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Physical education for the correction of dysgraphia in primary school pupils
Educaţia fizică în corectarea disgrafiei la elevii din clasele primare

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Abstract

Background. The topic of high current interest approached in this research is the use of physical education activities in school for the correction of dysgraphia. We proposed in this paper a psycho-pedagogical physical education model for the correction of dysgraphia in primary school pupils.

Objectives. Elucidation of psychomotor peculiarities in pupils with dysgraphia. Fundamentation, development and approval of a psycho-pedagogical model for the correction of dysgraphia by physical education methods in primary school pupils. Experimental validation of the efficiency of the psycho-pedagogical model for the correction of dysgraphia by physical education methods in primary school pupils.

Methods. Assessment of the psychomotor status of pupils by testing their motor reaction to sound and light, with the DP-1 reflex measuring device.

Results. At the end of the research, a study for the argumentation of the efficiency of specific physical education means for the correction of dysgraphia was performed, using methods for the initial and final investigation of psychomotricity in primary school pupils.

Conclusions. The development of psychomotricity in primary school pupils with writing disorders is particularly important because the application of specific physical education methods and techniques contributes to the correction of these disorders.

Key words: psychomotricity, dysgraphia, motricity, psycho-pedagogical model.

Rezumat

Premize. Actualitatea temei abordate în cercetarea de faţă este determinată de valorificarea activităţilor de educaţie fizică în şcoală, în scopul corectării disgrafiei. Am propus, în lucrarea de faţă, un model psihopedagogic de educaţie fizică, orientat pentru corecţia disgrafiei la elevii din învăţământul primar.

Obiective. Elucidarea particularităţilor psihomotrice la elevii cu disgrafie. Fundamentarea, elaborarea şi aprobarea Modelului psihopedagogic de corectare a disgrafiei prin influenţa mijloacelor de educaţie fizică la elevii din clasele primare. Validarea experimentală a eficacităţii Modelului psihopedagogic de corectare a disgrafiei prin influenţa mijloacelor de educaţie fizică la elevii din clasele primare.

Metode. Aprecierea stării psihomotorie a elevilor prin testarea reacţiei motorii la sunet şi lumină, cu dispozitivul de măsurare reflex DP -1 .

Rezultate. În finalul lucrării s-a realizat un studiu de argumentare a eficacităţii mijloacelor specifice de educaţie fizică în corectarea disgrafiei, utilizând metode de cercetare iniţială şi finală a psihomotricităţii elevilor din învăţământul primar.

Concluzii. Dezvoltarea psihomotricităţii la elevii cu tulburări de scriere din clasele primare deţine un loc semnificativ, deoarece aplicarea mijloacelor şi metodelor specifice educaţiei fizice contribuie la corectarea acestor tulburări.

Cuvinte cheie: psihomotricitate, disgrafie, motricitate, model psihopedagogic.

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Introduction

Nowadays, there is a huge number of primary school pupils with different psychomotor development problems, which result in learning, and especially, writing disorders. Dysgraphia is a written language learning disability with negative effects on the formation of the pupil's personality in primary school, having a clear effect at middle and high school age (Verza, 1983).

Dysgraphia means having severe problems with the written word, which is affected by extreme difficulty with fine motor skills - in spite of having normal intelligence and abilities.

Dysgraphia can have a negative impact on the success of a child in school. Many children with dysgraphia are not able to keep up with written assignments, cannot put coherent thoughts together on paper, or write legibly. This disability needs to be recognized and remedied before it creates long lasting negative consequences for the child (Crouch & Jakubecy, 2007).

Physical education in primary school, as a component of the teaching-learning school process, is aimed at contributing to the improvement of physical and intellectual development, of the pupils' motor skills, which is a fundamental category of the physical exercise practice system in the formation of psychomotor skills (Raţă, 2008).

The process of writing needs abilities, complex skills, which are difficult to assimilate and practice correctly (Burlea, 2007). They involve a large degree of symbolization and abstracting, an intellectual activity and a high level of psychomotor development (Stănescu, 2002).

Horghidan (2000) reports that it is a complex function which integrates and conjugates motor and psychic aspects determining individual behavior regulation and involving perceptive and individual functions, information reception and an adequate execution of the response act.

The process of writing integrates the neuro-psycho-motor system (Capellini, 2010). This phenomenon is explained by the fact that at proprioceptive level, with the movement organization function by somatesthesia, some sensory organs that are found in muscles, tendons, ligaments are sending and receiving nervous impulses about muscle contraction or relaxation; so, about muscle contraction, upper limb position and different movements that are used in writing (Navoloaca, 2008).

In this context, we should emphasize the fact that positive emotional motor instrumentality, with an active character of psychomotor development, accelerates the formation of a stable psyche, coordinates the activity from the motor centers of sensory receptors, interprets and creates motor presentations (Burlea, 2007). At the same time, very importantly, it normalizes and stabilizes the excitement and inhibition of the nervous system, which are so important for the graphic image formation (Maximenco, 2001).

Although there are a lot of studies about the role of physical education classes for the correction of dysgraphia by the development of the psychomotor sphere in primary school pupils, they need a proper interpretation and a larger experimental basis.

In this research, we mainly focused on motor dysgraphia because the literature (Drozdova, 2005; Caisîn & Racu, 2011) provides data according to which motor dysgraphia is most common in pupils.

Motor dysgraphia does not affect the symbolization of writing, but rather the shape of letters and the quality of writing. Etiologically, dysgraphia is due to maturational, emotional, educational, or mixed factors (1). Regarding maturational factors, alterations in the psychomotor development may affect lateralization, psychomotor efficiency, body schema, perceptual-motor functions, and graphic expression of language (Martins et al., 2013). Motor dysgraphia is due to deficient fine motor skills, poor dexterity, poor muscle tone, or unspecified motor clumsiness (Auclair et al., 2008). Letter formation may be acceptable in very short samples of writing, but this requires extreme effort and an unreasonable amount of time to accomplish, and it cannot be sustained for a significant length of time, as it can cause arthritis-like tensing of the hand (David, 2003). Overall, written work is poor to illegible even if copied by sight from another document, and drawing is difficult. Oral spelling for these individuals is normal, and their finger tapping speed is below normal. This shows that there are problems within the fine motor skills of these individuals. People with developmental coordination disorder may also suffer from dysgraphia. Writing is often slanted due to holding a pen or pencil incorrectly (Crouch & Jakubecy, 2007).

While there are a large number of studies about the role of physical education in logopaedics, there are still some unresolved problems related to the influence of physical education methods for the correction of diverse learning disorders including writing disorders by the development of the psychomotor sphere in primary school pupils.

Objectives

The aim of the work consists of setting the theoretical bases and elaborating a psycho-pedagogical model for the correction of dysgraphia by physical education methods in primary school pupils with writing disorders.

The objectives of the research

1. Analysis of the theoretical highlights of the correction of writing disability in primary school pupils by physical education methods.
2. Elucidation of psychomotor peculiarities in pupils with dysgraphia.
3. Fundamentation, development and approval of the psycho-pedagogical model for the correction of dysgraphia by physical education methods in primary school pupils.
4. Experimental validation of the efficiency of the psycho-pedagogical model for the correction of writing disability by physical education in primary school pupils.

Hypothesis

It is assumed that the elaboration of a program of the influence of specific physical education methods on the development of fine psychomotricity will contribute to the efficiency of the correction of writing disability in primary school pupils.

Material and methods

Research protocol

We mention that the study met the requirements of the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, and the approval of the

Ethical Commission of the Scientific Laboratory of the Chişinău Physical Education and Sports University was obtained.

The methodology was based on the modern scientific work of Bernştein and Dragnea (quoted by Rusnac, 1998), on the ideas and approaches of the methodological and organizational insurance, which allowed a high level of experimental research.

Period and place of the research

The study was conducted during a preparatory period from September 2012 to May 2013. The experimental groups were selected from M. Sadoveanu and G. Asachi high schools.

Subjects and groups

The experimental group consisted of 2nd form pupils (boys) with motor dysgraphia and included 15 subjects. The control group also consisted of 15 pupils with motor dysgraphia, 2nd form.

Tests applied

For the assessment of the psychomotor status of the primary school pupils with dysgraphia, the most indicated test was the following: motor reaction to sound and light - a DP-1 reflex measuring device was used. The testing of the motor reaction to light and sound stimuli used the special method consisting of the following procedure: the examiner pushes the button "trainer" and as a result launches a process of emission of sounds or light spots with the duration of 0.5 sec. After an indeterminate time for the examined person, the device launches a light or sound signal, to which the examined person should react by touching the button.

Complex motor reaction to a moving object - the measurement was made by a DP-1 reaction measuring device**.** With this method, the moving object was time. The measuring procedure consisted of the following instructions: a stopwatch is included in the device that counts time within a 15 sec limit; the examinee has the task to push the button on his console and to fix the stopwatch on command for 10 sec.; the examinee has 10 attempts in this test, with the further average significance measurement; there are "on time" reactions by the exact stopping of the stopwatch at 10 sec index and also "ahead of time reactions" and "delayed reactions" (the button is pushed after the indication - up to 10 sec).

The **"**tapping" test - the measurement with this device was made using a proper method which consists of the following test: during 4 time periods (10 sec each), the device will measure the maximum number of the board touches by the needle probe that is in the examinee's hand. The examinee should touch the board as many times as he can during each time period without any retention.

Statistical processing

The mathematical and statistical calculations were performed using Microsoft Office Excel methods.

Results

The diversity of psychomotor development inefficiencies in pupils with dysgraphia oriented us through the elaboration of the psycho-pedagogical model for the correction of dysgraphia by physical education methods in primary school pupils, which provides a number of physical exercises: for psychomotor development; general motricity; fine hand motricity (Figure 1).

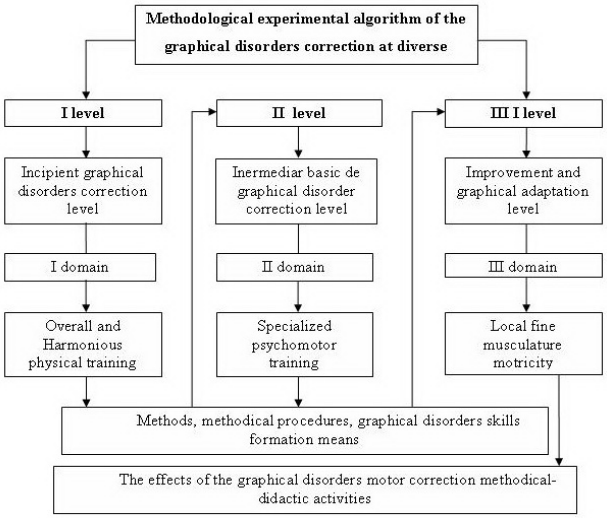

Fig. 1 – Experimental psycho-pedagogical model for the motor dysgraphia correction algorithm during the extracurricular physical education activity in primary school pupils.

For highlighting the efficiency of the influence of physical education on the correction of dysgraphia, a pedagogical experiment was organized and conducted during an academic year (Table I). The experiment was based on the synthesis of the theoretical premises and specific objectives previously stated. Thereby, two experimental groups of pupils (boys) were formed: an experimental group and a control group.

Table II shows the results of psychomotor testing in pupils with motor dysgraphia, including both the experimental and the control group.

Discussion

As shown in Table II, for the assessment of the psychomotor status of the pupils involved in the experiment, special tests were used which reflect the simple motor reaction to sound and light, the complex reaction to

Table I

Distribution of the experimental model classes in 2nd form pupils during the extracurricular activity for the correction of dysgraphia.

Methodical-didactic system	Incipient level of the correction of dysgraphia	Intermediate basic level	Improvement and graphical adaptation level	Evaluation	Total hours
Overall physical training	32	-	-	2	32
Specialized psychomotor training	-	50	-	2	52
Local fine musculature motricity development	-	-	20	2	22
Total hours	32	50	20	6	108

Table II

A comparative analysis of the test results of the psychomotor status in 2nd form pupils, the experimental group and the control group with dysgraphia.

№ d/o	Tests	Groups & statistics	Initial indices $\overline{X}$ ± m	Final indices $\overline{X}$ ± m	Statistics t	Statistics p
			Psychomotor condition			
1.	Motor reaction to sound (ms)	E	0.36±0.03	0.24±0.02	4.40	<0.001
		C	0.39±0.03	0.34±0.03	1.67	>0.05
		t	0.75	2.25	—	—
		P	>0.05	<0.05	—	—
2.	Motor reaction to light (ms)	E	0.35±0.03	0.23±0.02	4.80	<0.001
		C	0.36±0.03	0.33±0.03	1.33	>0.05
		t	0.25	2.25	—	—
		P	>0.05	<0.05	—	—
3.	Motor reaction to the moving object (ms)	E	10.18±0.31	9.07±0.27	3.61	<0.01
		C	10.43±0.32	9.91±0.30	1.79	>0.05
		t	0.57	2.10	—	—
		P	>0.05	<0.05	—	—
3.1.	Number of on time reactions (%)	E	7	79	Δ + **72**	
		C	8	13	Δ + 5	
3.2.	Number of early reactions (%)	E	28	12	Δ –**16**	
		C	26	24	Δ –2	
3.3.	Number of late reactions (%)	E	65	9	Δ –**56**	
		C	66	63	Δ –3	
4.	"Tapping" test 40 sec (no. of touches)	E	170.85±7.18	203.17±6.	4.84	<0.001
		C	172.30±7.13	181.18±7.00	1.33	>0.05
		t	0.14	2.23	—	—
		P	>0.05	<0.05	—	—
4.1.	Decrease of the number of touches from 1 to 4 on quadrate (%)	E	42	28	Δ –**14**	
		C	41	32	Δ –**9**	

Note: f - 14 P - 0.05; 0.01; 0.001
f - 28 P - 0.05; 0.01; 0.001
E – experimental group
C – control group
t = 2.145 2.977
4.140t = 2.048 2.763 3.674

the moving object and the rapidity level of the elementary movements. The tapping test reflects the complex development state of the fine psychomotor activity of the experimental and control groups at the beginning and at the end of the experiment. The results of the comparative research of the statistical features at the beginning of the experiment show that they are homogeneous (P>0.05). A comparative analysis of the results of the control group in the dynamics of the academic year evidenced that the mean statistical indices had slightly changed at the end of the experiment, so some improvement of the tapping test indices was found (9%); however, the simple reaction to sound and light stimuli and the general reaction to the moving object did not have an authentic character of the experiment development P>0.05.

In our opinion, overall psychomotor development in pupils from the control group shows at the same time motor activism, but it is decreasing in traditional physical education lessons. At the same time the study of the data of the psychomotor test in the experimental group shown in Table II can confirm that at the end of the experiment, final data compared to initial data were significantly improved P<0.01-0.001. So, the test indices characterizing the simple motor reaction to sound and light, the general reaction to the moving object, as well as speed capacity in the tapping test were improved. It should be noted that in the experimental group, the complex reaction components to the moving object were considerably improved: 72% more on time reactions; 16% less early reactions and 56% less late reactions. The improvement of indices in the tapping test by 14% at the end of the experiment shows the condition of the nervous system's motor centers, with a 5% decrease in the motor fatigue of the nervous system in the experimental group compared to the control group. These positive results of the experimental group pupils largely reflect the effective ensuring of motor activism by special extracurricular physical education activity.

A comparative analysis of the indices obtained at the end of the experiment shows that between the experimental and the control group there was a difference in all motor tests at P<0.05, which confirms the priority of the motor development of the experimental group pupils for the correction of dysgraphia by the influence of physical education in primary school pupils (Lupuleac, 2013).

By analyzing the psychomotor development in the experimental group pupils, it can be noted that during the experiment there were improved results in all applied tests. We can confirm the fact that on account of the psycho-pedagogical model for the correction of dysgraphia by the influence of physical education in primary school pupils from the experimental group, not only a positive but also a significant improvement of the psychomotor status was achieved.

Conclusions

Based on the investigation, we can formulate the following conclusions:

1. It has been analytically shown that physical

education represents a complex combination of specific components that can reveal the correction of dysgraphia.

2. The fundamentation of the psycho-pedagogical model for the correction of dysgraphia by the influence of physical education in primary school pupils has established an interconnection between purpose, objectives and dysgraphia correction levels. Therefore, the psycho-pedagogical model for the correction of dysgraphia by the influence of physical education in primary school pupils represents a conceptual construct that directs pedagogical interventions towards a larger number of physical education aspects: general, social and psychomotor physical.

3. The implementation of the psycho-pedagogical model for the correction of dysgraphia by the influence of physical education in primary school pupils supports the fact that placing the emphasis on specific physical education means can contribute to a substantial improvement of the writing process P<0.01-0.001.

Conflicts of interest

There are no conflicts of interest.

References

Auclair L, Siéroff E, Kocer S. A case of spatial neglect dysgraphia in Wilson's Disease. Arch Clin Neuropsychol. 2008;23(1):47-62.

Burlea G (coord.). Tulburările limbajului scris-citit. Ed. Polirom. Iaşi, 2007, 264 .

Caisîn S, Racu I. Psihologia copilului: Suport didactic pentru coordonatorii educaţiei inclusive. Ed. Institutul de Formare continuă, Chişinău, 2011, 172.

Capellini SA, Coppede AC, Valle TR. Fine motor function of school-aged children with dyslexia, learning disability and learning difficulties. Pró-Fono R. Atual. Cient. Print version 2010;22(3), Barueri.

Crouch, AL, Jakubecy JJ. Dysgraphia: How It Affects A Student's Performance and What Can Be Done About It. Teaching Exceptional Children Plus. 2007;3(3):1-13.

David S. Dyslexia and Dysgraphia: More Than Written Language Difficulties in Common. J Learn Disabil. 2003;36(4):307-317.

Drozdova N. Corecţia naruşenii ustnoi i picimenoi reci. (Corecţia dereglărilor limbajului oral şi scris) Minsc, BGPU, 2005, 74..

Horghidan V (coord.). Problematica psihomotricităţii. Ed. Globus, Bucureşti, 2000, 143-146.

Lupuleac V. Procesul de cercetare a psihomotricităţii elevilor cu tulburări dislexico-disgrafice. Teoria şi arta educaţiei fizice în şcoală. 2013;10(2): 86-89.

Macsimenco M. Neiropsihologhiceschii analiz dvigatelinîx form naruşenii pisma u mladşih şcolinicov- metodiceschii material. (Analiza neurologică a tulburărilor motrice de scriere la elevii claselor primare- material metodologic) Şcola zdorovia, 2001;(7):30-34.

Martins MRI, Bastos JA, Cecato AT, Araujo MLS, Magro RR, Vinicios A. Screening for motor dysgraphia in public schools. J. Pediatr. 2013;89 (1):70-74.

Navoloacă Z (coord.). Motricitatea-mediatorul important în integrarea vorbirii şi limbajului. Ed. Epigraf, Chişinău, 2008, 75.

Raţă G (coord.). Educaţia fizică şi metodica predării ei. Ed. PIM, Iaşi, 2008, 214.

Rusnac V. Problema dereglării scrisului la copiii marcaţi cu nedezvoltare globală de limbaj. În Integrarea şcolară şi socială a copiilor cu cerinţe speciale. Teză de doctorat, Institutul de Ştinţe ale Educaţiei, Chişinău, 1998.

Stănescu M. Educaţia fizică pentru preşcolari şi şcolari mici. O abordare psihomotrică. Ed. Semna, Bucureşti, 2002.

Verza E (coord.). Dizgrafia şi terapia ei. Ed. Didactică şi Pedagogică. Bucureşti, 1983, 243.

Websites

(1) http://ldx.sagepub.com/search?author1=David+S.+Mather&sortspec=date&submit=Submit