4	0.14	***	1.7	0.09	***	2.4	0.11	
Ball throws in ring at height of 2.2 meters from the floor	EG	2.5	0.14	2.27	2.5	0.18	3.41	2.6	0.19	4.45
	CG	2.0	0.17	*	1.7	0.15	**	1.6	0.12	***
Throw of ball from one hand to other with different temp	EG	2.7	0.11	2.69	2.5	0.14	2.97	2.7	0.13	3.14
	CG	2.2	0.15	*	1.8	0.19	**	2.1	0.14	**
Moving forward striking of ball on the floor and catch it	EG	2.6	0.12	3.8	2.5	0.14	5.42	2.6	0.17	3.09
	CG	1.9	0.14	**	1.5	0.12	***	1.9	0.15	**
Catching of ball from different initial positions	EG	2.8	0.13	3.91	2.5	0.11	6.99	2.5	0.23	4.5
	CG	1.9	0.19	**	1.2	0.15	***	1.1	0.21	***
Throw of ball to horizontal target with two arms alternatively	EG	2.5	0.11	2.06	2.5	0.21	2.77	2.6	0.24	3.14
	CG	2.1	0.16	*	1.8	0.14	*	1.6	0.21	**
Throw of ball to vertical target with two arms alternatively	EG	2.5	0.14	2.27	2.5	0.11	2.53	2.9	0.14	1.12
	CG	2.0	0.17	*	1.9	0.21	*	2.7	0.11	
Throw of objects to moving target	EG	2.4	0.22	2.02	2.4	0.18	3.74	2.3	0.11	8.44
	CG	1.8	0.2		1.5	0.16	**	1.1	0.09	**

Notes: Hereinafter all EG $n=20$ each, all CG — $n=25$ each; confidence of difference between two mean values is at level «*» — $p<0.05$, «**» — $p<0.01$, «***» — $p<0.001$

The results of girls with RMA were as follows: in EG most of movements were fulfilled at level of skill; in CG – at level of habit. The first fulfilled “throw of objects to moving target’ at level of habit, the latter – “catching of ball from

different initial positions” at the lowest level (with mark only 1.2 ± 0.15 points). At the same time in EG all marks were much higher (p at level from <0.05 to <0.001). In EG most of movements were assessed with highest marks, while in CG – only “throw of ball to vertical target with two arms alternatively”.

The results of girls with LMA were as follows: in EG most of movements were fulfilled at level of skill; in CG – at level of habit; the marks of the first were much better than the latter. Only fulfillment of “throw of ball to vertical target with two arms alternatively” did not differ: the girls of both groups achieved the highest level of this motor stereotype.

Boys. At the end of academic year in EG boys with ADA had most of movements at level of skill. Only “throw of objects to moving target” was fulfilled at level of habit (see table 2). In CG no movements were fulfilled at skill’s level – as a rule they were fulfilled at level of habit. For movements “throw of ball upward and catching of it 10 times minimum” and “catching of ball from different initial positions” CG boys received 1.2 ± 0.16 and 1.3 ± 0.18 points accordingly. Such marks witness the lowest level of motor stereotype’s formation.

Boys with RMA demonstrated the following changes of tested indicators: in EG most of movements were fulfilled at level of skill; “throw of objects to moving target”, “moving forward striking of ball on the floor and catch it” were assessed at level of habit. In CG skills were not formed for any movements – only habit. Exception were “moving forward striking of ball on the floor and catch it” and “throw of ball upward and catching of it 10 times minimum”. Boys fulfilled these movements at lowest level and their marks were accordingly: 1 ± 0.1 , 1.2 ± 0.16 and 1.4 ± 0.12 points. Thus, in EG all marks were higher than in CG. The highest mark in EG was given to “ball throws in ring at height of 2.2 meters from the floor” and in CG – “throw of ball to horizontal target with two arms alternatively”.

Table 2

Level of manual motor skills of boys with different MMA orientation during all experiment (points)

Description of movement	Group	ADA			RMA			LMA		
		\bar{x}	m	t	\bar{x}	m	t	\bar{x}	m	t
Throw of ball upward and catching of it 10 times minimum	EG	2.5	0.19	5.23	2.5	0.21	4.55	2.5	0.27	3.94
	CG	1.2	0.16	***	1.4	0.12	***	1.2	0.19	**
Ball throws in ring at height of 2.2 meters from the floor	EG	2.5	0.12	6.14	2.8	0.11	6.05	2.9	0.07	5.18
	CG	1.5	0.11	***	1.9	0.1	***	1.9	0.18	***
Throw of ball from one hand to other with different temp	EG	2.5	0.17	2.96	2.5	0.15	3.41	2.7	0.21	2.89
	CG	1.7	0.21	*	1.7	0.18	**	1.8	0.23	*
Moving forward striking of ball on the floor and catch it	EG	2.5	0.19	3.88	2.4	0.12	6.0	2.8	0.19	3.72
	CG	1.7	0.08	**	1.2	0.16	***	1.9	0.15	**
Catching of ball from different initial positions	EG	2.4	0.12	5.08	2.7	0.13	5.69	3.0	0	6.67
	CG	1.3	0.18	***	1.8	0.09	***	2.2	0.12	***
Throw of ball to horizontal target with two arms alternatively	EG	2.5	0.13	6.1	2.5	0.11	4.22	2.7	0.21	2.89
	CG	1.5	0.1	***	1.9	0.09	***	1.8	0.23	*
Throw of ball to vertical target with two arms alternatively	EG	2.6	0.14	4.88	2.5	0.12	4.45	2.8	0.17	4.21
	CG	1.7	0.12	***	1.5	0.19	***	1.9	0.13	***
Throw of objects to moving target	EG	2.4	0.19	3.44	2.3	0.23	5.18	2.4	0.26	1.5
	CG	1.5	0.18	**	1.0	0.1	***	1.9	0.21	

Boys with LMA showed analogous results, but with the following peculiarities: in EG only in “throw of objects to moving target” habit was formed; other movements were fulfilled at level of the highest stereotype. In CG most of movements were fulfilled at level of habit. The lowest mark was given to “throw of ball upward and catching of it 10 times minimum”. In total it conditioned significant difference in points: except “throw of objects to moving target”, the marks for all other movements were higher in EG than in CG.

Discussion

The received results were conditioned by a number of reasons. In the most general form EG better indicators were owing to application of the worked out methodic system. Specifying reasons, we can say that in EG we used symmetric approach to training of main movements. In CG children trained movements in convenient for them conditions, videlicet, by main arm, leg or in convenient direction. Not similar effect was conditioned by specificities of motor stereotype’s formation. In case of movement’s training first by main arm and then by weaker arm, child involves already formed motor program in this process. Such “adjustment” slows down formation of habit and skill as far as it takes place in inconvenient for the child conditions. In other variant of sequence transition from inconvenient to habitual (convenient) for the child conditions facilitates quicker formation of required motor program [1]. It is connected with the fact that independent of MMA orientation progressing of interaction between semi-spheres takes place. Such interaction is an important pre-condition for increasing of effectiveness of child’s functioning in all aspects [8; 11; 12]. Achievement of such results was also facilitated by physical exercises’ practicing at home. Role of physical culture instructors and kindergarten teachers was also rather important: they forms parents’ conscious position about importance of such trainings; recommended effective means and methods, realized by parents at home physical trainings of their children [9].

Conclusions:

Application of the offered system of motor functioning’s preventive development during 6th year of children’s life ensures better results in formation of manual motor skills, than traditional approach to this problem. For example, from all 8 tested movements, in experimental group of girls with ADA, RMA and LMA 7 movements were fulfilled at skill level. In control group only LMA girls demonstrated skill in one movement, in 5 movements they showed habit level and in 2 – only idea of movement. In boys’ groups results were analogous to the results of girls’ groups.

Further researches shall be directed to determination of effectiveness of the worked out system in formation of skills in movements, not connected with manual functioning, to adaptation of children with different MMA orientation to learning functioning in school.

Acknowledgement

This work has been fulfilled in compliance with combined plan of scientific-research works for 2010-2014 by topics “Pedagogic diagnostics in system of physical education in comprehensive educational establishment” (state registration number 0112U002160) and “Theoretical-methodic principles of application of information, pedagogic and medical-biological technologies for formation of healthy life-style” (state registration number 0113U002003).

Conflict of interests

The author declares that there is no conflict of interests.

References:

- 1 Balac'ka L, Galamanzhuk L, Iedinak G. Osoblivosti rozvitku motorki ditej z riznoiu rukhovoiu asimetriieiu mizh 3 i 6 rokami [Peculiarities of motor parameters' development in children with motor asymmetry between 3rd and 6th years of life]. *Visnik Prikarpat'skogo nacional'nogo universitetu* 2012;16:112–118 (in Ukrainian)
- 2 Bar-Or O, Rouland T. *Zdorov'e detej i dvigatel'naia aktivnost'* [Children's health and motor functioning], Kiev: Olympic Literature; 2009 (in Russian)
- 3 Bezrukikh MM. *Levorukij rebenok v shkole i doma* [Left-hand child in school and at home], Yekaterinburg: Factors; 2004 (in Russian)
- 4 Dubrovinskaia NV, Farber DA, Bezrukikh MM. *Psikhofiziologija rebenka* [Psycho-physiology of child], Moscow: Vldos; 2000 (in Russian)
- 5 Koval'chuk LV. *Psikhofizichnij rozvitok iak faktor gotovnosti shestilitnikh ditej do navchannia v shkoli. Cand. Diss.* [Psycho-physical development as factor of 6-years old children's fitness for learning at school. Cand. Diss.], Lviv; 2007 (in Ukrainian)
- 6 Korobejnukova LG. *Osoblivosti fizichnogo rozvitku ta formuvannia psikhofiziologichnikh funkcij u ditej molodshogo shkil'nogo viku v umovakh riznikh form navchannia. Cand. Diss.* [Specific features of junior school age children's physical development and formation of psycho-physiological functions in conditions of different teaching forms. Cand. Diss.], Kiev; 2002 (in Ukrainian)
- 7 Liasota TI. *Pidvishchennia adaptacijnikh mozhlivostej ditej 6–7 rokov do umov navchannia v pochatkovij shkoli zasobami fizichnogo vikhovannia. Cand. Diss.* [Improvement of 6-7 years old children's adaptation potentials to conditions of learning in primary school by means of physical education. Cand. Diss.], Kiev; 2012 (in Ukrainian)
- 8 Moskvina VA. *Mezhpolusharnye otnosheniia i problema individual'nykh razlichij* [Inter semi-sphere's relations and problem of individual differences], Orenburg: IPK OSU; 2002 (in Russian)
- 9 Orzhekhovska VM. *Preventivna pedagogika* [Preventive pedagogic], Cherkasy: Echo; 2007 (in Ukrainian)
- 10 Pangelova NIe. *Teoretiko-metodichni zasady formuvannia garmonijno rozvinenoi osobistosti ditini doshkil'nogo viku v procesi fizichnogo vikhovannia. Cand. Diss.* [Theoretical-methodic principles of formation of harmoniously developed pre-school age child in process of physical education. Cand. Diss.], Kiev; 2014 (in Ukrainian)
- 11 Panfilova NV. *Razvitie koordinacionnykh sposobnostej i obuchenie dvigatel'nym dejstviiam detej 4–6 let v sviazi s osobennostiami dvigatel'noj asimetrii. Cand. Diss.* [Development of coordination and training of 4-6 years children's motor skills in connection with features of motor asymmetry. Cand. Diss.], Moscow; 1992 (in Russian)
- 12 Sirotiuk AL. *Nejropsikholozhicheskoe i psikhofiziologicheskoe soprovozhdenie obucheniia* [Neuro-psychological and psycho-physiological support of learning], Moscow: Sphere; 2003 (in Russian)
- 13 Stoliarov VI, Firsin SA, Barinov SIu. *Soderzhanie i struktura fizkul'turno-sportivnogo vospitaniia detej i molodezhi* [Structure and content of physical culture and sport education of children and youth], Moscow: Science; 2012 (in Russian)
- 14 *Shchorichna dopovid' pro stan zdorov'ia naseleння Ukraini ta sanitarno-epidemichnu situaciu, 2011 rik* [Annual report about state of health of population of Ukraine and sanitary-epidemiological situation, 2011], Kiev; 2012 (in Ukrainian)
- 15 Armatas CA, Summers JJ. The Influence of Task Characteristics on the Intermanual Asymmetry of Motor Overflow. *Journal of Clinical and Experimental Neuropsychology* 2001;23(4):557–67.
- 16 Balatska LV. The improvement of the psycho-physical condition of the senior pre-school children with taking into consideration peculiarities of their motor asymmetry as a pedagogical problem. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports* 2010;9:6 - 8.
- 17 Bedoin N, Ferragne E, Lopez C, Herbillon V, De Bellecize J, des Portes V. Atypical hemispheric asymmetries for the processing of phonological features in children with rolandic epilepsy. *Epilepsy & Behavior*. 2011;21(1):42–51.
- 18 Brossard-Racine M, Majnemer A, Shevell MI. Exploring the neural mechanisms that underlie motor difficulties in children with Attention Deficit Hyperactivity Disorder. *Developmental Neurorehabilitation*. 2011;14(2):101–11.
- 19 Cornwell PL, Murdoch BE, Ward EC. Differential motor speech outcomes in children treated for mid-line cerebellar tumour. *Brain Injury*. 2005;19(2):119–34.

- 20 Deyneko AH. Formation of culture motor activity of pupils of 5-6 classes by means of basic gymnastics. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;1:24-28. <http://dx.doi.org/10.15561/18189172.2015.0105>
- 21 Galamandjuk LL. Effects of different training options on the basic movements physical fitness 4-year-old girls with different motor asymmetry. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;4:16-21. <http://dx.doi.org/10.15561/18189172.2015.0403>
- 22 Galamandjuk LL. Influence of different approaches to training of main movements on physical fitness of 4 years boys with various motor asymmetry. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;5:3-8. <http://dx.doi.org/10.15561/18189172.2015.0501>
- 23 Galamandjuk LL. Effectiveness of methodic system of motor functioning's preventive development in sixth year of children's life in their physical condition's improvement. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2015;6:3-8. <http://dx.doi.org/10.15561/18189172.2015.0601>
- 24 Gémus M, Palisano R, Russell D, Rosenbaum P, Walter SD, Galuppi B, et al. Using the Gross Motor Function Measure to Evaluate Motor Development in Children with Down Syndrome. *Physical & Occupational Therapy In Pediatrics* 2002;21(2-3):69-79.
- 25 Gershkoff-Stowe L, Hahn ER. Word comprehension and production asymmetries in children and adults. *Journal of Experimental Child Psychology* 2013;114(4):489-509.
- 26 Gnitecka20 Jolanta, Nowak Agata, Romanowska-Tolloczko Anna. Psychomotor therapy as a effective method of alleviating the symptoms of child's non-harmonious development. *Pedagogics, psychology, medical-biological problems of physical training and sport* 2015;5:44-48. <http://dx.doi.org/10.15561/18189172.2015.0508>
- 27 Goncharova NN, Yukhno YA, Lukjantseva GV. Innovative approaches to the organization of monitoring of physical state schoolchildren in physical education. *Physical Education of Students* 2012;5:43 - 46.
- 28 Grivas TB, Vasiliadis ES, Polyzois VD, Mouzakis V. Trunk asymmetry and handedness in 8245 school children. *Pediatric Rehabilitation* 2006;9(3):259-66.
- 29 Hale TS, Smalley SL, Dang J, Hanada G, Macion J, McCracken JT. ADHD familial loading and abnormal EEG alpha asymmetry in children with ADHD. *Journal of Psychiatric Research*. 2010;44(9):605-15.
- 30 Klimkeit EI, Mattingley JB, Sheppard DM, Lee P, Bradshaw JL. Perceptual asymmetries in normal children and children with attention deficit/hyperactivity disorder. *Brain and Cognition*. 2003;52(2):205-15.
- 31 Liederman J. Neonates show an asymmetric degree of head rotation but lack an asymmetric tonic neck reflex asymmetry: Neuropsychological implications. *Developmental Neuropsychology*. 1987;3(2):101-12.
- 32 Lyulina NV, Zakharova LV, Vetrova IV. Effect of complex acrobatic elements in the development of physical skills of preschool children. *Physical Education of Students* 2013;4:59-62. <http://dx.doi.org/10.6084/m9.figshare.662618>
- 33 Müller BCN, Kühn-Popp N, Meinhardt J, Sodian B, Paulus M. Long-term stability in children's frontal EEG alpha asymmetry between 14-months and 83-months. *International Journal of Developmental Neuroscience*. 2015;41(0):110-4.
- 34 Podrigalo LV, Platonova AG, Cieślicka M. Comparative analysis of vitamin status of schoolchildren in recreational period. *Physical Education of Students* 2013;5:79-82. <http://dx.doi.org/10.6084/m9.figshare.771201>
- 35 Podstawski Robert, Borysławski Krzysztof. Influence of pe teachers' qualifications on the motor abilities of early school-age children. *Physical Education of Students*, 2014;1:56-63. <http://dx.doi.org/10.6084/m9.figshare.903695>
- 36 Podstawski Robert, Omelan Aneta, Zapert Monika, Żurek Piotr. School and out-of-school physical activity of children in rural areas. *Physical Education of Students* 2014;4: 55-60. <http://dx.doi.org/10.6084/m9.figshare.979315>
- 37 Przybyła A, Haaland KY, Bagesteiro LB, Sainburg RL. Motor asymmetry reduction in older adults. *Neuroscience Letters*. 2011;489(2):99-104.
- 38 Roeder MB, Mahone EM, Gidley Larson J, Mostofsky SH, Cutting LE, Goldberg MC, et al. Left-Right Differences on Timed Motor Examination in Children. *Child Neuropsychology*. 2008;14(3):249-62.
- 39 Schuetze P, Croff S, Das Eiden R. The development of motor asymmetries in 1-month-old infants who were prenatally exposed to cocaine. *Laterality: Asymmetries of Body, Brain and Cognition* 2003;8(1):79-93.
- 40 Sedova OO. The investigation of the level of preschool children with eyesight problems functional state. *Physical Education of Students* 2013;2:54-58. <http://dx.doi.org/10.6084/m9.figshare.156381>

- 41 Semanychyn TM, Popel' SL. Professional portrait of future instructors for physical education of preschool. *Physical Education of Students* 2015;1:60-66. <http://dx.doi.org/10.15561/20755279.2015.0109>
- 42 Tikhonova NV. Sale leisure activities of children and youth in out of school educational establishments of physical culture and sports destinations. *Physical Education of Students* 2014;5:38-42. <http://dx.doi.org/10.15561/20755279.2014.0507>
- 43 Vasserman M, Bender HA, MacAllister WS. Motor Skills Development in Children With Inattentive Versus Combined Subtypes of ADHD. *Applied Neuropsychology: Child*. 2013;3(2):145–51.
- 44 Voropay SM, Sukachov OV. Comparative characteristics of the state of the motor function of boys and girls aged 4-5 years. *Pedagogics, psychology, medical-biological problems of physical training and sports* 2013;4:3-7. <http://dx.doi.org/10.6084/m9.figshare.691010>
- 45 Yordanova J, Kolev V, Rothenberger A. Chapter 18 - Event-related oscillations reflect functional asymmetry in children with attention deficit/hyperactivity disorder. In: E. Başar CB-E, A. Özerdem, P.M. Rossini and G.G. Yener, editor. *Supplements to Clinical Neurophysiology* [Internet]. Elsevier; 2013. p. 289–301. Available from: <http://www.sciencedirect.com/science/article/pii/B9780702053078000181>

Information about the author:

Galamandjuk L. L.: <http://orcid.org/0000-0001-9359-7261>;
yedinak.g.a@gmail.com; Lesya Ukrainka Eastern European
National University; Volya Avenue 13, Lutsk, 43025, Ukraine.

Cite this article as: Galamandjuk L. L. Effectiveness of
experimental system in children's mastering of main manual
motor skills. . *Pedagogics, psychology, medical-biological
problems of physical training and sports* 2015;7:3-10. [http://
dx.doi.org/10.15561/18189172.2015.0701](http://dx.doi.org/10.15561/18189172.2015.0701)

The electronic version of this article is the complete one and can be
found online at: <http://www.sportpedagogy.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the
Creative Commons Attribution License, which permits unrestricted
use, distribution, and reproduction in any medium, provided the
original work is properly cited ([http://creativecommons.org/licenses/
by/3.0/deed.en](http://creativecommons.org/licenses/by/3.0/deed.en)).

Received: 04.06.2015

Accepted: 04.07.2015; Published: 10.07.2015