BABES-BOLYAI UNIVERSITY OF CLUJ NAPOCA

FACULTY OF PSYCHOLOGY AND EDUCATIONAL SCIENCES

DOCTORAL THESIS
- SUMMARY -

Psycho-pedagogical intervention program in students with attention deficit hyperactivity disorder

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KEY WORDS: attention deficit and hyperactivity, attention deficit, hyperactivity, learning difficulties, lexicographical difficulties, executive functions, working memory, organization, planning, docimological tests, neuropsychological tests, psycho-pedagogical intervention program, study case.

The topic of the research and its relevance

Disorders such as attention deficit and hyperactivity disorder occur as frequently as they used to, but this issue didn't use to be raised and discussed as stringent as today.

The complex of manifestations specific to the attention deficit hyperactivity disorder occurs and develops in the context of mainstream school, and the psycho-pedagogical intervention depends, in any context, upon teacher's experience and knowledge horizon. In our opinion, it is obvious that attention deficit hyperactivity disorders represent a "specific category" of special educational needs.

Deficits in the sphere of attention deficit and hyperactivity disorder and other manifestations such as impulsivity or deficient executive functions expose students to the risk of poor school performance. Students with attention deficit and hyperactivity find it harder to assimilate organization, planning and time management skills in comparison with their peers who do not have such disorders. To what extent do these deficits affect school performance?

We find out the answer to this question by measuring the development level of the skills influencing school activity organization, for example students have to write down their homework, organize projects, organize their study time, maintain an optimum motivation, maintain their attention focused for some considerable time, adapt to different teachers, cope with a large volume of material and requirements.

Difficulties children with attention deficit hyperactivity disorder have in adapting to school can be reduced through structured and customized psycho-pedagogical intervention programs. Psycho-pedagogical literature on intervention programs for manifestations specific to attention deficit and hyperactivity disorders belongs, in our opinion, to the exploration (observation) and parceling formative-ameliorative interventions type.

School environment is a context that requires planning, control, coordination and evaluation of the interaction and of the ways of active participation in the educative-

instruction process. In consequence, school is an appropriate environment to exercise self-control (Miranda et al., 2006). At the same time, school represents a challenge for children with disorders from the attention deficit and hyperactivity disorder spectrum, this disorder being usually diagnosed when going to school, that is after the age of seven, precisely because of the accentuation of symptoms as a consequence of the increase in requirements concerning attention, school work organization and other responsibilities.

Psycho-pedagogical interventions in school can benefit from various techniques such as behavior reinforcement and behavior reduction strategies or combined behavioral and cognitive techniques with focus on organizational strategies, social skills and independent work skills (Miranda et al., 2006).

Combined intervention techniques is an option also recommended by the American Academy of Pediatricians that introduces the concept of educational and behavioral intervention (Campbell & Cohen, 1990, quoted by Reiber &Mc Laughlin, 2004).

Psycho-pedagogical intervention can and sometimes must be associated with medical intervention, respectively drug treatment. Experience shows that drug treatment does not resolve difficulties by itself. Even after its commencement, organizational skills have to be formed. Medications only prepare the body for proper functioning, but do not equip it with the necessary skills.

This research aims to approach the issue of association between school difficulties, primary manifestations in attention deficit and hyperactivity disorder and those of executive functioning, with implications for psycho-pedagogical intervention.

This paper consists of two parts: the first part establishes in two chapters, general and particular aspects related to attention deficit and hyperactivity disorder, and the second part illustrates in three chapters learning difficulties specific to students with attention deficit hyperactivity disorder.

Chapter I. Attention deficit and hyperactivity – Overview

Any deficit that belongs to a specific area of behavior has different manifestations throughout development. Identifying the existing problems as well as the level of development at that time has a special importance in establishing the predictions concerning problem's effects. Cognitive deficits acting for a long period of time without any interference, or those existing in an inadequate environment, can have repercussions in a variety of functioning fields.

The most common disorders that may occur in childhood are hyperkinetic and oppositional behaviors. The main features of these disorders relate to three areas: attention

deficit, hyperactivity and impulsivity, manifestations that are more frequent and more intense in the case of these children than in the case of other children of the same age.

The definition and diagnostic criteria for attention deficit and hyperactivity have undergone many changes over time due to changes in the conceptualization of this disorder, but the foundation is represented by a persistent pattern of inattention and / or hyperactivity-impulsivity.

It is considered that the etiology of the attention deficit and hyperactivity disorder is conditioned by several factors, combining neurological, genetic and psychosocial factors. The precise cause of the attention deficit and hyperactivity disorder remains unknown because of the disease's heterogeneity, so it is unlikely to find a single etiology that can be applied well in all cases.

The hyperactivity / attention deficit (DSM - IV - TR, Romila coord., 2003) is a disorder that occurs in various cultures, and the differences in the use of the concept originate probably more from the different diagnostic practices than from differences in clinical presentation.

Chapter II. The system of cognitive and socio-emotional resources in children with attention deficit hyperactivity disorder

More and more studies confirm the delayed cognitive processes in children with attention deficit and hyperactivity, processes preceding the decision to organize an answer and respond to a stimulus. There are involved many aspects of brain's function, given the wide range of cognitive functions.

Attention is used both in behavior and in thinking. Lack of efficiency in task solving is the main feature of the child with attention deficit hyperactivity, inefficiency that can be caused or not by attention dysfunctions.

Executive functions refer to the wide variety of functions that activate, organize, integrate and manage other functions and include controlled thinking, self-monitoring and self-evaluation, planning, succession and organization. For most children with attention disorders and hyperactivity, executive functions are the most compromised of the three systems (attention, executive functions, working memory).

Working memory is where information that can be retained for a short period of time is stored and processed and is also the mechanism for transferring information into long-term memory and recalling it.

The shortcomings of the working memory also contribute to a poor reading comprehension, especially in the case of long and complex sentences or in the case of poor fluency.

Emotion / affect can influence attention's wide range of functions in ways that damage and / or improve cognitive functioning. Also, deficiencies in child's ability to regulate motor and mental activities may be the result of growing in an environment where the basic requirements regarding physical and mental comfort are constantly unfavorable.

Studies indicate that the association between attention deficit / hyperactivity disorder and learning difficulties results in poor school performance. However, this relationship has to be studied in detail to see if there is a particular association between primary manifestations of the attention deficit and hyperactivity and specific learning difficulties. This research begins with an ascertaining phase in which this association analyzed, achieving the transition to the part of the paper referring to the experimental study on students with learning disabilities and attention deficit hyperactivity. The results of this ascertaining study represent a preamble to the literature describing learning difficulties in the case of students with attention deficit and hyperactivity disorder.

Chapter III. Learning difficulties in the case of students with attention deficit and hyperactivity disorder (ADHD)

People with learning difficulties have this problem their entire life. Learning difficulties can be overcome if the affected person develops strategies to deal with them. For example, many students with learning difficulties have developed indifference in order to divert attention from their inability to fulfill school tasks. It is possible that their learning difficulty might also have affected also their growth in what concerns physical coordination and emotional development; they may be unable to detect subtleties that allow people to respond appropriately to social situations, and therefore they might present socially unacceptable behavior. Some people are under constant stress and tension due to learning difficulties, fact that can trigger physical symptoms and inhibit the ability to learn.

What differentiates students with attention deficit and hyperactivity from those with normal development is the frequency and intensity of behavioral disturbances, the predominant elements in the young student being the restlessness and excessive anxiety. Inattention and impulsivity can contribute to inadequate resolution of the assigned tasks and instructions or to negligent execution of the assigned activity.

There have been many debates on the relationship between attention deficits and specific learning disorders, but there is conclusive evidence of significantly high rates of

specific learning disorders (difficulties in reading, mathematics or written expression) among people diagnosed with attention deficit (Cantwell and Baker, 1991).

Literature regarding hyperactivity and reading difficulties provides several works indicating possible ways in which these can be associated, including behavioral disorders as an important mediator. Stevenson (1996) developed a model that summarizes the possible relationships between behavioral disorders, learning difficulties and hyperactivity. Particular attention was given to studies that have contrasted the association between hyperactivity, conduct disorder and reading problems in the same data set. This is a desirable situation, if there are identified the associated characteristics, for each trajectory being established the influences involved.

Chapter IV. Research coordinates

Given the theoretical premises on attention deficit and hyperactivity associated with learning difficulties, the following general hypothesis was formulated for this research:

Consistent application in the case of students with attention deficit and hyperactivity disorder (grades II-IV) of a psycho-pedagogical intervention program structured on organization, self-organization components, general and specific character components for reading and writing activities, in relation to executive functions' specific profile contribute to efficient learning.

This hypothesis imposed centering the experimental investigation on three coordinates described in the following hypotheses:

1. The types of attention deficit and hyperactivity are associated differently with specific learning difficulties in the area of reading and writing.
2. The profile of the executive functions correlate differently with school performance in reading and writing tasks.
3. Developing and practicing the organization skills, self-organization skills and skills specific to reading and writing, support significantly the process of eliminating reading and writing difficulties.

To test the formulated hypotheses, several objectives were taken into account:

O1. Describing the specific of the executive functions for students' with attention deficit hyperactivity disorder manifestations.

O2. Studying the relationships between executive functions and learning difficulties in children with attention deficit and hyperactivity.

O3. Developing and investigating the psycho-pedagogical intervention program based on the "organizational skills development techniques for students with attention deficit and

hyperactivity" component. This set of techniques was developed in order to be implemented by the classroom teacher in the context of *Language and communication* curriculum area.

O4. Developing and investigating the efficiency of the psycho-pedagogical intervention program based on the "development techniques for the organizational skills associated with self-organization skills, in customized manners for learning difficulties (reading and writing)" component.

Consequently, the psycho-pedagogical intervention program is a composite one. It combines two components: development techniques of the organizational skills in students with attention deficit and hyperactivity and development techniques of the organizational skills associated with self-organizational skills, in customized manners for learning difficulties.

The independent variable of the research was the psycho-pedagogical intervention program.

The dependent variables of interest in the research were represented by:

- ✓ variables regarding school performance: reading fluency, reading comprehension, written expression;
- ✓ variables regarding executive functioning: graphic and motor organization and visuospatial skills, planning and visuospatial memory; planning, monitoring, self-regulation and problem solving skills.

There were also categorical variables: the class in which the student with attention deficit hyperactivity disorder associated with learning difficulties was enrolled, drug therapy these students benefit from or not, the type of attention deficit and hyperactivity.

In the final part of the research was introduced a new categorical variable: the medical diagnosis of attention deficit and hyperactivity.

The research was carried out in several stages.

The first stage of the research was an observational one and aimed to identify learning difficulties in students with attention deficit and hyperactivity. In this stage were used pedagogical evaluation tools and a student behavior evaluation scale, in the last six months of educational activity. This scale was designed taking into account behavioral indicators specified in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, Text Revision (Romila, 2003).

In this stage were involved 55 students with attention deficit hyperactivity disorder, enrolled in the 2nd, 3rd and 4th grade, in the mainstream education system.

In the first stage was also applied and standardized the test that assesses reading fluency, l'Alouette (Skylark) Test. It was tested on 237 students from the 2nd, 3rd and 4th grade in mainstream education.

The first phase lasted from March to June in the 2010-2011 school year, while the other stages were to take place in the school year 2011-2012.

The second stage consisted in emphasizing the existence of deficiencies in the executive functioning in children with attention deficit and hyperactivity disorder and the methods of association with learning difficulties.

From this stage, the group of participants involved in the research consisted of 42 students with attention deficit and hyperactivity associated with reading and writing difficulties. There were also evaluated reading and writing skills (with l'Alouette test that measures reading fluency, a reading comprehension test and image composition test) and the executive functioning, with neuropsychological tests (Rey complex figure and Tower subtest of Nepsy test battery). These samples used for evaluating reading and writing skills and the executive functioning, will be used as well in other stages in order to re-evaluate students with attention deficit and hyperactivity associated with learning difficulties.

In the **third stage** have been elaborated by the PhD student: the psycho-pedagogical intervention program structured on two components, organization, self-organization with general character and specific to reading and writing difficulties, in customized manners and the materials needed to implement the program.

The fourth stage consisted in the implementation of the first component of the psycho-pedagogical intervention program "development techniques of the organizational skills in students with attention deficit and hyperactivity", intervention that was conducted over a period of 8 weeks.

The fifth step consisted in evaluating the effectiveness of the intervention program applied in the previous stage. This was achieved by reapplying the tests used in the second stage: L'Alouette test, reading comprehension tests and image composition, as well as neuropsychological tests (Rey Complex Figure test and Tower subtests of Nepsy test battery). At this stage, reading comprehension and image composition tests were similar to those in the second stage, respecting the structure and rules of composition.

In the sixth stage the program implementation continued with the component “development techniques for the organizational and self-organizational skills, in customized ways, specific to learning difficulties (reading and writing)”. At this stage was continued the

work with the organizational skills formed the third stage. It was developed over a period of 16 weeks.

A seventh stage consisted in the evaluation of the combined intervention program. In this stage were used: L'Alouette test and tests for reading comprehension and image composition, as well as neuropsychological tests (Rey Complex Figure and Tower subtest from Nepsy test battery).

At this stage, reading comprehension tests and image composition were identical in structure and composition to those used in the second stage.

The research was conducted during the 2010-2011 and 2011-2012 school years, on a sample of 55 students with attention deficit and hyperactivity, diagnosed by school psychologists in several educational institutions in Tirgu Mures. In this sample, 52 pupils had learning difficulties, and the pedagogical intervention program was implemented in the case of 42 students with attention deficit and hyperactivity disorder - inattentive, hyperactive / impulsive and combined types, integrated into mainstream education.

Previously, verbal agreement was required from these students and from the classroom teacher and written consent was required from the parents of students with attention deficit and hyperactivity and learning difficulties involved in research. Written agreement was obtained in the case of 42 students, out of which 31 were diagnosed with attention deficit and hyperactivity, and 11 presented the specific manifestations of attention deficit and hyperactivity.

Students taking part in this research were enrolled the 2nd, 3rd and 4th grades in several schools in Tirgu Mures. Since the manifestation of learning difficulties (dyslexia-dysgraphia phenomena) has a constant character, the diagnosis is set at the end of the first year of schooling.

The methodology of this study is a composite one and includes docimological, neuropsychological tests and a behavioral assessment scale.

The first step consisted in the application of the ***Behavioral rating scale of students with attention deficit and hyperactivity***, a scale built taking into account behavioral indicators specified in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, Text Revision (Romila, 2003). This was a task for the class teacher in order to confirm / infirm the presence of the characteristic symptoms in these students. The scale includes specific manifestations to different types of attention deficit and hyperactivity disorder: inattention, hyperactivity / impulsivity and combined, indicating the frequency of each manifestation (never, sometimes, often, always). Texts for dictation were compiled in

order to meet the phonetic and lexical requirements specific to Romanian language. The task began with the dictation of words and isolated sentences then continued with a text consisting of sentences with words made up of various combinations of consonants, groups of letters, diphthongs, etc. When elaborating this task it was taken into account students' ability to focus attention at that age. Another task was ***listening comprehension***, which consisted of writing down some ideas from a text presented orally. The text was new to students, adequate for their age and it was played twice. This test's purpose was to verify the spontaneous transposition of oral language into written language, after organizing and planning ideas from the text heard.

Reading a text at first sight (text from a book of stories) was another test used to identify learning difficulties. It consisted of a visual-auditory task that involves reaching comprehension through symbols: letters and words. The target here was reading fluency and reading comprehension, aspect evaluated by oral expression.

In the case of students with attention deficit and hyperactivity disorder, diagnosed with learning difficulties, the next step consisted in applying evaluating tasks of school performance: l'Alouette (Skylark) test, reading comprehension test, image composition. Then came the turn of neuropsychological tests: Rey Complex Figure (copy and recall) and Tower subtest (from Nepsy test battery).

L'Alouette (Skylark) test was applied, a test that gives indications about the performance when reading aloud an unknown text, about reading fluency.

Reading comprehension test is an informational tool concerning reading comprehension. This test aims to highlight the ability of students with attention deficit and hyperactivity to read and understand a text.

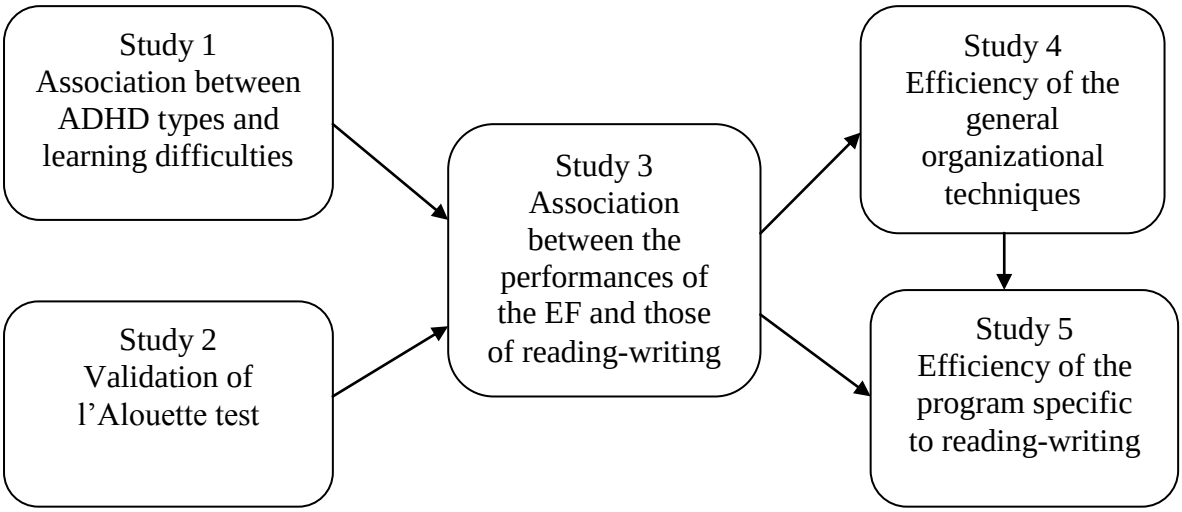
Image composition (card elaborated by the PhD student, Appendix 8) is another assessment tool. The ability to express ideas in writing, inspired by images is one of the activities with the best results in terms of evaluating speech development, fluency, the capacity to organize, plan and formulate correct sentences, understanding the details that have attracted attention. The analyzed items are presented in the scoring table (elaborated by the PhD student, Appendix 9).

Rey Complex Figure Test (Kulcsar, 1980) is designed to test deficient planning and organization in students with attention deficit and hyperactivity. The figure in this task is a complex geometric route, which brings together several properties: the absence of an obvious significance, easy graphic design and a rather complicated ensemble structure, in order to ask for a perceptive, analytical and organizational activity. This task consists in copying and then

recalling a complex figure. Copying the Rey complex figure shows student's graphic and motor organization capacity and his visual and spatial abilities, as this reproduction can be achieved only if there is a certain organization, significance and report determined by the knowledge stored in memory.

Tower Subtest (Nepsy test battery, Korkman, M., Kirk, U., Kemp, S., 2005) can be used by the experimenter, only if a certificate is held. It assesses the executive functions of planning, monitoring, self-regulation and problem solving. The child must take into account respecting some rules under time constraints. The target area is attention / executive functions -central elements in the neuropsychological assessment from Nepsy tests battery.

Figure IV.1. General structure of the research



In the first study, which is an exploratory, respectively ascertaining study, was highlighted the association between the types of attention deficit and hyperactivity and learning difficulties. Many studies have shown that there are students with attention deficit and hyperactivity, who have learning difficulties with a specific role in academic failure. Learning disabilities in students with and attention deficit and hyperactivity disorder, according to the literature, occur mainly in reading tasks (Stevenson, 1996).

Nowadays, in Romania, we are facing penury in what concerns instruments assessing reading fluency. Thus, it was necessary to build and validate such an instrument. The starting point was a known instrument, the test l'Alouette (Skylark) for obvious reasons: the need to assess reading fluency on units larger than the word, but in situations reducing the effect of context decoding.

After consulting some experts, specialists in special psycho-pedagogy from the University "Babes-Bolyai" of Cluj Napoca, the validation of an instrument that assesses reading fluency was achieved. So, the 2nd study consisted in the validation of l'Alouette test (Skylark).

Study no. 3 was carried out through neuropsychological tests targeting executive functions from the EF spectrum (Executive Control Functions) and there was highlighted the association between performances in executive functioning and performances in reading and writing tasks. Various studies have shown that learning difficulties are neuropsychological disorders caused by specific processing problems. An eloquent example would be dyslexia, which may be the consequence of deficits in phonological processing, due to attention difficulties.

Studies no. 4 and 5 have investigated the effectiveness of the intervention program on the two components: organization, self-organization with general and specific character, for learning difficulties (reading and writing).

The study on the association between the types of attention deficit and hyperactivity disorder (ADHD) and learning difficulties was an ascertaining study of the frequency of learning difficulties depending on the type of attention deficit and hyperactivity, correlational between the type of attention deficit and hyperactivity disorder (ADHD) and the frequency of specific learning difficulties.

Validation study of l'Alouette test (Skylark), a test assessing reading automaticity, was adapted from l'Alouette test for Romanian language; the text was elaborated in Romanian by the PhD student, validated and standardized for the school population in our country.

The study on the association between the performances of the executive functions (EF) and lexicographical performance was another study that established the correlation between the executive functioning profile, highlighted by neuropsychological tests, with school performance in reading and writing tasks.

The study on the efficiency of the psycho-pedagogical intervention program structured on organizational components with general character was an experimental study.

For the entire psycho-pedagogical intervention program (organizational component with general character and organizational, self-organizational component with a character specific to learning difficulties) an experimental within-subjects approach.

In this study was applied the first part of the psycho-pedagogical intervention program, a program structured on organizational components of general character. The

intervention program was conducted over a period of 8 weeks and was implemented by the teacher in the classroom, in the case of students with attention deficit and hyperactivity disorder, with associated learning difficulties.

This study established the effectiveness of the first part of the psycho-pedagogical intervention program using the techniques of organization, self-organization of general character.

The study on the efficiency of the psycho-pedagogical intervention program, structured on components specific to reading and writing was a continuation of the experimental study.

It was applied the second part of the psycho-pedagogical intervention program, program 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 and hyperactivity disorder and learning difficulties.

After completing the entire program of psycho-pedagogical intervention, students were assessed again using the instruments targeting reading and writing (l'Alouette test, reading comprehension and image composition) and neuropsychological tests: Rey - Complex Figure (copy - recall) and Tower subtest (Nepsy) establishing its efficiency.

Additional study regarding the efficiency of the psycho-pedagogical intervention program in the case of students diagnosed with attention deficit and hyperactivity.

Students with attention deficit and hyperactivity, which benefited from psycho-pedagogical intervention with the consent of their parents and did not have a medical diagnosis, were referred to the specialist in order to confirm / infirm the diagnosis of attention deficit hyperactivity disorder.

A total of 31 students already had a medical diagnosis, 29 of them were under medication.

Because until the end of the intervention the number of students medically diagnosed with attention deficit and hyperactivity did not change (for various reasons), an additional study was conducted only on these students, in order to confirm / infirm the effectiveness of the psycho-pedagogical intervention program.

There was realized an analysis of the learning difficulties in children with attention deficit and hyperactivity who did not benefit from the psycho-pedagogical intervention program because their parents didn’t give their consent for the implementation of the program. The pupils whose learning difficulties were detected at the beginning of the research

(the end of the 2011 school year) were given again, at the end of the 2012 school year, the dictation test and the task of reading a text at first sight.

The case study was used to illustrate the effectiveness of the intervention program for a student with attention deficit hyperactivity disorder and learning disabilities.

Chapter V. Presentation, analysis and interpretation of data

V.1. Study on the association between the types of attention deficit hyperactivity disorder and learning difficulties.

In the present study, with the help of the pedagogical tasks, was made an assessment of the difficulties in the sphere of reading and writing faced by students with attention deficit and hyperactivity disorder - combined type, predominantly inattentive type, and predominantly hyperactive type.

Results revealed the presence of learning difficulties, especially in the dictation test in the case of all types of attention deficit and hyperactivity; in the listening comprehension test, in the case of the attention deficit and hyperactivity disorder predominantly inattentive type; and in reading test for the combined type and the predominantly hyperactive type.

The most frequent difficulties, present in all types of attention deficit and hyperactivity were grapheme substitutions, graphemes and syllables omissions, disortography and graphemes and / or syllables addition.

Phonological processing disorders, disorders of the working memory, of the attention that cannot be focused and maintained on a tasks due to disruptive agents, are causes of the difficulties mentioned above.

The difficulties in identifying and organizing the main ideas of the text heard were present in all types of attention deficit and hyperactivity, the inability to maintain attention until the end of the text they had to listen making its mark.

Slow reading characterizes especially students with attention deficit and hyperactivity disorder combined type, but the other two types as well: predominantly inattentive and predominantly hyperactive. Thus, there were presented more frequently the substitutions, the grapheme / phoneme omissions, especially in the combined and inattentive type, while in the hyperactive type were frequent the substitutions and word pronunciation alteration.

Comparing the differences between the frequencies for the associations obtained through the Crosstabs procedure, using Chi-Square Tests, it can be noticed that the differences are not statistically significant for the three types of attention deficit hyperactivity disorder: combined, inattentive, hyperactive / impulsive.

Table V.2. X^2 values for the comparison of frequencies

ADHD type		Value	df	Asymp. Sig. (2-sided)
combined	Pearson Chi-Square	,683[a]	6	,995
	Likelihood Ratio	,680	6	,995
	N of Valid Cases	75		
hyperactive	Pearson Chi-Square	,000[b]	2	1,000
	Likelihood Ratio	,000	2	1,000
	N of Valid Cases	12		
inattentive	Pearson Chi-Square	,475[c]	3	,924
	Likelihood Ratio	,488	3	,922
	N of Valid Cases	35		

a. 4 cells (33,3%) have expected count less than 5. The minimum expected count is 3,73.
b. 6 cells (100,0%) have expected count less than 5. The minimum expected count is 2,00.
c. 5 cells (62,5%) have expected count less than 5. The minimum expected count is 2,06.

Thus, the first hypothesis according to which the types of attention deficit and hyperactivity are associated differently with specific learning difficulties in reading and writing sphere are not confirmed.

According to this conclusion, in the development of the psycho-pedagogical intervention program, it was not taken into account the type of attention deficit and hyperactivity disorder, the difficulties in the area of reading and writing being found equally in children with attention deficit and hyperactivity disorder, regardless of their type.

V.2. Validation study of l'Alouette (Skylark) test

The fidelity of l'Alouette test was satisfactory, given the coefficient of internal consistency (Cronbach's alpha) of 0.79, so the value of the alpha coefficient is above 0.70.

The relative validity, to the criterion, allowed the analysis of the concordance degree between the inferences made on the basis of test scores and those based on a criterion test (Albu, 1998). For the Romanian language version of the test l'Alouette, it was examined the extent to which test scores estimate the positions currently occupied by participants based on the scores from a reading automaticity test, that is the Three Minutes Test. Reporting to the criteria given in the literature (Stan, 2002), we can say that the value of the obtained validity is high, indicating a good validity of l'Alouette test.

Given the achieved standardization, it was possible to use l'Alouette test for assessing the level of reading automaticity in students with attention deficit and hyperactivity involved in this research.

V.3. Study regarding the association between performances in evaluating the executive functions (EF) and lexicographical performances

Since the deficits of the executive function increase the risk of learning difficulties, a survey was conducted in order to establish the correlations between the profile of executive functioning and the performance profile, in terms of reading and writing.

In this study, we analyzed the correlation between the variables of interest in the research, concerning the executive functioning (graphical and motor organization, visuospatial memory and planning; skills of planning, monitoring, self-regulation and problem solving, strategy elaboration) and those concerning school performance (reading automaticity, reading comprehension, written expression skills).

Thus, there was found a positive correlation between the variables of school performance (reading comprehension) and the neuropsychological variables (perceptual visuospatial and organization skills, $r = 0.48$, $p < 0.01$; skills of planning, monitoring, self-regulating and problem solving, $r = 0.32$, $p < 0.05$), while the variables of interest concerning school performance (reading automaticity, written expression skills) do not correlate with the neuropsychological variables (perceptual visuospatial and organizational skills, visuospatial memory and planning; skills of planning, monitoring, self-regulation and problem solving).

Table V.17. Correlation matrix between the six variables in pretest

	Rey-copy 1	Rey-recall1	Tower1	l'Alouette1	Reading comprehension 1	Image composition1
Rey- copy	-	,657**	,654**	-,040	,480**	,251
Rey-recall 1	,657**	-	,585**	,058	,276	,136
Tower1	,654**	,585**	-	-,132	,329*	,134
l'Alouette1	-,040	,058	-,132	-	,444**	,457**
Reading comprehension1	,480**	,276	,329*	,444**	-	,616**
Image composition1	,251	,136	,134	,457**	,616**	-

**. p< 0.01

*. p< 0.05

L'Alouette test aims the reading automaticity of meaningless sentences made up of mixed words, and the difficulties appeared in this situation are given by deficient phonological processing, characteristic for students with attention deficit and hyperactivity, but also by the difficulties in focusing and maintaining attention on the task.

Image composition, a test that verifies the ability to express in written, is poor, primarily because of the poor vocabulary of students involved in the study and because of the difficulties in organizing ideas for writing. Although literature shows that writing tasks engage the executive functioning skills, the results of this study indicate a statistically insignificant association. This result could be explained by the fact that a task such as image composition is generally difficult for this age group. The introduction of some cognitive organizers would facilitate the accomplishment of this task.

Table V.18. Correlation matrix between the 6 variables in children with ADHD from the 2nd, 3rd and 4th grades – in pretest

Grade		Rey-copy1	Rey-recall1	Tower1	l'Alouette 1	Reading comprehension 1	Image composition1
2nd	Rey-copy1	-	,526	,436	-,110	,196	,493
	Rey-recall1	,526	-	,326	-,286	-,200	,416
	Tower1	,436	,326	-	-,465	-,170	-,228
	l'Alouette1	-,110	-,286	-,465	-	,588*	,427
	Reading comprehension1	,196	-,200	-,170	,588*	-	,228
	Image composition1	,493	,416	-,228	,427	,228	-
3rd	Rey-copy1	-	,722**	,818**	-,010	,782**	,397
	Rey-recall1	,722**	-	,682**	,214	,664**	,273
	Tower1	,818**	,682**	-	,082	,794**	,339
	l'Alouette1	-,010	,214	,082	-	-,089	-,009
	Reading comprehension1	,782**	,664**	,794**	-,089	-	,556*
	Image composition1	,397	,273	,339	-,009	,556*	-
4th	Rey-copy1	-	,485	,704*	-,034	,320	,113
	Rey-recall1	,485	-	,542	,250	-,006	,035
	Tower1	,704*	,542	-	,297	,564	,496
	l'Alouette1	-,034	,250	,297	-	,564	,651*
	Reading comprehension1	,320	-,006	,564	,564	-	,935**
	Image composition1	,113	,035	,496	,651*	,935**	-

**. p< 0.01

*. p< 0.05

School performance is positively correlated with neuropsychological test results especially in the 3rd grade, in the majority of students, where the variable reading comprehension correlates strongly with the results on all three neuropsychological tests (r = 0.78, p <0.01 - graphic-motor organization, r = 0.66, p <0.01 - visuospatial memory and planning, r = 0.79, p <0.01 - skills of planning, monitoring, self regulation and problem solving). In the case of students with drug treatment, all school performances correlate to those obtained in neuropsychological tests.

It can be concluded that the executive functioning correlates differently with school performance, which confirms the second hypothesis concerning the fact that the profile of the executive functions correlates differently with academic performance in reading and writing tasks.

The elaboration of the psycho-pedagogical intervention program took into account this study, according to which deficits in the executive functioning are reflected differently in the sphere reading and writing, which is why it was necessary to customize the intervention in accordance with the learning difficulties encountered in the field of reading and writing.

V.4. Study on the effectiveness of the psycho-pedagogical intervention program structured on the organizational component with general character

In the present study, after applying the intervention program on the organizational component with general character (posttest partly), there are positive correlations between the variables of interest in research, concerning the graphical and motor organization and visuospatial abilities (Rey test - copy) and variables related to school performance: those concerning reading comprehension (reading comprehension, $r = 0.57$, $p < 0.01$) and written expression (image composition, $r = 0.54$, $p < 0.01$); positive correlation between variables concerning visuospatial memory and planning (Rey test - recall) and written expression (image composition, $r = 0.40$, $p < .01$).

In the second grade, the correlation was positive between the variables reading automaticity (L'Alouette test) and reading comprehension (reading comprehension, $r = 0.58$, $p < 0.05$) and between the variables: planning, monitoring, self-regulation and problem solving (Tower subtests) and reading comprehension (reading comprehension, $r = 0.63$, $p < 0.05$) and written expression (image composition, $r = 0.87$, $p < .01$).

In the 3rd and 4th grades, there are several correlations between the variables of interest in the research, obtained using neuropsychological tests and tests assessing school performance; in the 3rd grade, correlations were very strong, between variables concerning visual and spatial perceptual skills and organizational skills , but also those of visuospatial memory and planning (Rey test – complex figure) and variables obtained with school tasks; between variables concerning planning, monitoring, self-regulation and problem solving (Tower subtests) and reading comprehension (Reading Comprehension, $r = 0.70$, $p < .01$). In the 4th grade there were strong correlations between variables concerning planning, monitoring, self-regulation and problem solving (Tower subtest) and those evaluating school performance ($r = 0.91$, $p < 0.01$ - reading comprehension, $r = 0.89$, $p < 0.01$ – picture composition) and between variables concerning reading comprehension (reading

comprehension) and visuospatial perceptual skills and organizational skills (Rey-copy) with Pearson coefficient r = 0.61, at a significance level p <0.05.

In what concerns the correlations of the assessments in the partial posttest (the organizing component of general character), when controlling the type of attention deficit and hyperactivity, it was observed that there were no improvements for the hyperactive type, neither in the partial posttest were there correlations between variables. In the inattentive type there were strong correlations between variables from the neuropsychological tests and those of the school 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, the number of subjects participating in the study was quite small (4 students), which may explain the lack of significant correlations.

Comparing the same variables of interest in the research, in all assessments, before the intervention (pretest) and partially post-intervention, based on the organizing component of general character, it was observed that there is a difference between results, in the sense of obtaining better results in all assessments from the partial posttest, compared to the scores obtained in pretest. The average of the results concerning the formation of the organizational and visuospatial perceptual skills (Rey test - copying) increased from 32,50 to 44,64; the ability to express ideas in writing (image composition) increased, the average of the results reaching 48,10 in the partial posttest.

Table V.25. Statistical indicators for the 6 pairs of variables, pretest - partial posttest

		Mean	Std. Deviation	Std. Error Mean
Pair 1	Rey – copy pretest	32,50	16,277	2,512
	Rey – copy partial posttest	44,64	16,018	2,472
Pair 2	Rey –recall pretest	31,79	17,030	2,628
	Rey – recall partial posttest	57,98	18,905	2,917
Pair 3	Reading comprehension pretest	36,31	15,423	2,380
	Reading comprehension partial posttest	45,24	17,248	2,661
Pair 4	Image composition pretest	33,81	14,348	2,214
	Image composition partial posttest	48,10	15,018	2,317
Pair 5	Tower pretest	5,02	1,220	,188
	Tower partial posttest	10,74	1,380	,213
Pair 6	l'Alouette pretest	32,76	12,048	1,859
	l'Alouette partial posttest	45,24	11,712	1,807

There are high correlations between the variables of each pair and these correlations are significant, for example Pearson r coefficients, the highest ($r = 0.84$, $p < 0.01$ for the variable concerning graphical-motor organizing and visuospatial skills - Rey-copy $r = 0.95$, $p < 0.01$ in the case of the variable concerning reading automaticity - L'Alouette test) show a major difference that occurred in children between the two measurements.

Best scores obtained by students in the partial posttest, are not due to random variations, but may be clearly assigned to the educational intervention performed between the two measurements.

Table V.27. *T* test (pretest - partial posttest)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Rey – copy 1 – Rey – copy 2	-12,143	8,913	1,375	-14,920	-9,365	-8,829	41	,000
Pair 2	Rey recall1 – Rey recall2	-26,190	14,091	2,174	-30,581	-21,800	-12,046	41	,000
Pair 3	Reading comprehension 1 – Reading comprehension 2	-8,929	10,033	1,548	-12,055	-5,802	-5,768	41	,000
Pair 4	Image composition 1- Image composition 2	-14,286	12,076	1,863	-18,049	-10,523	-7,667	41	,000
Pair 5	Tower 1 – Tower 2	-5,405	1,740	,268	-5,947	-4,863	-20,131	41	,000
Pair 6	l'Alouette1 –l'Alouette2	-12,476	3,704	,572	-13,630	-11,322	-21,830	41	,000

There are no differences concerning the categorical variable *grade*, in the case of improving students' school results. Results were better for most students, regardless of the grade they were enrolled in. In the case of students from the 3rd and 4th grades, there are statistically significant differences between pretest and partial posttest, at a significance level $p < 0.01$ for all variables. In the case of pupils from the 2nd grade, variables related to reading comprehension are an exception to this rule, but this is not statistically significant, probably because in this period prevails reading strengthening and poor attentional resources cannot yet process the text read.

Table V.28. *T* test in students with ADHD in 2nd, 3rd and 4th grades (pretest - partial posttest)

Grade			Paired Differences					t	Df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
2nd	Pair 1	Rey copy 1- Rey copy 2	-10,385	12,326	3,419	-17,833	-2,936	-3,038	12	,010
	Pair 2	Rey recall1 – Rey recall2	-30,000	14,720	4,082	-38,895	-21,105	-7,348	12	,000
	Pair 3	Tower 1 – Tower 2	-4,308	1,974	,548	-5,501	-3,115	-7,867	12	,000
	Pair 4	l'Alouette1 – l'Alouette2	-12,385	4,482	1,243	-15,093	-9,676	-9,962	12	,000
	Pair 5	Reading comprehension 1 – Reading comprehension 2	-5,385	12,494	3,465	-12,934	2,165	-1,554	12	,146
	Pair 6	Image composition 1- Image composition 2	-10,769	11,875	3,294	-17,945	-3,593	-3,270	12	,007
3rd	Pair 1	Rey copy 1- Rey copy 2	-13,235	7,694	1,866	-17,191	-9,280	-7,093	16	,000
	Pair 2	Rey recall1 – Rey recall2	-22,647	13,477	3,269	-29,576	-15,718	-6,929	16	,000
	Pair 3	Tower 1 – Tower 2	-5,471	1,375	,333	-6,177	-4,764	-16,408	16	,000
	Pair 4	l'Alouette1 – l'Alouette2	-13,647	3,297	,800	-15,342	-11,952	-17,069	16	,000
	Pair 5	Reading comprehension 1 – Reading comprehension 2	-10,294	8,191	1,987	-14,506	-6,083	-5,182	16	,000
	Pair 6	Image composition 1- Image composition 2	-18,235	12,862	3,120	-24,849	-11,622	-5,845	16	,000
4th	Pair 1	Rey copy 1- Rey copy 2	-12,500	6,216	1,794	-16,449	-8,551	-6,966	11	,000
	Pair 2	Rey recall 1– Rey recall2	-27,083	14,216	4,104	-36,115	-18,051	-6,600	11	,000
	Pair 3	Tower 1 – Tower 2	-6,500	1,243	,359	-7,290	-5,710	-18,112	11	,000
	Pair 4	l'Alouette1 – l'Alouette2	-10,917	2,937	,848	-12,783	-9,050	-12,874	11	,000
	Pair 5	Reading comprehension 1 – Reading comprehension 2	-10,833	9,252	2,671	-16,712	-4,955	-4,056	11	,002
	Pair 6	Image composition – Image composition2	-12,500	10,335	2,984	-19,067	-5,933	-4,190	11	,002

Results improved significantly both in students who received drug treatment and those who did not receive drug treatment, this condition not causing differences in the results of the partial posttest in the neuropsychological tests and in those of school performance. All differences are statistically significant at a significance level $p < 0.01$.

Table V.29. *T* test in students with and without drug treatment (pretest - partial posttest)

Treatment			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
With treatment	Pair 1	Rey copy 1- Rey copy 2	-12,321	7,635	1,443	-15,282	-9,361	-8,539	27	,000
	Pair 2	Rey recall – Rey recall2	-26,786	12,997	2,456	-31,825	-21,746	-10,906	27	,000
	Pair 3	Tower 1 – Tower 2	-5,286	2,016	,381	-6,067	-4,504	-13,875	27	,000
	Pair 4	l'Alouette – l'Alouette2	-12,536	3,766	,712	-13,996	-11,075	-17,613	27	,000
	Pair 5	Reading comprehension1– Reading comprehension 2	-9,464	10,483	1,981	-13,529	-5,400	-4,777	27	,000
	Pair 6	Image composition1- Image composition 2	-15,179	12,873	2,433	-20,170	-10,187	-6,239	27	,000
Without treatment	Pair 1	Rey copy 1- Rey copy 2	-11,786	11,369	3,039	-18,350	-5,221	-3,879	13	,002
	Pair 2	Rey recall – Rey recall2	-25,000	16,525	4,417	-34,541	-15,459	-5,661	13	,000
	Pair 3	Tower 1 – Tower 2	-5,643	1,008	,269	-6,225	-5,061	-20,942	13	,000
	Pair 4	l'Alouette – l'Alouette2	-12,357	3,713	,992	-14,501	-10,213	-12,453	13	,000
	Pair 5	Reading comprehension1– Reading comprehension 2	-7,857	9,347	2,498	-13,254	-2,460	-3,145	13	,008
	Pair 6	Image composition1- Image composition 2	-12,500	10,516	2,810	-18,572	-6,428	-4,448	13	,001

In the case of hyperactive students, there are some variables that register improvements between the pretest and the partial posttest, but these improvements are not significant because of the small number of subjects. Based on *t* values, a statistically significant difference can be noticed between the performance of the group with attention deficit and hyperactivity disorder in pretest and partial posttest, which indicates a change in the performance of executive functions after the implementation of the intervention program based on the organizational techniques. There were significant improvements in reading automaticity, but not in reading comprehension or written expression.

In students with attention deficit hyperactivity disorder predominantly inattentive and combined type, implementing the first component of the psycho-pedagogical intervention program was effective, in the sense of performance improvement between pretest and posttest in what concerns organizational component of general character (differences were significant at a significance level $p < .01$).

V.5. Study on the efficiency of the psycho-pedagogical intervention program, structured on components specific to reading and writing

In the final posttest, after the implementation of the entire psycho-pedagogical intervention program on the two components: organization, self-organization of a general and specific character for reading and writing activities, significant positive correlations were obtained between the variables concerning graphical-motor organization and visuospatial skills and all variables concerning school performance (reading automaticity, $r = 0.70$, $p < 0.01$; reading comprehension, $r = 0.69$, $p < 0.01$ and written expression, $r = 0.70$, $p < 0.01$); between the variables concerning visuospatial memory and planning and school performance variables (reading automaticity, $r = 0.67$, $p < 0.01$; reading comprehension, $r = 0.72$, $p < 0.01$ and written expression, $r = 0.69$, $p < 0.01$); the situation is similar in the correlation of variables concerning skills of planning, monitoring, self regulation and problem solving and all variables of school performance (reading automaticity, $r = 0.66$, $p < 0.01$; reading comprehension, $r = 0.68$, $p < 0.01$ and written expression, $r = 0 , 72$, $p < 0.01$).

Correlations were accentuated, compared to the situation from the partial posttest, focused on the organizational component of general character, which confirms that there were positive changes in student performance.

In the case of students from the 2nd grade, there were positive correlations between the visuospatial perceptual and organizational skills (Rey-copy) and reading automaticity (l'Alouette test, $r = 0.65$, $p < 0.05$), reading comprehension (reading comprehension, $r = 0.60$, $p < 0.05$) and written expression (image composition $r = 0.60$, $p < 0.05$); also between planning, visuospatial memory (Rey-recall) and reading automaticity (l'Alouette test, $r = 0.57$, $p < 0.05$), reading comprehension (reading comprehension, $r = 0.70$, $p < 0.01$) and written expression (composition by image $r = 0.71$, $p < .01$).

In the 3rd grade, the significant positive correlations, at a significance level $p < 0.01$, were present in all variables concerning school performance. This was the grade with the highest performance in terms of results correlation.

In the 4th grade, there were significant correlations:

- ✓ at a significance level $p < 0.01$: between visual and spatial perception and organizational skills and all variables concerning school performance (reading automaticity, $r = 0.81$; reading comprehension, $r = 0,79$ and written expression, $r = 0.72$); between the variables concerning planning, visual and spatial memory and reading automaticity, $r = 0.75$ and between the skills of planning, monitoring, self

regulation and problem solving and reading automaticity, r = 0,84, a reading comprehension, r = 0,71 and written expression r = 0.76.

- ✓ at a significance level p <0.05: between planning and visuospatial memory and reading comprehension, r = 0.62 and written expression, r = 0,64. Thus, improvements were shown in each class.

In what children with attention deficit and hyperactivity disorder following drug treatment are concerned, correlations were significant between all variables of interest for the research (neuropsychological tests and tasks assessing school performance) but at a significance level p <0.05; in the case of those not benefiting from medication there were improvements, but not for all the variables.

When controlling the type of attention deficit and hyperactivity there were observed improvements in all types, but the strongest correlations were met at a significance level of 0.000, in all variables, in students with attention deficit and hyperactivity disorder – the combined type.

We drew a comparison between the variables of interest in the research, in the assessments at the end of the psycho-pedagogical intervention program (final post-intervention) and the initial results (pretest) and those realized after the implementation of the first part of the program, based on the organizational component of general character (partial post-intervention). In both cases, the intervention brought about positive change in student performance, changes that accentuated in time, fact that indicates the effectiveness of the implemented intervention program.

Table V.37. *T* test (final posttest compared to partial posttest)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Rey copy 2 – Rey copy 3	-26,071	8,940	1,379	-28,857	-23,286	-18,900	41	,000
Pair 2	Rey recall 2 – Rey recall 3	-26,310	10,064	1,553	-29,446	-23,173	-16,941	41	,000
Pair 3	Tower 2 – Tower 3	-4,238	1,973	,304	-4,853	-3,623	-13,920	41	,000
Pair 4	l'Alouette 2 – l'Alouette 3	-32,381	14,303	2,207	-36,838	-27,924	-14,672	41	,000
Pair 5	Reading comprehension2 – Reading comprehension3	-31,190	14,220	2,194	-35,622	-26,759	-14,215	41	,000
Pair 6	Image composition2– Image composition3	-29,405	11,904	1,837	-33,114	-25,695	-16,008	41	,000

There were significant improvements in students' performance and the fact that there were registered better scores in both cases (partial post-intervention and final post-intervention) at a significance level of 0.000, shows that this is not due to random variation, but obviously to the implementation of the psycho-pedagogical intervention program with the two components: organization, self-organization with a general character and with a character specific to reading and writing activities.

Table V.42. *T*-test (final posttest compared to pretest)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Rey copy1 – Rey copy3	-38,214	13,785	2,127	-42,510	-33,919	-17,966	41	,000
Pair 2	Rey recall1 – Rey recall3	-52,500	13,936	2,150	-56,843	-48,157	-24,415	41	,000
Pair 3	Tower1 – Tower 3	-9,952	1,794	,277	-10,511	-9,393	-35,959	41	,000
Pair 4	l'Alouette1 - l'Alouette 3	-44,857	14,971	2,310	-49,522	-40,192	-19,418	41	,000
Pair 5	Reading comprehension1 – Reading comprehension3	-40,119	13,502	2,083	-44,327	-35,912	-19,257	41	,000
Pair 6	Image composition1 – Image composition3	-43,690	14,401	2,222	-48,178	-39,203	-19,662	41	,000

Taking into account the fact that the significance level is 0.000, for all pairs of variables of interest in the research, it can be concluded that higher scores obtained by students in the final posttest, are not due to random variation, but can be clearly attributed to the pedagogical intervention performed between the two measurements (pretest and final posttest).

Based on the *t* values, all differences between the means on each pair of variables in both interventions, show statistically significant improvements, regardless of the grade students were in.

Table V.38. *T* test for students with ADHD from the 2nd, the 3rd and the 4th grade (final posttest compared to partial posttest)

grade			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
2nd	Pair 1	Rey copy2 – Rey copy3	-24,231	8,623	2,392	-29,442	-19,020	-10,131	12	,000
	Pair 2	Rey recall2 – Rey recall3	-21,538	8,752	2,427	-26,827	-16,250	-8,873	12	,000
	Pair 3	Tower 2 – Tower 3	-3,538	1,613	,447	-4,513	-2,564	-7,908	12	,000
	Pair 4	l'Alouette 2 - l'Alouette 3	-34,077	12,984	3,601	-41,923	-26,231	-9,463	12	,000
	Pair 5	Reading comprehension2 – Reading comprehension3	-38,462	16,123	4,472	-48,204	-28,719	-8,601	12	,000
	Pair 6	Image composition2 – Image composition3	-31,154	14,599	4,049	-39,976	-22,332	-7,694	12	,000
3rd	Pair 1	Rey copy2 – Rey copy3	-24,412	8,993	2,181	-29,036	-19,788	-11,192	16	,000
	Pair 2	Rey recall2 – Rey recall3	-27,059	11,048	2,680	-32,739	-21,378	-10,098	16	,000
	Pair 3	Tower 2 – Tower 3	-4,765	2,078	,504	-5,833	-3,697	-9,456	16	,000
	Pair 4	l'Alouette 2 – l'Alouette 3	-33,529	15,472	3,753	-41,484	-25,574	-8,935	16	,000
	Pair 5	Reading comprehension2 – Reading comprehension3	-29,412	9,824	2,383	-34,463	-24,361	-12,344	16	,000
	Pair 6	Image composition2 – Image composition3	-30,588	8,993	2,181	-35,212	-25,964	-14,023	16	,000
4th	Pair 1	Rey copy2 – Rey copy3	-30,417	8,382	2,420	-35,743	-25,091	-12,570	11	,000
	Pair 2	Rey recall2 – Rey recall3	-30,417	8,382	2,420	-35,743	-25,091	-12,570	11	,000
	Pair 3	Tower 2 – Tower 3	-4,250	2,094	,605	-5,581	-2,919	-7,030	11	,000
	Pair 4	l'Alouette 2 – l'Alouette 3	-28,917	14,557	4,202	-38,166	-19,668	-6,881	11	,000
	Pair 5	Reading comprehension2 – Reading comprehension3	-25,833	15,201	4,388	-35,491	-16,175	-5,887	11	,000
	Pair 6	Image composition2 – Image composition3	-25,833	12,583	3,632	-33,828	-17,838	-7,112	11	,000

Tabel V.43. *T* test for students with ADHD from the 2nd, the 3rd and the 4th grade (final posttest compared to pretest)

Grade			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
2nd	Pair 1	Rey copy1 – Rey copy 3	-34,615	16,515	4,581	-44,596	-24,635	-7,557	12	,000
	Pair 2	Rey recall1 – Rey recall 3	-51,538	12,313	3,415	-58,979	-44,098	-15,092	12	,000
	Pair 3	Tower1 - Tower 3	-9,615	1,758	,488	-10,678	-8,553	-19,723	12	,000
	Pair 4	l'Alouette1 - l'Alouette 3	-46,462	15,213	4,219	-55,655	-37,268	-11,012	12	,000
	Pair 5	Reading comprehension1 – Reading comprehension3	-43,846	17,696	4,908	-54,540	-33,153	-8,934	12	,000
	Pair 6	Image composition 1 – Image composition3	-41,923	12,672	3,515	-49,581	-34,266	-11,928	12	,000
3rd	Pair 1	Rey copy1 – Rey copy 3	-37,647	13,005	3,154	-44,333	-30,961	-11,936	16	,000
	Pair 2	Rey recall1 – Rey recall 3	-49,706	15,049	3,650	-57,443	-41,968	-13,618	16	,000
	Pair 3	Tower1 – Tower 3	-9,941	1,749	,424	-10,840	-9,042	-23,436	16	,000
	Pair 4	l'Alouette1 - l'Alouette 3	-47,176	15,134	3,670	-54,958	-39,395	-12,853	16	,000
	Pair 5	Reading comprehension1 – Reading comprehension3	-39,706	12,051	2,923	-45,902	-33,510	-13,585	16	,000
	Pair 6	Image composition 1 – Image composition3	-48,824	15,363	3,726	-56,723	-40,924	-13,103	16	,000
4th	Pair 1	Rey copy1 – Rey copy3	-42,917	11,172	3,225	-50,015	-35,818	-13,307	11	,000
	Pair 2	Rey recall1 – Rey recall3	-57,500	13,734	3,965	-66,226	-48,774	-14,503	11	,000
	Pair 3	Tower1 - Tower 3	-10,333	1,969	,569	-11,585	-9,082	-18,175	11	,000
	Pair 4	l'Alouette1 - l'Alouette 3	-39,833	14,522	4,192	-49,060	-30,607	-9,502	11	,000
	Pair 5	Reading comprehension1 – Reading comprehension3	-36,667	9,847	2,843	-42,923	-30,410	-12,899	11	,000
	Pair 6	Image composition1 – Image composition3	-38,333	13,371	3,860	-46,829	-29,838	-9,931	11	,000

In the case of students with attention deficit hyperactivity disorder who benefitted / did not benefit from drug treatment, the differences between the means obtained on the two variables in each pair, between the final posttest compared to the partial one and the pretest, were statistically significant, at a significance level <0.01 in both cases. This situation indicates a change in performance following the implementation of the intervention program based on the two components.

Statistically significant differences based on *t* values are also observed in the type of attention deficit and hyperactivity, at a significance level <0.05, between the final posttest,

both compared with the pretest and the partial posttest, in the case of the predominantly inattentive and combined type.

Table V.40. *T* test in students with ADHD of hyperactive, inattentive and combined type (final posttest compared to partial posttest)

ADHD			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Hyperactive	Pair 1	Rey copy 2 – Rey copy 3	-21,250	14,361	7,181	-44,102	1,602	-2,959	3	,060
	Pair 2	Rey recall 2 – Rey recall 3	-26,250	13,769	6,884	-48,159	-4,341	-3,813	3	,032
	Pair 3	Tower 2 – Tower 3	-4,000	1,414	,707	-6,250	-1,750	-5,657	3	,011
	Pair 4	l'Alouette 2 – l'Alouette 3	-23,250	13,961	6,981	-45,465	-1,035	-3,331	3	,045
	Pair 5	Reading comprehension2 – Reading comprehension 3	-31,250	10,308	5,154	-47,652	-14,848	-6,063	3	,009
	Pair 6	Image composition2 – Image composition3	-21,250	10,308	5,154	-37,652	-4,848	-4,123	3	,026
Inattentive	Pair 1	Rey copy 2 – Rey copy 3	-30,000	7,071	2,236	-35,058	-24,942	-13,416	9	,000
	Pair 2	Rey recall2 – Rey recall3	-29,000	11,005	3,480	-36,873	-21,127	-8,333	9	,000
	Pair 3	Tower 2 – Tower 3	-3,400	1,647	,521	-4,578	-2,222	-6,530	9	,000
	Pair 4	l'Alouette 2 – l'Alouette 3	-22,400	13,858	4,382	-32,313	-12,487	-5,111	9	,001
	Pair 5	Reading comprehension2 – Reading comprehension3	-29,000	10,750	3,399	-36,690	-21,310	-8,531	9	,000
	Pair 6	Image composition2 – Image composition3	-25,000	7,454	2,357	-30,332	-19,668	-10,607	9	,000
Combined	Pair 1	Rey copy 2 – Rey copy 3	-25,357	8,491	1,605	-28,649	-22,065	-15,803	27	,000
	Pair 2	Rey recall 2 – Rey recall 3	-25,357	9,421	1,780	-29,010	-21,704	-14,242	27	,000
	Pair 3	Tower 2 – Tower 3	-4,571	2,098	,397	-5,385	-3,758	-11,529	27	,000
	Pair 4	l'Alouette 2 – l'Alouette 3	-37,250	12,295	2,323	-42,017	-32,483	-16,032	27	,000
	Pair 5	Reading comprehension2 – Reading comprehension3	-31,964	15,948	3,014	-38,148	-25,780	-10,606	27	,000
	Pair 6	Image composition2 – Image composition3	-32,143	12,651	2,391	-37,048	-27,237	-13,444	27	,000

Tabel V.45. *T* test in students with ADHD of hyperactive, inattentive and combined type (final posttest compared to pretest)

ADHD			Paired Differences					t	df	Sig. (2-tailed)
			Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
						Lower	Upper			
Hyperactive	Pair 1	Rey copy1 – Rey copy 3	-30,000	21,602	10,801	-64,374	4,374	-2,777	3	,069
	Pair 2	Rey recall1 – Rey recall 3	-58,750	10,308	5,154	-75,152	-42,348	-11,399	3	,001
	Pair 3	Tower1 - Tower 3	-10,500	1,732	,866	-13,256	-7,744	-12,124	3	,001
	Pair 4	l'Alouette1 - l'Alouette 3	-35,500	16,381	8,190	-61,566	-9,434	-4,334	3	,023
	Pair 5	Reading comprehension1 – Reading comprehension 3	-35,000	5,774	2,887	-44,187	-25,813	-12,124	3	,001
	Pair 6	Image composition1 – Image composition3	-28,750	10,308	5,154	-45,152	-12,348	-5,578	3	,011
Inattentive	Pair 1	Rey copy1 – Rey copy 3	-44,000	12,867	4,069	-53,204	-34,796	-10,814	9	,000
	Pair 2	Rey recall1 – Rey recall 3	-51,000	11,972	3,786	-59,564	-42,436	-13,471	9	,000
	Pair 3	Tower1 - Tower 3	-9,800	1,751	,554	-11,053	-8,547	-17,697	9	,000
	Pair 4	l'Alouette1 - l'Alouette 3	-35,300	12,885	4,074	-44,517	-26,083	-8,664	9	,000
	Pair 5	Reading comprehension1 – Reading comprehension3	-40,000	13,540	4,282	-49,686	-30,314	-9,342	9	,000
	Pair 6	Image composition1 – Image composition3	-38,500	13,550	4,285	-48,193	-28,807	-8,985	9	,000
Combined	Pair 1	Rey copy1 – Rey copy 3	-37,321	12,582	2,378	-42,200	-32,443	-15,696	27	,000
	Pair 2	Rey recall1 – Rey recall 3	-52,143	15,119	2,857	-58,005	-46,280	-18,250	27	,000
	Pair 3	Tower1 – Tower 3	-9,929	1,864	,352	-10,652	-9,206	-28,178	27	,000
	Pair 4	l'Alouette1 - l'Alouette 3	-49,607	13,601	2,570	-54,881	-44,333	-19,300	27	,000
	Pair 5	Reading comprehension1 – Reading comprehension3	-40,893	14,405	2,722	-46,479	-35,307	-15,021	27	,000
	Pair 6	Image composition1 – Image composition3	-47,679	13,505	2,552	-52,915	-42,442	-18,682	27	,000

In the case of the predominantly hyperactive type, differences are significant at a level <0.05, between the final posttest compared to the partial posttest, in almost all pairs of variables, except for graphic-motor organization and visuospatial skills, probably because of the low number of participants. The situation is identical in the case of the differences between the means of the scores obtained on the two paired variables (graphic-motor

organization and visuospatial skills) between the partial posttest compared to the pretest, the significance level being > 0.05.

The obvious improvement of the performances in the 3rd grade in the majority of the students could be explained by the fact that this is the period in which training favorably influences the overall development, especially reading and writing. The result is a kind of stability and later, in the 4th grade differentiated development will occur. It seems that in students from the 2nd grade, there is a heterogeneous period in what concerns the acquirements, and the level of automaticity varies.

Study on the efficiency of the psycho-pedagogical intervention program in students diagnosed with attention deficit and hyperactivity.

Comparing the variables of interest in the research, in students diagnosed with attention deficit and hyperactivity in all three stages of the research concerning the efficiency of the psycho-pedagogical intervention (pre-intervention, post-intervention organizational component of general character and post-intervention on the component with a character specific to learning difficulties), is like a supplement, aiming to enhance program's efficiency. Significance tests show statistically significant differences that arise in the case of students with medical diagnosis.

The implementation of the psycho-pedagogical intervention program. Case study.

Following the assessments that were made during the program and at its end, remarkable progress was observed.

On neuropsychological tasks, the evolution was rather important: in Rey-copy and Rey-recall tasks, the 90th percentile was reached; details can be noticed in the reproduction of the image. Copying is accurate, rich, executed without delay, according to the age, visual and spatial data are rationally perceived and structured. Performance at Tower subtest reached the scaled score 15, proof for the development of planning and monitoring of self-regulation. H.V. manages to obey the necessary rules, without delaying.

Results in reading and writing assessment tasks also show the progress registered. In l'Alouette test, H.V. manages to register a score between 101 (minimum) and 115 (maximum), reading correctly 111 words. In reading comprehension test, the score achieved is 60, managing to find answers to questions related to predictive, factual and elaboration inferences, to a connection inference and manages to establish a simple relationship, cause and effect, to a question of this type. In image compositing task is observed the way of organizing ideas, sentences, the text has an introduction and a conclusion, he manages to describe the image, and the writing is more organized, obtaining 70 points.

Developing the ability to adopt, maintain and transfer cognitive sets, use structured search strategies, use planning and flexible strategies, in other words the development of the executive functioning, shows the important role of the psycho-pedagogical intervention in students with attention deficit and hyperactivity.

CONCLUSIONS

This research was conducted on a group of participants made up of 42 students with attention deficit hyperactivity disorder who had learning difficulties in the area of reading and writing and consisted in the implementation of a program of psycho-pedagogical intervention. The psycho-pedagogical intervention program was conducted over a period of 24 weeks and may be applied by the teacher in the classroom, in order not to disturb the smooth running of educational activities. It was divided into two components: an organizing component, self-organizing 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 automate them.

In order to identify learning difficulties in the area of reading and writing, an ascertaining study was conducted, after giving dictation, text comprehension and reading tasks.

On the basis of the tests applied to detect learning difficulties in students with attention deficit and hyperactivity, was reached the first objective of the research, describing the specific of the executive functions for the manifestations of students with attention deficit and hyperactivity. The most common difficulties in these students were substitutions, followed by omissions of phonemes / graphemes, syllables, words, that were highlighted by dictation tests, in all types of attention deficit hyperactivity disorder: combined, predominantly inattentive and predominantly hyperactive / impulsive. Also, a high frequency, present in all types of attention deficit and hyperactivity, was represented by the disortography followed by words merging, in the combined and inattentive types, and additions of phonemes / graphemes and even syllables in all types. This can be explained by the fact that students with attention deficit and hyperactivity have phonological processing disorders, have difficulties in distinguishing subtle differences between sounds with a close place of articulation or between deaf and sound consonants that can be the cause of the misunderstanding of words. They need more time to process the meaning of what they hear, they try to understand something that was said a couple of minutes before, they do not have

the ability to maintain their attention focused on the task when confronted to disruptive agents, which is why, most often they cannot keep up with what was said.

At the listening comprehension task, students with attention deficit and hyperactivity, regardless of the type, had difficulties in identifying the ideas in the text presented orally. The selection and gathering of words and verbal images for transmitting various meanings, may be the result of difficulties in the executive functioning (organization of ideas and correct formulation of sentences), working memory, with an essential role in written expression.

Slow reading is frequent in children with attention deficit hyperactivity disorder combined type; in the inattentive type the most common difficulty is the altered pronunciation of polysyllabic words existing in written form. It is considered that reading difficulties result from a basic cognitive deficit involving phonological processing. Also, difficulties can be explained by the abundance of disturbances that do not allow people to focus and maintain attention on important stimuli.

Also, students may have reading difficulties because of visual perception disorders, attention disorders, so that they perceive some graphemes in different positions from how they are written. They may confuse left and right positions and may have trouble distinguishing the background object (the context in which the object lies). Therefore, students omit words or lines when reading, perceive letters and words incorrectly and may perceive some letters backwards, like "b" instead of "d etc.

Any type of attention deficit and hyperactivity entails various difficulties in the area of reading and writing. Learning difficulties are mostly the result of the difficulties of the executive functions that activate, organize, integrate and manage mental processes that involve the neuropsychological functioning responsible with students' academic performance. In the case of students with attention deficit - hyperactivity disorder and reading difficulties, reading difficulties appear from the deficits of the basic executive function associated with attention deficits.

Executive function's deficits have an adverse effect on school performance, regardless of the type of the attention deficit and hyperactivity disorder: combined, predominantly inattentive, predominantly hyperactive / impulsive.

Through the correlational study, which was conducted between the profile of the executive functioning and that of reading and writing performances, was taken into account the second objective of the research, the study of the relationship between executive functions and learning difficulties in children with attention deficit and hyperactivity. The profile of executive functioning was highlighted by neuropsychological tests (Rey Complex Figure Test

- Copy, Rey Complex Figure Test - Recall; Tower subtest of the Developmental Neuropsychological Assessment Battery - NEPSY) and school performance in reading and writing tasks was highlighted by pedagogical tests: l'Alouette (text prepared by the PhD student, test validated and calibrated on school population of Romania), Reading Comprehension and Image Composition (tasks elaborated by the PhD student).

There were realized correlations between variables of interest in the research, referring to executive functioning (graphic-motor organization, visuospatial memory and planning; skills of planning, monitoring, self-regulation and problem solving) and those concerning school performance (reading automaticity, reading comprehension, written expression). Thus, we could conclude that the executive functioning profile relates differently to the performance in the field of reading and writing.

The last two objectives refer to the elaboration and implementation of the psycho-pedagogical intervention program on the two components „development techniques of the organizational skills in students with attention deficit and hyperactivity "(objective three) and "development techniques of the organizational skills associated with the self-organizational ones, in customized ways for learning difficulties (reading and writing)" (objective four).

Better results, compared to the pretest, obtained by students with attention deficit and hyperactivity disorder associated with learning difficulties, in both stages of the revaluation, partial posttest (implementation of the first part, based on the organizational component of general character) and final posttest (implementation of the second part of the psycho-pedagogical intervention program based on intervention specific to reading and writing) demonstrate the improvements in students' academic performance.

Results obtained show positive correlations between the following variables in pretest:

- between variables measuring school performance (reading comprehension, written expression skills and reading automaticity);
- between the results of the three neuropsychological tests: graphic-motor organization; formation of planning skills and visuospatial memory; formation of planning, monitoring, self regulation and problem solving skills.

In the case of students in the 3rd grade were obtained positive correlations between variables concerning reading comprehension and those obtained in the three neuropsychological tests, between the variables of school performance and those of executive functioning, in children with attention deficit and hyperactivity receiving medication and in children with attention deficit hyperactivity disorder combined type, between the variables of executive functioning and those of school performance.

- In the partial posttest: levels of significance between the partial posttest and pretest (*t* test) is, in most cases $t = 0.000$, for all pairs of variables of interest in the research, fact that gives us the possibility to say that higher scores obtained by students in the partial posttest, are not due to random variation, but are attributable to the implementation of the psycho-pedagogical intervention program on the organizing component of general character.

In what concerns students' year of study, results were better in most students. The same happened in the case of students with attention deficit hyperactivity disorder receiving medication or not. Given the type of attention deficit and hyperactivity, in the case of the hyperactive type, although improvements appear between pretest and partial posttest, they are not significant. We are going back to the presumed explanation that refers to the small number of participants in research (4 students).

- In the final posttest: the significance level, for all variable pairs of interest in the research is $t = 0.000$, excepting the category of students with attention deficit hyperactivity disorder of predominantly hyperactive type, where differences between results are significant at a level <0.05 for most variables, it can be concluded that the scores obtained by students in the final posttest are due to the implementation of the psycho-pedagogical intervention program. Also, in the case of students diagnosed with attention deficit and hyperactivity, improvements are statistically significant at a significance level of $p <0.05$.

There were also involved partial factors that influence certain learning segments, for example:

- in pretest: in the case of attention deficit and hyperactivity predominantly inattentive, correlate only graphic-motor organizational skills with visuospatial memory and planning, reading comprehension correlates with the written expression ability; academic performance in reading comprehension tasks and graphic-motor organizational skills with the skills of planning, monitoring, self regulation and problem solving; in students diagnosed with attention deficit and hyperactivity exists a correlation between graphic-motor organizational skills and reading comprehension.
- In the partial posttest there is positive correlation: between graphic-motor organizational skills and school performance variables: reading comprehension and written expression; between organizing-planning and visuospatial memory and the ability to express in writing; between reading automaticity and both variables of school performance: reading comprehension and written expression; in the 2nd grade between reading automaticity and reading comprehension; in the 2nd grade, between the skills of planning, monitoring, self

regulation and problem solving and reading comprehension and written expression; in the 3rd grade: very strong correlations between the skills of planning, monitoring, self regulation and problem solving and reading comprehension; in the 4th grade, strong correlations between skills of planning, monitoring, self regulation and problem solving and school performance: reading comprehension and written expression skills; between reading comprehension and graphic-motor organizational skills; in the case of attention deficit and hyperactivity disorder combined type, between the skills of planning, monitoring, self regulation and problem solving and variables of school performance: reading comprehension and written expression skills; in the case of students diagnosed with attention deficit and hyperactivity correlate graphic-motor organizational skills with reading comprehension and written expression skills.

- In the final posttest: in the 2nd grade correlate positively the skills of planning, monitoring, self regulation and problem solving with the variables concerning school performance: reading comprehension and written expression skills; in students with attention deficit and hyperactivity the predominantly hyperactive type, correlate graphic-motor organizational skills with reading automaticity and written expression skills, organization, planning and visuospatial memory and written expression and skills of planning, monitoring, self regulation and problem solving with reading automaticity and reading comprehension.

At the other pole was situated the lack of correlation:

- in the pretest: between written expression, reading automaticity and variables of executive functioning between variables concerning school performance and those of executive functioning, in the case of students not receiving treatment and those with attention deficit hyperactivity disorder the predominantly hyperactive type; in the case of students not diagnosed with attention deficit hyperactivity disorder between all variables of interest in the research.
- in the partial posttest: in the case of the attention deficit hyperactivity disorder the predominantly hyperactive type, which means that these variables do not influence the performance of students with attention deficit hyperactivity disorder; in students not diagnosed with attention deficit hyperactivity disorder, between skills of planning, monitoring, self regulation and problem solving and variables concerning school performance.
- In the final posttest: in students with attention deficit hyperactivity disorder the predominantly inattentive type between the skills of planning, monitoring, self regulation and problem solving and variables concerning school performance; in students not diagnosed

with attention deficit hyperactivity disorder between graphic-motor organizational skills and visuospatial memory and planning and variables concerning school performance (reading automaticity and written expression skills) and between the skills of planning, monitoring, self regulation and problem solving and reading comprehension.

So we can say that in the case of students with attention deficit hyperactivity disorder, the psycho-pedagogical intervention program was effective and it must integrate contents and experiences from the field of factors impacting the attention deficit hyperactivity disorder.

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