ANALYSIS CONCERNING THE TYPES OF LEARNING DIFFICULTIESIN THE CASE OF STUDENTS WITH ATTENTION DEFICITHYPERACTIVITY DISORDER

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Abstract. The identification of learning problems in what concerns knowledge acquisition and children's characteristics can prevent learning difficulties. The particularities of cognitive processes of children with attention deficit hyperactivity disorder become more obvious when these children go to school, where the demand to adjust knowledge is growing. Poor school performance encountered in the case of most students with this disorder may be the result of manifestations specific to attention deficit hyperactivity disorder and of the deficient executive functions as well. In this study were analyzed learning difficulties faced by young students in reading and writing activities depending on the executive functions' profile. Studies concerning learning difficulties and the role of the executive functions in the development of reading and writing skills support the development of a psycho-pedagogical intervention program in this field.

Keywords: ***organizing, planning, automaticity in reading, reading comprehension, written expression***

1. Introduction

Frequent difficulties emphasized after finishing learning tasks may favor the appearance of an improper, problematic, negative and socially unacceptable behavior. This occurs as a reaction in order to divert attention from the failure in carrying out school tasks, when students usually develop an attitude of indifference.

Students with attention deficit hyperactivity disorder often develop learning difficulties caused by general cognitive deficits. The impairment of the executive functions, considered to be the most affected of the three systems: attention, executive functions and working memory, causes difficulties in terms of planning, organization, self-monitoring and self-evaluation. Students with attention deficit hyperactivity disorder having such a difficulty present problems in solving academic tasks, establishing priorities, planning, they have difficulties in starting a task, in performing verifications required in order to identify mistakes, in using time wisely, etc.

2. The research

The principle of differentiated instruction was the starting point in conducting this study in order to establish relations between the profile of the executive functions and learning difficulties faced in reading and writing activities.

The research was conducted on a sample of 42 students with attention deficit hyperactivity disorder - the inattentive, hyperactive / impulsive and combined types, integrated in mainstream schools and presenting specific characteristics in the field of reading and writing. Since the manifestation of learning difficulties (dyslexia- dysgraphia phenomena) is constant, the diagnosis is established at the end of the first year of schooling.

Reading and writing skills were assessed using pedagogical tests measuring reading automaticity, reading comprehension and image composition, and the executive function was

evaluated using the neuropsychological tests (Rey Complex Figure test and Tower subtest of Nepsy test battery).

The variables of interest in the research were represented by: variables targeting school performance: reading automaticity, reading comprehension, written expression skills and variables targeting the executive functioning: graphic-motor organization and visual-spatial skills, visual-spatial memory and planning, planning, monitoring, self-regulation and problem solving skills.

There were also categorical variables: the grade the student with attention deficit and hyperactivity disorder associated with learning difficulties comes from, the drug therapy received or not by the student and the type of attention deficit and hyperactivity.

In order to identify students with attention deficit hyperactivity disorder presenting lexical and graphical disorders, there were used dictation, listening and reading comprehension tasks.

Dictation tests were made so as to meet phonetic and lexical requirements specific to the Romanian language. They began with the dictation of isolated words and sentences and continued with a text made up of words containing various combinations of consonants, groups of letters, diphthongs, etc., in the composition of which was taken into account students' ability to concentrate specific to their age.

Another test was listening comprehension, for which students had to write down the ideas of a text that had been presented orally. The text was new to students, suitable for their age. The aim of this task was to verity the spontaneous transposition of oral language into written language after organizing and planning the ideas from the presented text orally.

Reading a text at first sight (paragraphs from a book of stories) was another test used for identifying learning difficulties. It consisted of a visual-auditory task involving reaching comprehension using symbols: letters and words. There were analyzed reading automaticity and reading comprehension, aspect evaluated taking into account oral expression.

In the case of students with attention deficit hyperactivity disorder presenting learning difficulties, there were used tasks assessing school performance: The Three Minute test, reading comprehension tasks, image composition tasks. They were followed by neuropsychological tests: Rey Complex Figure test (copy and recall) and Tower subtest from Nepsy test battery.

The Three Minute Test was used, this being a test that offers information concerning the performance when reading aloud an unknown text, reading automaticity.

Reading is usually assimilated in the first grade and later it becomes fluent. Reading involves perceiving separately the units that make up the word and pursuing their synthesis. As time goes on, the perception of the word becomes global and later the same thing occurs in the case of the syntagmatic units. "Global, syncretic perception of reading is connected with reading automaticity and it manifests itself through increased speed with the attention focused on main ideas" (Green, 1983, p.45).

Reading implies an attentive and laborious deciphering stage, manifesting a state of tension resulting from the concentration of the mental activity before the automation phase. One can distinguish the difference between the willful deciphering from the first stage of reading, and its automation, which allows us to read without self control in which case

accuracy, speed and talent transform reading into an easier operation. Training reading skills allow skipping the intermediate stages represented by the recognition of graphemes and their assembly.

Dyslexia is defined as the difficulty in learning to read, that appears in the absence of sensory or neurological disorders, of an inadequate educational process, of an unfavorable socio-cultural environment, in the case of a normal intellect, as the result of a disruption of the fundamental cognitive skills, of constitutional origin. (Burlea et al, 2004)

The text of the Three Minute Test consists mainly of neologisms that make up nonsensical sentences, this fact being made known to the reader before starting to read. This test represented the tool used for evaluating reading automaticity.

The text is made up of sentences whose words are unknown to the subjects. Words that make up the text are mostly neologisms ("concession", "fluid", "deduction", "dialect", etc.), impossible constructions ("At dawn a trumpet declines", "A cart of articulation is neutral", "The brush soufflé has an ancient, warm, refreshing difficulty " etc..), a "salad" of words that form various sentences, meaningless in a context. The main purpose of this test is to evaluate the accuracy and speed when reading aloud. The test enables the evaluation of the types of errors (categories: phonological, lexical, etc.). There is no control for reading comprehension.

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

There were evaluated conscious reading and the way in which words, sentences and the entire text were understood by students. The term of conscious reading involves an active reading engaging student's thinking and affective processes, thus contributing to a nuanced and sensitive understanding of the text. Questions were formulated in order to indicate if the message of the text was understood, details were brought out in the discussion, highlighting the relationship cause-effect/consequences of the events. Questions also targeted knowledge and the understanding of the general, primary and contextual sense of words. Later students used their imagination and continued the text.

Imagecompositionis another assessment task. The capacity to express ideas in written form starting from an image is one of the activities with the best results in evaluating speech development, speech fluency, the ability to organize, plan and formulate sentences correctly and in noticing details that attracted attention.

Rey complex figure test (Kulcsar, 1980) is designed to test planning and organization that are deficient in the case of students with attention deficit hyperactivity disorder. The figure from this task consists in a complex geometric route having several characteristics: the absence of an obvious significance, easy graphic achievement and a rather complicated structure of the assembly, in order to require a perceptive, analytical and organizing activity. This task consists in copying and then reproducing from memory 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, planning, significance and reports determined by the knowledge stored in memory.

Tower subtest (NEPSY tests battery, Korkman, M., Kirk, U., Kemp, S., 2005) assesses the executive functions of planning, monitoring, self-regulation and problem solving. The child must take into account respecting some rules within the imposed time limits. The target area is attention/executive functions - central elements in the neuropsychological assessment from Nepsy tests battery.

Developmental Neuropsychology uses the term *executive functions* to designate the use of planning and flexible strategies (Denckla, 1996), the ability to adopt, maintain and transfer cognitive sets, to use structured search strategies, in order monitor performance and correct errors, the ability to resist or inhibit the urge to respond to issues that are important but irrelevant in the task (Denckla, 1996, Pennington, Groisser and Welsh, 1993). These components of the executive functions interact, direct and modulate attentional processes, including the maintenance at an optimal level of neurophysiological activation and vigilance, the quest, selection and attention focus on relevant information from a wide range of stimuli.

3. Research methodology

The study concerning the association between the performance of the executive functions and lexical-graphical performance was conducted individually, in a quiet environment, especially arranged for individual activity.

In the first phase there were used two tests targeting the executive functions: Rey complex figure (*copy* – targeting the graphic-motor organization and visual-spatial skills, *recall* - evaluating visual-spatial memory and planning); Tower subtest (NEPSY) - evaluating planning, error monitoring and problem solving.

In the second phase there were evaluated reading and writing: the Three Minute test was used in order to assess reading automaticity; reading comprehension (targeting the comprehension of the read text); image composition (targeting the ability to express in written from).

There were used neuropsychological tests: Rey test (complex figure) and Tower subtest from Nepsy test battery. Perceiving visually is not the same as experiencing a simple sensory contact; visual perception implies reactivating, in contact with the reality, the visual habituations or contracting new ones. Tower subtest may reflect deficits in the ability to plan the work strategy.

Later were used the pedagogical tasks: the Three Minute Test was applied to each student with attention deficit hyperactivity disorder. Another task was reading a text at first sight and reading comprehension. Reading includes two basic processes, namely the *decoding process* that involves understanding the relationship between phonemes and graphemes and its translation from a representation specific to oral language into written language, and the *comprehension process*, that make the student understand the meaning of isolated words or of words that are in the context. Rieben (1989) reports that there is a difference between the cognitive processes involved in reading (the central, fast, automated ones) that imply the identification of words and those that require maximum concentration and cognitive resources, the understanding processes, that are possible if the previous processes are automated enough. The evaluation of written expression starting from an image aimed highlighting the capacity to organize and formulate ideas, the familiarity with the grammar, the vocabulary. It is one of the activities with the best results in evaluating speech

development, speech fluency, and the ability to organize and formulate correct sentences and in indicating the details that attracted reader's attention.

4. Interpretation of results

The deficits of the executive function increase the risk of learning difficulties. This study was carried out in order to establish the association between the profile of the executive functioning and the performance profile, in what concerns reading-writing.

First it was established how the six variables of interest for the research correlate between themselves (reading automaticity, reading comprehension, written expression skills, graphic-motor organizing and visual-spatial skills, visual-spatial memory and planning; planning, monitoring, self-regulation and problem solving skills) using the Pearson coefficient, in order to see how some neuropsychological variables are associated with school performance variables.

The variables concerning the organization and visual spatial memory and planning correlated between themselves ($r = 0.65$, $p < 0.01$), students who obtained good results at Rey-copy task tend to reach the same level at Rey - recall task; also the variables concerning visual spatial memory and planning correlated with those concerning the planning, monitoring, self-regulation and problem solving skills, where the coefficient $r = 0.65$, at a significance level $p < 0.01$, that is $r = 0.58$, $p < 0.01$). Therefore, the variables concerning the neuropsychological performance were consonant and highly correlated.

Variables measuring school performance correlate positively ($r = 0.61$, $p < 0.01$), students obtaining high scores at reading comprehension tests tend to have good results at written expression tests, and also at the Three Minute Test, which measures reading automaticity ($r = 0.45$, $p < 0.01$).

It was noted that the executive functioning profile, highlighted through neuropsychological tests, relates to school performance in reading and writing tasks, but that this is done differently. The variables targeting the organization correlate positively with those targeting reading comprehension ($r = 0.48$, $p < 0.01$); in other words, students who obtained good scores on Rey-copy task also obtained good scores at this variable of school performance. Planning, monitoring, self-regulation and problem solving skills correlate ($r = 0.32$, $p < 0.05$) with reading comprehension. There are other correlations between reading automaticity and reading comprehension, $r = 0.44$, $p < 0.01$, as well as between reading automaticity and written expression ($r = 0.45$, $p < 0.01$).

In conclusion, the variables measuring school performance and the executive functions using neuropsychological tests correlate positively with each other. Reading comprehension correlates with planning, monitoring, self-regulation and problem solving skills, but written expression and reading automaticity do not correlate with the results of the three neuropsychological tests.

School performance correlates differently with the variables concerning the executive functioning measured using neuropsychological tests (graphic-motor organization, visual-spatial memory and planning; planning, monitoring, self-regulation and problem solving skills).

In order to vary these findings, we want to see what happens to these correlations if we make a different analysis, taking into account the grade the student comes from. By

controlling the variable *grade* it can be noticed that academic performances correlate positively with the results of the neuropsychological test, especially in the case of the 3rd grade, where the results on reading comprehension correlate strongly with variables targeted by the three neuropsychological tests ($r = 0.78$, $p < 0.01$ – graphic motor organization; $r = 0.66$, $p < 0.01$ – visual-spatial memory and planning, $r = 0.79$, $p < 0.01$ - planning, monitoring, self-regulation and problem solving skills). School performance correlates differently from the neuropsychological tests performance in what concerns the class the student comes from as well.

Analyzing separately the correlations in the case of students with attention deficit and hyperactivity disorder undergoing a medical treatment respectively those who were not undergoing a medical treatment, a major difference can be seen: in the case of students not benefiting from medical treatment, school performance does not correlate with the results of the neuropsychological tests; significant correlations can be observed only in the group of students with attention deficit and hyperactivity disorder receiving medication (reading comprehension and graphic-motor organization: $r = 0.50$, $p < 0.01$).

The same correlations were tested separately on the attention deficit and hyperactivity variable that divides subjects into three groups: predominantly hyperactive, predominantly inattentive and combined type.

It seems that the group in which the associations between the variables at the neuropsychological tests and those concerning school performance are more frequent, is the group of subjects with attention deficit hyperactivity disorder - combined type, in which case the results at reading comprehension test correlate with the results at graphic-motor organization task: $r = 0.61$, $p < 0.01$. In the case of the attention deficit hyperactivity disorder - the predominantly hyperactive type, the correlations are missing completely, and in the case of the inattentive type there are correlations only between the graphic motor organization and visual spatial memory and planning between each other ($r = 0.77$, $p < 0.01$) and only between reading comprehension and written expression between each other ($r = 0.74$, $p < 0.05$).

5. Research findings

Positive correlation was found between school performance variables (reading comprehension) and the neuropsychological variables (graphic-motor and visual-spatial organizational skills, $r = 0.48$, $p < 0.01$; planning, monitoring, self-regulation and problem solving skills, $r = 0.32$, $p < 0.05$), while there is no correlation between the variables of interest concerning school performance (reading automaticity, written expression skills) and the neuropsychological ones (graphic-motor and visual-spatial organizational skills and organizational skills; planning and visual spatial memory; planning, monitoring, self-regulation and problem solving skills).

The Three Minute Test targets the reading automaticity of meaningless sentences made up of mixed words, and the difficulties that appear in this situation are caused by the poor phonological processing that is characteristic to students with attention deficit hyperactivity disorder, and as well by the difficulties to focus and maintain attention on the task.

Image composition task, targeting the ability to express ideas in written form is deficient primarily because of the poor vocabulary of the students involved in the study, but as

well because of the difficulties in organizing ideas in written form. Although in the literature it is pointed out that the tasks to express ideas in written form stimulate the executive functioning skills, results of the present study indicate a statistically insignificant association. This result could be explained as well by the fact that a task to write a text starting from an image is generally difficult for this age group. The introduction of cognitive organizers would facilitate this task.

School performance positively correlate with neuropsychological tests results especially in the case of the 3rd grade, in the case of most students, where the variable reading comprehension correlates strongly with the results obtained at the three neuropsychological tests ($r = 0.78$, $p < 0.01$ - graphic-motor organization; $r = 0.66$, $p < 0.01$ - visual-spatial planning and memory; $r = 0.79$, $p < 0.01$ - planning, monitoring, self regulation and problem solving skills). In the case of students that received drug treatment all school performances correlated significantly with those obtained at neuropsychological tests

It can be concluded that the executive functioning correlates differently with school performance so that in the elaboration of a psycho-pedagogical intervention program for students with attention deficit hyperactivity disorder and learning difficulties belonging to the reading and writing field, one must take into account the deficiencies of the executive functioning that reflect differently in the field of reading and writing: phonological processing disorder, visual and auditory perception problems, dysorthographia, reading comprehension, writing a text inspired by an image, fine motor difficulties.

BIBLIOGRAPHY :

Brown, T. E. (2000). Attention-deficit disorders and comorbidities in children, adolescents, and adults, *American Psychiatric Press*.

Burlea, G., Burlea, M, Mereuţă, M., Zanfirache, A., Milici, R.C. & Burlea, A. (2004). *Dicţionar explicativ de logopedie*, Editura Sedcom Libris, Iaşi.

Denckla, M.B. (1996) Research on executive function in a neurodevelopmental context: application of clinical measures. *Developmental Neuropsychology* 12:5–15

Denckla, M.B. (1996b). A theory and model of executive function, in *Attention, Memory, and Executive Function.* Edited by Lyon GR, Krasnegor NA. Baltimore, MD, Paul H Brookes.

Eslinger, P.J. (1996). Conceptualizing, describing, and measuring components of executive function: a summary. In *Attention, Memory and Executive Function*. Edited by Lyon GR, Krasnegor NA. Baltimore, MD, Paul H Brookes, pp 367–395.

Grec, C.D. (2014). *ADHD. Intervenţie psihopedagogică.*Editura EIKON, Cluj-Napoca

Korkman,M., Kirk,U., Kemp,S., (2005). *Nepsy. Evaluarea neuropsihologică a dezvoltării. Manual.*

Kulcsar, T. (1980). *Lecţii practice de Psihodiagnostic*, capitolele 2 şi 3.

Pennington, B.F., Grossier, D. & Welsh, M.C. (1993). Contrasting neuropsychological deficits in attention deficit hyperactivity disorder versus reading disability. *Developmental Psychology*, 29, 511-23.

Rieben, L. (1989). Individual differences in word recognition: A path from an interactive model of reading to an interactive instructional setting. *European Journal of Psychology of Education*, 4, 329-347

Verza, E. (1983). *Disgrafia şi terapia ei*, Editura Diactică şi Pedagogică, Bucureşti.