

LEARNING DIFFICULTIES AND EFFECTIVE INTERVENTION IN THE CASE OF STUDENTS WITH ATTENTION DEFICIT AND HYPERACTIVITY DISORDER

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Abstract. The manifestations specific to attention deficit and hyperactivity emerge and develop in the context of mainstream school and the psycho-pedagogical intervention depends, in any context, upon teachers' experience and knowledge. Compared to their peers who do not have such disorders, students with attention deficit and hyperactivity disorder have difficulties in forming the organizing, planning and time management skills. School adjustment difficulties these students have can be ameliorated through structured and customized psycho-pedagogical intervention programs. This paper aims to test the effectiveness of such a psycho-pedagogical program. In our opinion, the psycho-pedagogical literature concerning the intervention programs in the case of manifestations specific to attention deficit and hyperactivity disorder belongs to the exploratory (observatory) and formative - ameliorative parceling intervention types.

Keywords: attention deficit hyperactivity disorder, psycho-pedagogical intervention, graphic-motor organization, planning skills, reading automaticity.

Introduction

School is a challenge for students with attention deficit hyperactivity disorder, this disorder being usually diagnosed when the child goes to school, that is after the age of 7, precisely because of the fact that symptoms worsen as a consequence of the increasing demands of attention, organization of activities and other school responsibilities. School environment is a context that requires planning, control, coordination and evaluation of interactions and ways of active participation in the educational process.

Starting from the principle of the differentiated education, it is admitted that all students must receive educational influences adequately, according to their individual characteristics and needs. By applying psycho-pedagogical intervention programs in the case of students with attention deficit hyperactivity disorder, equal chances of development can be ensured.

Reading and writing particularities encountered in students with ADHD

Following the completion of a study aimed at detecting the students with attention deficit hyperactivity disorder who were integrated in the mainstream education, there were identified the difficulties that appear in the area of reading and writing, in the *Language and Communication* curriculum area.

In what concerns the pupils involved in the research, in their dictation papers were found several mistakes consisting in the substitution of letters and even groups of letters. For example they wrote *grişă* (instead of *grijă*), *steşar* (instead of *stejar*), *etaş* (instead of *etaj*), *cospodărie* (instead of *gospodărie*), *cincaşă* (instead of *gingaşă*), *jnur* (instead of *şnur*), *schimp* (instead of *schimb*), *gând* (instead of *când*), *fânt* (instead of *vânt*), *brichindel* (instead of *prichindel*) etc. There were substituted especially the sounds whose points of articulation were close (c - g; ş - j; t - d; f - v; etc.), as well as the consonants ş - s; m - n; s - ş, for

example *restea* (creștea), *păpusa* (păpușa), *înbogăți* (îmbogăți), *schimb* (schimb), *Ton* (Tom) etc.

There were found several mistakes in the use of "i" in written language, in the sense that the grapheme "i" was omitted: *ochi* (instead of *ochii*), *galben* (instead of *galbeni*), *dinț* (instead of *dinți*). The omission of "i" after the letter „ț”, for example, generates a rough pronunciation of the letter „ț” (and other hissing sounds) and the transformation of „i” in „î”; when it is semivocalic and final, it disappears completely. For many children, the hissing sounds „ș” and „ț” are pronounced roughly and contain the "i". When replacing the 'e' with 'i', the student takes into consideration some phonetic methods, rather than the determinations based on disorders from the cognitive, perceptive or auditory- spatial sphere. For example, the transformation of "e" into "i" in the words: *făcia*, *urechia*, *vechie*, *lighian*.

In the dictation papers, there are also inversions, especially inversions anticipating the graphemes: *princhidel* (prichindel), *unc* (nuc), *jelete* (Degețel), but they are not frequent.

Errors were found also in the spelling of consonant combinations. Difficulties that appear in their phonemic analysis is explained by the fact that the student fails to perceive and distinguish clearly both elements that make up the word, because they are, on one hand, closely united, and on the other hand, one of the consonants overshadows the other.

The degree of association of two or three consonants is also determined by their resemblance and by the way in which the transition from one to the other is made. This transition can sometimes be very smooth and sometimes less smooth, depending upon consonants' acoustic and kinesthetic resemblance. In the first case, if they are also similar, the consonants are strongly merged, one of them losing completely its individuality. In the second case, the connection between the consonants is not that strong and they can be more easily separated. A characteristic example of the first category of words is *astfel*, where "t", whose presence is not that obvious, disappears from its place next to "s", to which it resembles in terms of the articulation point.

At the written test, for which the students had to reproduce the ideas of an orally presented text, prevailed the dysorthographia, which was less common at the dictation test. Most experts believe that the dysorthographical phenomena, even if they give the impression of being separated from the reading – writing disorders, turn into dysgraphia and dyslexia. Borel - Maisonny, S. (in E. Verza 1983) points out that dysorthographia has negative implications in learning to read and write and in acquiring knowledge.

After the task for which the students had to express in written the ideas of an orally presented test, there were highlighted various mistakes: omissions, substitutions, additions of letters, poor vocabulary, repeatedly used words, ignorance and disrespecting of the grammatical rules. The ideas related inversely compared to the action's real course, for example:

*“The snake left hissing.
I'll bite you! I'll bite you!
The bunny befriended the hedgehog. ”*

show difficulties in terms of the representation and spatial-temporal orientation, organization and planning.

Vocabulary problems are usually due to disorders at the level of the acoustic-vestibular perception and generally at the level of cognitive processes, with negative implications on performing analysis and synthesis operations as well as on the discrimination of verbal symbols.

It was found that a relatively high number of students with attention deficit hyperactivity disorder have lexical problems, which has repercussions on text comprehension. The student is unable to read and identify the word as a whole, as a global entity with a specific significance and sense. In some cases the transition from analysis to synthesis, from literalization and spelling to the synthesis of the word is achieved with difficulty. Some students show difficulties in reading words with a higher degree of difficulty or polysyllabic words, fact that determines the dyslexic to try to guess the word. Interestingly, there were cases in which students were hesitant, asking if they could whisper read / silent read first and then read loudly (to become familiar with the text).

They perceive the syllabic components as standalone units, while the longer words are read entirely, only after some stumblings.

Their attention is focused on reading the word as a whole and on the shape of the word in order to make the reading fluent, and as a consequence the text is not well understood.

The meaning of larger units, syntagms, sentences and phrases is even more difficult to understand and as a consequence of focusing attention on disparate units, the context and subcontext do not fulfill any longer the role of substitution and completion of information. Hence, a number of difficulties in reproducing what has been read and in reporting to some references with collateral ramifications to the basic idea. The students read with difficulty, with mistakes, slowly, hesitant, with stumblings and blockages, with omissions, distortions or substitutions of words.

It should be noted that in most cases with lexical-graphical disorders there are striking deficiencies in what concerns the spatial organization, as well as some disorders in temporal organization. Reading activities imply compliance with the rules concerning the succession and spatial-temporal organization. Placing the graphemes within the page presents qualitative value depending upon the spatial orientation and the organization of the signs, in terms of shape, but also structure and succession.

Hypothesis and objectives of the research

Given the theoretical premises concerning the attention deficit hyperactivity disorder associated with learning difficulties, the following research hypothesis was formulated: *The development and use of the organizing and self-organizing skills and of those skills that are specific to reading and writing, support significantly the elimination of reading and writing difficulties.*

In order to test the formulated hypothesis, the following objective was taken into account: the investigation of a psycho-pedagogical intervention program based on two components: techniques for developing the organizing skills in students with attention deficit hyperactivity disorder and techniques for developing the organizing skills, associated with the self-organizing skills, in ways customized for learning difficulties.

The independent variable was represented by the psycho-pedagogical intervention program.

The dependent variables that are significant for this research were represented by: variables targeting school performance: reading automaticity, reading comprehension, written expression; and variables targeting the executive functioning: graphic-motor organization and visual-spatial skills, planning and visual-spatial memory, planning, monitoring, self regulating and problem solving skills. There were also categorical variables: the *grade* the student with attention deficit hyperactivity disorder associated with learning difficulties and receiving drug treatment was enrolled in, the *drug treatment* these students receive or not and the *type of attention deficit and hyperactivity*.

Research methodology

For the entire psycho-pedagogical intervention program (organization component with general character and organization, self-organization component specific to learning difficulties) was chosen a within-subjects experimental approach, of the type pretest - intervention - post-test.

The study was conducted on a group of 42 students with attention deficit hyperactivity. There were evaluated reading and writing skills (using the Three Minutes Text Test, measuring reading automaticity; the reading comprehension test and the image composition test) and the executive functioning, using the neuropsychological tests (Rey complex figure test and Tower subtest from the NEPSY test battery).

The first part of the pedagogical intervention program structured on general character organizational component, lasted eight weeks and was implemented in the classroom by the teacher, in the case of students with attention deficit hyperactivity disorder and associated learning difficulties. The intervention consists of a set of techniques aimed to develop and consolidate the general organizing skills. During this program (8 weeks), new techniques were introduced and the previous ones were consolidated. A cumulative consolidation was achieved. In accordance to the findings, the deficient behaviors were consolidated.

The second part of the psycho-pedagogical intervention program was applied, this program being structured on components specific to reading and writing. This intervention program was implemented by the teacher during 16 weeks in the case of students with attention deficit hyperactivity disorder and learning difficulties.

Before and after the completion of the entire psycho-pedagogical intervention program, students were assessed with instruments targeting reading and writing (the Three Minutes Text Test, reading comprehension test and image composition test) and neuropsychological tests: Rey - complex figure test (copy -recall) and Tower subtests (Nepsy), establishing its effectiveness.

Interpretation of results

Following the application of the intervention program on the organizational component of general character (partial post-test), there are positive correlations between the variables of interest in the research, concerning the graphical - motor organization and visual-spatial abilities (Rey test - copy) and the variables concerning school performance: those concerning the comprehension of the text read (reading comprehension, $r = 0.57$, $p < 0.01$) and written expression (image composition, $r = 0.54$, $p < 0.01$); positive correlation between the

variables concerning planning and visual-spatial memory (Rey test - recall) and the one concerning the written expression (image composition, $r = 0.40$, $p < 0.01$).

At the level of the 2nd grade, the correlation was positive between the variables concerning reading automaticity (Three Minutes Text Test) and the one concerning reading comprehension (Reading Comprehension, $r = 0.58$, $p < 0.05$), but also between the variables: planning, monitoring, self regulation and problem solving (Tower subtests) and the variables concerning reading comprehension (reading comprehension, $r = 0.63$, $p < 0.05$) and the one targeting written expression (image composition, $r = 0.87$, $p < 0.01$).

In the 3rd and 4th grades there are many correlations between the variables of interest in the research, obtained using neuropsychological tests and those assessing school performance; in the case of the 3rd grade, the correlations were very strong between the variables targeting the graphic- motor organization skills and visual-spatial skills, but also those concerning planning skills and visual-spatial memory (Rey - complex figure) and the variables obtained with school tasks; between the variables concerning planning, monitoring, self-regulating and problem solving (Tower subtest) and the one concerning reading comprehension (Reading Comprehension, $r = 0.70$, $p < 0.01$). In the case of the 4th grade, there were strong correlations between the variables covering planning, monitoring, self-regulating and problem solving (Tower subtest) and the ones assessing school performance ($r = 0.91$, $p < 0.01$ - Reading Comprehension, $r = 0.89$, $p < 0.01$ – Image composition) and between the variable targeting the comprehension of the read text (reading comprehension) and graphic-motor and visual- spatial organizational skills (Rey - copy) with Pearson coefficient $r = 0.61$ at a significance level $p < 0.05$.

In what concerns the correlations of the evaluations from the partial post-test (organizing component of general character), when controlling the type of attention deficit and hyperactivity disorder, it was observed that there was no improvement in the case of the hyperactive type and that in the partial post-test there were no correlations between the variables. In the case of the inattentive type there were strong correlations between the variables from neuropsychological tests and those from academic tasks; and although weaker, correlations may be encountered in the combined type as well. In the case of the attention deficit hyperactivity disorder – predominantly hyperactive type, the number of subjects participating in the research was quite small (4 students), fact that could explain the lack of significant correlations.

Comparing the same variables of interest in research, from all the assessments, before the intervention (pretest) and partial post-intervention, based on the organizing component of general character, was observed the existence of a difference between results, in the sense of obtaining better results in all the assessments from the partial post-test, compared to the scores from the pretest. The average of the results in what concerns the formation of the graphic- motor organizational skills and visual- spatial skills (Rey test - copy) increased from 32,50 to 44,64 ; the ability to express ideas in writing (image composition) increased, the average reaching 48,10 in the partial post-test.

There are high correlations between the variables of each pair and all these correlations are significant, for example, the highest Pearson r coefficients ($r = 0.84$, $p < 0.01$ for the variable concerning graphic- motor and visual- spatial skills - Rey – copy; $r = 0.95$, $p <$

0.01 for the variable concerning reading automaticity Three Minutes Text Test) show a major difference that occurred in the case of children between the two measurements.

The higher scores obtained by students in the partial post-test are not due to random variations, but may be clearly assigned to the educational intervention performed between the two measurements.

There are no differences concerning the categorical variable *grade* in the case of the improvement of students' academic performance. Results were better for most students, regardless of the grade. In the case of students from the 3rd and 4th grades, there are statistically significant differences between the partial post-test and the pretest, at a significance level $p < 0.01$ in the case of all variables. In the case of students from the 2nd grade, the exceptions are represented by the variables related to reading comprehension, which is not statistically significant, probably because in this period prevails the consolidation of the reading skills and the deficient attentional resources cannot yet process the text read.

Results improved significantly, in the case of students who received medical treatment but also in the case of those who did not receive medical treatment, this condition not causing differences between the results from the partial post-test at the neuropsychological tests and those of school performance. All differences are statistically significant at a significance level $p < 0.01$.

In the case of the hyperactive students, as the number of subjects is very small, there are several variables in which, although there appear improvements between the pre-test and the partial post-test, these improvements are not significant. Based on the *t* values, one can observe a statistically significant difference between the performance of the group with attention deficit hyperactivity disorder, between pretest and partial post-test, which indicates a change of the executive functions' performance after the implementation of the intervention program based on organizational techniques. There were significant improvements in the automaticity of reading, but not in reading comprehension or written expression.

In the case of students with attention deficit hyperactivity disorder - the predominantly inattentive and combined type, the implementation of the first component of the psycho-pedagogical intervention program was effective in terms of improved performances between pretest and post-test on the organizational component of general character (differences were significant at a significance level $p < 0.01$).

The study investigating the effectiveness of the psycho-pedagogical intervention program, structured on components specific to reading and writing is a continuation of the experimental study. This study continued the data analysis resulted from the application of the second component of the psycho-pedagogical intervention program, based on the development techniques of the organizational skills, associated with self-organizing skills specific to reading and writing.

In the case of all pairs of variables, the averages between the partial post-test and the final post-test increased. In other words, there is a difference between the results, in the sense of higher scores in all the variables in the partial post-test, compared to the scores from the final post-test (except the reading automaticity, where the difference between the averages is not significant at a level < 0.05).

Analyzing each pair of tested variables, the value of the correlations between the variables and the level of significance, it was observed that there are high correlations

between the paired variables (except for reading automaticity, whose coefficient is significant at a significance level < 0.05) and that all these correlations are significant at a significance level < 0.01 . For example, the highest Pearson coefficients (0.84 in the case of the graphic-motor organization and visual-spatial skills, 0.85 in the case of planning and visual-spatial memory) show a strong correlation between the two measurements.

Given the fact that for all pairs of variables the level of significance is 0.000, we can conclude that the better results obtained by the pupils in the final post-test compared to the partial post-test are not due to random variations, but can be clearly attributed to the educational intervention performed between the two measurements.

T-test was repeated on paired samples on these variables, controlling also the variable grade (students were enrolled in the 2nd, 3rd and 4th grade). The differences between averages, on each pair of assessment tools, show statistically significant improvements, regardless of grade: the results improved in most of the students between the partial post-test and the final post-test, regardless of grade.

Next, the same test was used in the context of controlling another variable, to see if there are differences in the performance of students who received medical treatment and the performance of those who received medical treatment. In the case of controlling this variable, the results are also conclusive: results improved significantly in the case of students who received drug treatment, but also in the case of students who did not receive drug treatment, as this condition does not produce differences in the results of the final post-test compared to the partial post test, neither at the neuropsychological tests nor in school performance tests.

Another attempt was represented by the repetition of the test, controlling the variable type of attention deficit hyperactivity disorder. On what concerns the types of ADHD, analyzing the results divided into the three types (hyperactive, inattentive and combined), we can say that in the case of students belonging to the inattentive and combined groups, the psycho-pedagogical intervention was effective, in the sense of the significant improvements of school performance between the partial post-test and the final post-test. In the case of the hyperactive students results are not significant, the differences between the results are not significant at a level < 0.01 (for none of the variables), but most of them are significant at a level < 0.05 (planning and visual-spatial memory; planning, monitoring, self regulating and problem solving skills; reading automaticity, reading comprehension, written expression).

The six variables (covered by the tests: Rey complex figure - copy and recall, Tower subtest, and the tests concerning school performance) will be compared before the intervention (pretest) and after the final intervention (final post -test). In the final post-test, for each pair of tested variables, there appear again the value of the correlations between the variables and the level of significance. It was observed that there are high correlations between the results of each pair of variables and that all these correlations are significant at a significance level < 0.05 . For example, the highest Pearson *r* coefficients (0.62 for the graphic - motor organization variable, 0.60 for the planning and visual-spatial memory variable) indicate a major difference in the case of students between the two measurements.

Better scores obtained by students at the final post-test, are not due to random variations, but may be clearly assigned to the psycho-pedagogical intervention performed between the two measurements.

The variable grade was also controlled (students were from the 2nd, 3rd and 4th grades), repeating the *t* test on paired samples on the same variables. All the differences between the averages indicate statistically significant improvements on each pair of evaluation, regardless of grade: the results improved in most of the students from pretest to the final post test, regardless of grade. It should be noted, however, that at the level of the 3rd grade, the improvements are noticeable.

The same test is used in the context of controlling another variable, to see if there are differences in the performance of students who received medication and those who did not receive medication. When controlling this variable, results are also conclusive: the results were significantly improved in the case of students who received drug treatment but also in the case of students who did not receive drug treatment; this condition did not cause differences in the results of the final post-test, in the neuropsychological tests or in the school performance tests.

T test was repeated, taking into account the type of attention deficit and hyperactivity. Analyzing the results, divided on the three types of attention deficit and hyperactivity (hyperactive, inattentive and combined), it can be said that in the case of students belonging to the group with attention deficit hyperactivity—the predominantly inattentive and combined types, the psycho-pedagogical intervention was effective, in the sense of a significant improvement of their performances between the pretest and the final post-test. In the case of the hyperactive children, there is one variable in which, although improvements occur between pretest and the final post-test, these improvements are not statistically significant. (graphic - motor organization, where the significance level is > 0.05).

Conclusions and discussions

The psycho-pedagogical intervention program was conducted over a period of 24 weeks and may be applied by the teacher in classroom, in order not to disturb the smooth running of the educational activities. The program was structured on two components: a component of organization, self-organization of general character and a component with a character specific to reading and writing difficulties. The formed organizational skills were used throughout the intervention program, in order to automatize them.

In order to identify learning difficulties in the area of reading and writing, an ascertaining study was conducted after testing the following skills: dictation, listening comprehension and reading a text at first sight.

The better results obtained by students with attention deficit hyperactivity associated with learning difficulties, in both phases of the reevaluation, after the implementation of the first part (based on the component of organization of general character) and after the implementation of the second part of the program psycho-pedagogical intervention (based on intervention specific to reading and writing) demonstrate improvements in students' school performance.

We can therefore say that in the case of students with attention deficit hyperactivity disorder, the psycho-pedagogical intervention program was effective and that it should integrate contents and experiences from the field of factors impacting on attention deficit and hyperactivity disorders.

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