

UDK 377.37:372.45  
BBK 4457.681.9-411.2,03-243  
GSNTI 14.25.09  
Code VAK 13.00.01; 13.00.03

**M. V. Gushchinskaya**  
Moscow, Russia

### **PREVENTION OF VISUAL-SPATIAL AND REGULATORY DYSGRAPHIA IN THE PROCESS OF EARLY FORMATION OF GRAPHOMOTOR WRITING SKILLS IN SECONDARY SCHOOL PUPILS**

**Abstract.** The article is devoted to an experimental study of results of application of the preventive system of formation of graphomotor writing skills worked out by the author in children with predictors of regulatory and visual-spatial dysgraphia. The author outlines the issue of the growing number of typically developing preschool children whose problems with writing acquisition result from the objective laws of the child's functional brain genesis, as well as the increasing number of first-graders whose development does not fit the generally accepted age-related indicators. The article discusses questions of the modern conception of modernization of education, of recognition of the uniqueness and intrinsic value of human individuality, of finding ways of socialization of the person with disabilities, and the development of new pedagogical strategies of education process in order to efficiently address the challenges of teaching children with partial or mild deviations. The study proves that it is time to create at the reading and writing lessons the pedagogical conditions allowing teachers to prevent and correct errors arising from instability of the basic functional components and to lay the foundations of literate written speech of schoolchildren. The author presents the results of approbation of the suggested method in mass school practice. Using the methods of statistical data processing, the author carries out a comparative analysis of the works of the pupils who participated in the control experiment for the parameter "average value of dysgraphic violations frequency" in the "risk group" and "conventional norm". The study determines the effectiveness of the system.

**Keywords:** disabilities; dysgraphia; dysgraphia predictors; logopedics; teaching writing; graphomotor skills; writing disorders.

**About the author:** Gushchinskaya Marianna Vyacheslavovna.

*Place of employment:* Speech Therapist, State Budgetary Institution "Center for Sports and Recreation "SOC-IN", Moscow, Russia.

*E-mail:* maridnp@mail.ru.

## INTRODUCTION

The modern society witnesses the tendency towards increase of the number of children with mild deviations in development. The latest education conceptions and the acknowledgement of uniqueness and inherent value of the person's individuality have led to the search for new ways of socialization of a person with disabilities, to design of new pedagogical strategies targeted at development of the humanistic ideas. The problem of the growing number of children needing complex assistance of various specialists sets the task to unite effort in order to effectively overcome the difficulties of development, education, upbringing and socialization in general of the children with disabilities under the conditions of the education process.

The issue of low educability of schoolchildren becomes especially urgent now from the social and pedagogical point of view. The number of the primary school pupils who cannot cope with the requirements of the standard school program has grown over two recent decades 2-2.5 times as much, reaching 30%. According to the Ministry of Education and Science of the Russian Federation, 78% of the pupils need special forms and methods of education. Physiologists and psychologists report, that 30% of first-graders demonstrate delay in gen-

eral motor development on entering school, and 38% of the children have significant difficulties in writing skills acquisition [2].

Special attention should be paid to the works of T. V. Akhutina, M. M. Bezrukikh, E. V. Krupskaya, A. R. Luriya, R. I. Machinskaya, O. A. Semenova, N. M. Pylaeva devoted to the state of arbitrary regulation of actions and visual-spatial functions as basic components in the process of development of the grapho-motor writing skill [1; 2; 10; 11; 14]. Formation of the written speech prerequisites is completed by the end of the ages of 6-7 years on average. But this does not mean that the child's psychological functions and processes are perfect: we observe underdevelopment of certain cognitive functions, brain mechanisms of arbitrary regulation of activity, concentration of attention, visual perception, visual-spatial tracing, analysis and differentiation, as well as poor formation or violation of integrative functions – visual-motor and auditory-motor coordination and mechanisms of nervous-muscular regulation; all this hampers execution of graphic movements [1]. According to the data of ontogenetic investigations, the age of writing skill acquisition is characterized by significant individual differences in the degree of maturity of all physiological systems, and the central nervous sys-

tem in particular [2]. As a result, unevenness of development of separate regions of the child's brain and individual peculiarities of his cognitive functions lead to lagging behind in formation of the functional components of the higher psychological functions, which are also present in the system of writing.

Enough attention is being paid in modern literature to the issue of writing disorders connected with underdevelopment of the regulatory component (problems of arbitrary regulation of speech and keeping up the cortex in tone and in active working condition) [9; 10; 11; 14].

It is the immaturity of the cortex and the brain regulatory structures that influence the acquisition of the writing skill in a specific way, which is reflected both on the semantic and graphical aspects of this process. The general character of regulatory disorders allowed T. V. Akhutina to single out a specific kind of writing disorder – *regulatory dysgraphia* [1]. Another, not in the least less significant functional component in acquisition of the graphomotor writing skill is the *visual-spatial* one. Being the leading component of any psychological activity, spatial concepts are the earliest to emerge but the longest to develop psychological functions in the ontogenesis. According to the data produced by a number of researchers, the zone under description becomes wholly mature by the ages of 11-14 years

[1; 8]. The maturity of the spatial component and its sublevels: coordinating, metric and topological concepts make up one of the most important constituents of the functional system of writing, because the letter is a geometrically organized object.

T. V. Akhutina defines this kind of disorder as visual-spatial dysgraphia [1].

In this connection, determination of the level of formation of the given functions at the stage of beginning schooling, as well as the organization of special pedagogical conditions in the process of primary teaching writing are important for successful acquisition of the skill both by the conventionally typical child and by the child with mild deviations in development.

### **RESEARCH**

This article describes the verification results of the previous stages of research on the topic and the suggested methods of teaching in mainstream school practice. This task was accomplished with the help of a control experiment.

The aim of the control experiment was to check up the effectiveness of the suggested preventive system of teaching writing (PSTW) in other schools without preliminary testing and assessment of the real capability of graphomotor activity of each child.

### **Tasks:**

- To analyze the works of the pupils at the end of the first and the second years of schooling who learn writing according to the traditional teaching methods [4] and according to the PSTW [5] with the purpose of discovering dysgraphic regulatory and visual-spatial errors.

- Using the methods of statistical procession, to compare the results of all classes between themselves on the average values of the frequency of dysgraphic errors (DE), and the ratio of the number of the pupils from the “risk group” with the total number of the pupils both in the experimental classes and in the classes which had taken part in the earlier formative experiment [6].

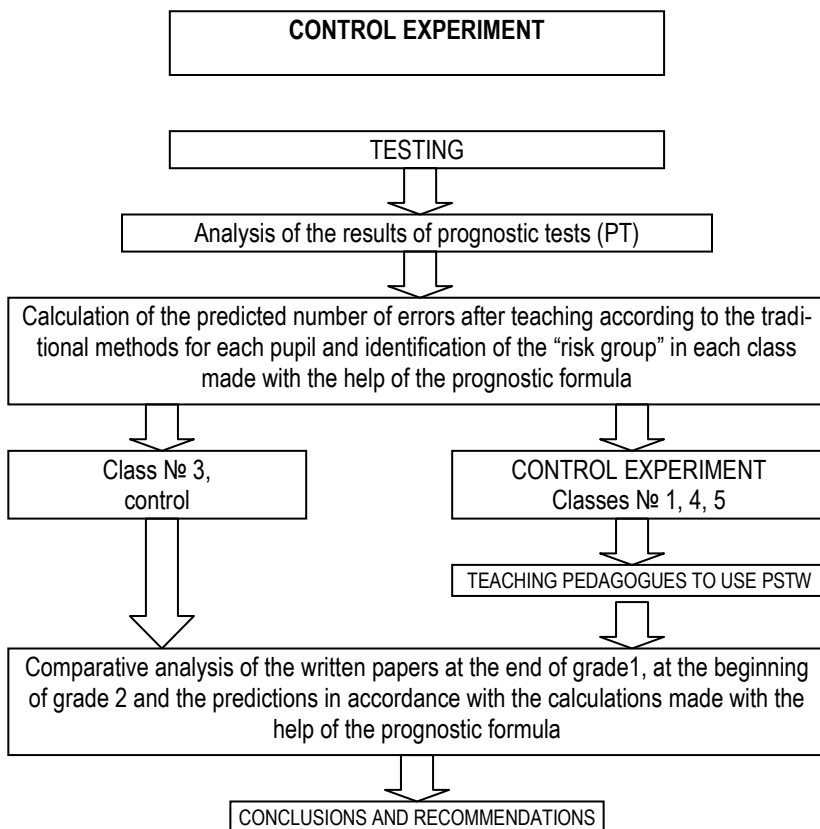
- To identify the change of the DE frequency in the “risk groups” after a three months break in the pedagogical process (summer vacation) in learning writing using the traditional teaching methods and the PSTW.

We made a decision to carry out the control experiment with the same teachers based on their teaching ex-

perience only. The control experiment was conducted according to the scheme shown in picture 1. Having conducted a course of teaching writing according to the traditional methods, the selected teachers let their pupils out of school. During the summer vacation, the selected teachers took a course of training in the methods of work according to the PSTW. The newly enrolled first-graders learned writing according to the PSTW.

It is necessary to comment here on the peculiarity of our participation in conducting teaching writing according to the PSTW at the stage of the formative experiment in the experimental class and at the stage of the control experiment.

In the first case, we performed the basic work in teaching children of the experimental class according to the PSTW. The teachers of these classes reinforced the learnt algorithms of activity with the children according to the author’s instructions.



**Figure 1.** The scheme of the control experiment as a constituent part of the basic experiment.

In the second case, during the summer vacation the teachers took a course of training on the PSTW, i.e. they mastered the methods of teaching and received the didactic material (workbooks for the children). Then, during the control experiment the teachers taught the children independently on the basis of the authored system.

The teacher of class № 3, who had taken part in the formative experiment, taught the control class and the class during the pilot and the second stage experiment according to the standard program [4]. The experiment outcomes analysis showed that the results of teaching different classes by the same teacher had hardly changed,

i.e. the average values of the DE frequency in accordance with the MWW test ( $W_{exp} < 1.96$ ) did not differ. We may assume that over the period (4 years) the characteristics of the contingent had not significantly changed.

### COURSE OF EXPERIMENT

90 people took part in the experiment. The control experiment scheme is shown in figure 1.

Tables 1 and 2 contain the results of the pupils whose calculated data on the number of dysgraphic errors was above the critical value.

Analyzing table 1 we can see that in class № 1, according to the calculated data, seven pupils be-

longed to the “risk group” of the kinds of dysgraphia under observation. While teaching writing according to the preventive system, the number of the pupils of the given group was equal to 5; 7 pupils had been predicted to be in class № 4, and after learning according to the PSTW there were only 3 pupils in the “risk group”; 7 pupils had been predicted to be in class № 5, and in reality there was only 1 pupil. It should be also noted that practically all pupils had much fewer dysgraphic errors of regulatory and visual-spatial nature in their written papers in comparison to the prediction.

**Table 1.** Control experiment, end of grade 1, experimental and calculated frequency of dysgraphic errors

| Pupil | Class № 1  |             | Class № 4  |             | Class № 5  |             |
|-------|------------|-------------|------------|-------------|------------|-------------|
|       | Experiment | Calculation | Experiment | Calculation | Experiment | Calculation |
| 24    | 34         | <b>36</b>   | 34         | <b>38</b>   | 32         | <b>40</b>   |
| 25    | 32         | <b>47</b>   | 30         | <b>45</b>   | 30         | <b>48</b>   |
| 26    | <b>42</b>  | <b>44</b>   | 33         | <b>43</b>   | 33         | <b>38</b>   |
| 27    | <b>38</b>  | <b>38</b>   | 35         | <b>45</b>   | 34         | <b>42</b>   |
| 28    | <b>37</b>  | <b>56</b>   | <b>43</b>  | <b>45</b>   | 34         | <b>45</b>   |
| 29    | <b>40</b>  | <b>74</b>   | <b>36</b>  | <b>43</b>   | 35         | <b>43</b>   |
| 30    | <b>45</b>  | <b>36</b>   | <b>40</b>  | <b>73</b>   | <b>37</b>  | <b>64</b>   |

**Table 2.** Control experiment, beginning of grade 2, number of dysgraphic errors

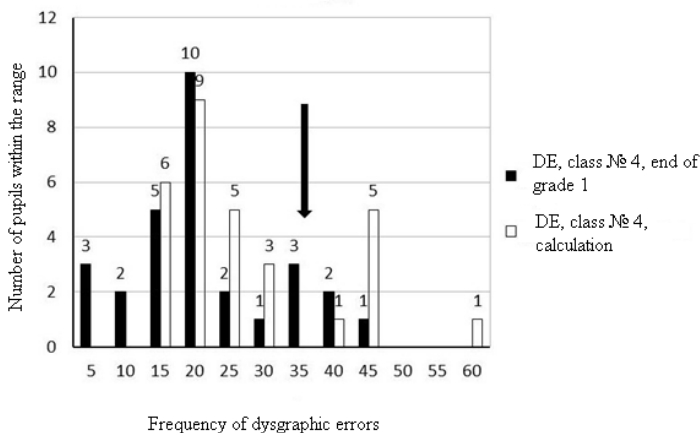
| Pupil | Class № 1 | Class №4  | Class №5  |
|-------|-----------|-----------|-----------|
| 24    | 32        | 31        | 35        |
| 25    | 33        | 33        | 33        |
| 26    | 34        | <b>40</b> | <b>40</b> |
| 27    | 34        | 34        | 34        |
| 28    | 35        | 35        | 35        |
| 29    | <b>36</b> | 34        | 34        |
| 30    | <b>36</b> | <b>36</b> | <b>36</b> |

After that, we examined the papers (home, classroom and test papers) of the pupils with relation to the presence of dysgraphic errors at the beginning of the second grade (see table 2). The summer vacation gives an opportunity for the natural processes to balance external intervention (teaching a skill) against the child's internal capabilities. As a result, the acquired skill gets deformed. The degree of this deformation depends both on the capabilities of the child, to be more exact, on their compliance with the tasks to be achieved, and on the pedagogical intervention: the more effective it is, the higher the stability of the acquired skill. In such circumstances, the differences in the study results of the written works of the

pupils in terms of dysgraphic errors may be attributed to the efficiency of the methods of teaching graphomotor skills.

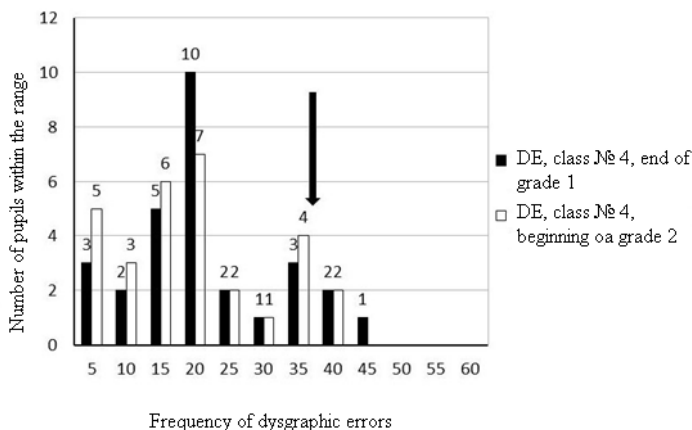
According to the comparison of the results obtained at the beginning of the second grade and at the end of the first grade (table 2), the number of dysgraphic errors in the papers of the children of all three control classes decreased considerably. This fact may testify to the stabilization of the graphomotor writing skill in teaching in accordance with the authored preventive system of education. The data of the control experiment are shown in figures 2 and 3 in the column diagrams of the density of distribution of dysgraphic errors.

Dysgraphic errors, Class № 4.  
 Predicted and real results at the end of grade 1.



**Figure 2.** Distribution density of the number of dysgraphic errors of class № 4 (the pocket is equal to «5»), calculated (predicted) and real results at the end of grade 1

Dysgraphic errors, Class № 4.  
 End of grade 1 and beginning of grade 2



**Figure 3.** Distribution density of the number of dysgraphic errors of class № 4 (the pocket is equal to «5»), at the end of grade 1 and the beginning of grade 2.



## CONCLUSIONS

1. We have registered a salient tendency towards decrease of children with a considerable number of dysgraphic errors of regulatory and visual-spatial nature (i.e. DE more than the critical value) in all classes.

2. Stabilization of writing skills is observed after the summer vacation, which is demonstrated in decrease of the number of children with DE more than the critical value in all classes learning according to the PSTW.

The control experiment data revealed that as a result of application of the authored Preventive System of Teaching Writing there happens a positive shift in the following parameters:

- the load on the teacher and the pupils is lowered;
- the quality of the education process gets improved;
- teaching writing according to the given scheme has a rehabilitation-preventive character, which is of great importance at the present moment of development of the education system in terms of inclusive education – teaching children with various levels of development, including those with disabilities, in general education mainstream schools.

### References

1. Akhutina, T. V. Trudnosti pis'ma i ikh neyropsikhologicheskaya diagnostika / T. V. Akhutina, N. M. Pylaeva // Pis'mo i chteniye: trudnosti obucheniya i korrektsiya / pod red. O. B. Inshakovoy. — M. : MPSI, 2001. S. 7—20.
2. Bezrukikh, M. M. Zdorov'esberegayushchaya shkola / M. M. Bezrukikh. — M. : MPSI, 2004. — 240 s.
3. Bernshteyn, N. A. Fiziologiya dvizheniy i aktivnost' / N. A. Bernshteyn. — M. : Nauka, 1990. — S. 373—392.
4. Goret'skiy, V. G. Didakticheskiy material k urokam obucheniya gramote : posobie dlya uchashchikhsya / V. G. Goret'skiy. —3-e izd. — M. : Prosveshchenie, 1984. — 63 s.
5. Gushchinskaya, M. V. Tekstovyy redaktor, modeliruyushchiy kirillicheskiy rukopisnyy tekst (Programma Hwriter) / M. V. Gushchinskaya, A. Ya. Andreev. — Svidetel'stvo ob ofitsial'noy registratsii programmy dlya EVM № 2007614465.
6. Gushchinskaya, M. V. Eksperimental'noe izuchenie prediktorov regulatorynykh i zritel'no-prostranstvennykh disgraficheskikh narusheniy u mladshikh shkol'nikov / M. V. Gushchinskaya, E. A. Ekzhanova // Vestn. Cherepovets. gos. un-ta : nauch.-metod. zhurn. Minobrnauki Rossii. — 2012. — Dop. vyp., sent. — S. 50—59.
7. Ekzhanova, E. A. Diagnostiko-prognosticheskiy skrining na nachal'nykh etapakh obucheniya : metod. posobie / E. A. Ekzhanova. — M. : Deyton, 2000. — 68 s.
8. Inshakova, O. B. Otrazhenie zritel'no-prostranstvennykh trudnostey v pis'me pervoklassnikov / O. B. Inshakova, A. N. Krichyevets, T. V. Akhutina // Rannyyaya diagnostika, profilaktika i korrektsiya narusheniy pis'ma i chteniya. — M. : MGSI, 2006. — S. 44—49.
9. Kornev, A. N. Narusheniya chteniya i pis'ma u detey / A. N. Kornev. — SPb. : MiM, 1997. — 286 s.
10. Korsakova, N. K. Neuspevayushchie deti: neyropsikhologicheskaya diagnostika trudnostey v obuchenii mladshikh shkol'nikov / N. K. Korsakova, Yu. V. Mikadze, E. Yu. Balashova. — M. : Pedagogicheskoe o-vo Rossii, 2002. — 160 s.
11. Luriya, A. R. Pis'mo i rech': neyropsikhologicheskie issledovaniya / A. R. Luriya. — M. : Akademiya, 2002. — 352 s.
12. Minzov, A. S. Ekonometrika / A. S. Minzov. — M. : Izd-vo MFA, 2001. — 54 s.

13. Prishchepova, I. V. Rechevoe razvitie mladshikh shkol'nikov / I. V. Prishchepova. — SPb. : KARO, 2008. — 160 s.
14. Semenova, O. V. Mozgovye mekhanizmy proizvol'noy regulyatsii deyatelnosti i formirovanie navyka pis'ma u detey 7—8 let / O. V. Semenova, R. I. Machinskaya, T. V. Akhutina, E. V. Krupskaya // Fiziologiya cheloveka. — 2001. — T. 27, № 4. — S. 23—30.
15. Tsvetkova, L. S. Neyropsikhologiya scheta, pis'ma i chteniya: narushenie i vosstanovlenie / L. S. Tsvetkova. — M. : MPSI, 2000. — 299 s.
16. Graham, S. Preventing Writing Difficulties: Providing Additional Handwriting and Spelling Instruction to At Risk Children in First Grade / S. Graham, K. R. Harris // Teaching Exceptional Children. — 2006. — May/Jun. — Vol. 38. — Iss. 5.