Depression in Children Diagnosed with Attention Deficit Hyperactivity Disorder (ADHD): Aggressive Behavior and Impairments in Peer Relationships as Predictors

Geanina Cucu-Ciuhan*[i], Anita Valentina Dănciulescu[ii]**

*Department of Psychology, Communication Sciences and Social Work, Faculty of Educational Sciences, Social Sciences and Psychology, University of Pitești, Romania

**Faculty of Psychology and Educational Sciences, University of Bucharest, Romania

Abstract

Introduction: *The number of school-aged children that are struggling with difficulties in establishing proper relationships with peers and with aggressive behavior, referred for psychological assessment and psychotherapy in our psychology clinic, has been continuously increasing over the last years.*

Objectives: *The aim of this study was to examine the relationship between aggressive behavior, impairments in peer relationships, inattention, and impulsivity-hyperactivity as predictors for the level of depressive symptoms in children diagnosed with ADHD.*

Methods: *A clinical sample of 119 children, aged from 7 to 15 years old, who were diagnosed with ADHD, have been tested in a psychology clinic in Romania, over the past three years, using the Child Depression Inventory (CDI) and Conner's 3rd Edition.*

Results: *Children with high levels of peers' relationships impairments, aggression, inattention and impulsivity-hyperactivity also manifest very high levels of associated depressive symptoms. Also, impairments in peer relationships and the level of aggression explained important levels of variance (25.2%) of the children's depressive symptoms.*

Conclusions: *The practical implications in child psychotherapy refer to the approach of the intervention so that it also includes a treatment for emotional disorders apart from addressing the child's cognitive, behavior and social problems.*

Keywords: child depression, peers relationships impairments, aggression, inattention, impulsive-hyperactive

[i] Corresponding author: univ. prof. Geanina Cucu-Ciuhan, PhD, Department of Psychology, Communication Sciences and Social Work, Faculty of Educational Sciences, Social Sciences and Psychology, University of Pitești, Romania, email: geaninaciuhan@gmail.com, geanina.ciuhan@upit.ro.

[ii] Anita Valentina Dănciulescu, PhD student, University of Bucharest, Romania, email: anitadanciulescu@yahoo.com.

I. Introduction

Attention-deficit and hyperactivity disorder (ADHD) is considered one of the most disabling psychiatric conditions in childhood and adolescence, described as a prevalent neurodevelopmental disorder, associated with a range of long-term impairments, with a complex and multifactorial etiology (Walton, Pingaul, Cecil, Gaunt, Relton, Mill & Baker, 2016).

The disorder is characterized by developmentally inappropriate levels of inattention and hyperactivity/ impulsivity (Wu, Bralten, Cao, Hoogman, Zwiers, An, Sun, Yang, Zang, Franke & Wang, 2017), to a degree that is inconsistent with one's developmental level (Purper-Ouakil, Ramoz, Lepagnol-Bestel, Gorwood & Simonneau, 2011). The symptoms are present in multiple settings (in school, at home and with siblings), which can result in performance challenges in social, educational or work situations. They include behaviors such as: failure to pay close attention to details, excessive talking and difficulty in organizing tasks and activities, an inability to remain seated in appropriate situations or fidgeting (DSM-5, 2013).

According to the 2013 European Commission Report, ADHD has a prevalence of 5% in younger age groups (the European Commission, 2013). Other more recent studies mention a prevalence of 7.2% in children (Thomas, Sanders, Doust, Beller & Glasziou, 2015). The Romanian Government published a report in 2016 stating that there are 5.015 children diagnosed with ADHD in our country, 3.744 of them being aged between 5 and 14 years old (Guvernul României, 2016).

Wu (2017) demonstrated in a study with over 200 participants that white matter microstructural alterations occur in children with ADHD. The observed pattern partly correlated with cognitive functioning in working memory and inhibition performance (Wu et al., 2017). Recent studies have shown that executive functions, the mental control processes needed to carry out goal-directed behaviors, are impaired in individuals diagnosed with ADHD (Binhadyan & Wickramasinghe, 2018). The executive functions are: planning for future goals, inhibiting maladaptive responses, maintaining and manipulating information in working memory and flexibly adapting behaviors to changes in the environment (Dajani, Llalbre, Nebel, Mostofsky & Uddin, 2016). The executive functions affected in ADHD are: management and planning, attention, emotion control, effort, working memory and self-regulation (Binhadyan & Wickramasinghe, 2018). These findings emphasize the importance of psychological evaluation centered on cognitive and executive functions for children suspected of ADHD.

Externally directive impulsive aggression, characterized by behavioral disinhibition, alongside a lack of planning and concerns about consequences, can be observed in patients diagnosed with ADHD and is reflected in low frustration tolerance and recurrent temper tantrums (Cackowski et al., 2017). Aggression is widely observed in children with attention deficit/ hyperactivity disorder (ADHD), and behavioral studies suggest a strong link between aggressive behavior and frustration or the unsatisfied anticipation of reward (Scime & Norvilitis, 2006). Neuropsychological studies suggest that ADHD in children is associated with reduced nucleus accumbens gray matter volumes and decreased fronto-accumbal structural connectivity and that the patterns of gray and white matter structure (i.e., morphometry and connectivity, respectively) in children with ADHD are predictive of the level of aggression in these children (Cha et al., 2015). In one recent study, the conclusion was that the aggressive behavior of school aged children is correlated with high humiliation/ rejection, high social anxiety, increased performance fears, low harm avoidance, and low perfectionism (Author, 2018). These findings emphasize the importance of complex behavior evaluation for children suspected of ADHD.

II. The current study

The aim of this study was to examine the relationship between the aggressive behavior, impairments in peer relationships, inattention, and impulsivity-hyperactivity as predictors for the level of depressive symptoms in children diagnosed with ADHD.

Research question 1: Are there significantly statistic correlations between the level of aggressive behavior, impairments in peer relationships, inattention, and impulsivity-hyperactivity in children diagnosed with ADHD, and their depressive symptoms?

Research question 2: Are the levels of aggressive behavior, impairments in peer relationships, inattention and impulsivity-hyperactivity predictors for the level of depressive symptoms in children diagnosed with ADHD?

III. Methods

Participants

The current study uses data involving a clinical sample of 119 Romanian children, aged from 7 to 15 years old, 81 males and 38 females, referred by their parents or teachers to a psychology clinic in Bucharest. All primary and middle school children referred for psychological evaluation by their parents and/ or

teachers in the last three years, who met the diagnostic criteria for ADHD, were included in the research sample. The children age distribution was as follows: 77 children aged 7 to 9 years old, 33 children aged between 10 and 12 years old and 9 children aged between 13 and 15 years old.

Measures

This study utilized the Romanian version of *Child Depression Inventory (CDI) – Parent form* (Kovacs, 1992) to evaluate the depressive symptoms of children. The scale is a parent-report instrument and consists of 17 items, each evaluating a symptom of depression or related affect. The items are presented as three statements of variable symptom severity. The 17 items are distributed across two basic scales: *Emotional problems* and *Functional problems*, and there is a scale for *Total Depression*. The respondents' rate using a 4-point scale anchored with four response options: *not at all* = 0, *sometimes* = 1, *frequently* = 2, and *in most of the cases* = 3. Internal consistencies ranging from 0.59–0.68 have been reported in the standardization sample (Kovacs, 1992). The test is adapted for the Romanian population and is commonly used in main clinics in the country for the assessment of children's emotional problems.

The author used the Romanian version of *Conners 3rd Edition, teacher form* (Conners, 2008), in order to evaluate the behavioral problems. The scores taken into account are the ones from the aggressive behavior scale. *Conners Rating Scale* is a thorough assessment for ADHD and its associated problems and disorders in children aged 6 to 19 years old (Conners, Pitkanen & Rzepa, 2011). The test is adapted for the Romanian population and is commonly used in by main clinics in the country.

The variables taken into account were: aggressive behavior, impairments in peer relationships, inattention, impulsivity-hyperactivity and the level of depressive symptoms.

Procedure

Written informed consent forms were signed by the parents of all children included in the study. The *Child Depression Inventory (CDI) – Parent form* was administered individually to every parent by a clinical psychologist. The *Conners 3rd Edition, teacher form*, was sent to the teacher via children's parents, with an explanatory letter signed by the clinical psychologist, and after completion the parent would bring the test back to the clinic.

IV. Results

Descriptive analysis

Mean scores and standard deviations for each measure are presented in Table 1. Analyses were conducted to determine the distribution of scores in the study sample, for each variable of the present study.

	N	Minimum	Maximum	Mean	Std. Deviation
CDI Total Score	119	1.00	35.00	14.61	7.27
Inattention	119	.00	30.00	15.07	7.19
Impulsivity-Hyperactivity	119	.00	50.00	23.57	12.79
Aggression	119	.00	51.00	15.81	12.51
Peers relationships	119	.00	21.00	8.2605	5.68
Valid N (listwise)	119				

Table 1: Means and standard deviations

Correlational analysis

Table 2 presents the correlations between variables. The first hypothesis was supported by significant correlation coefficients that indicate very high effect sizes.

	CDI Total Score	Sig. (2-tailed)
Aggression	.455**	.000
Peers relationships impairments	.457**	.000
Inattention	.417**	.000
Impulsivity-Hyperactivity	.298**	.001

*Note: **p<.01, *p<.05*

Table 2: Pearson correlation coefficients among study variables (N=119)

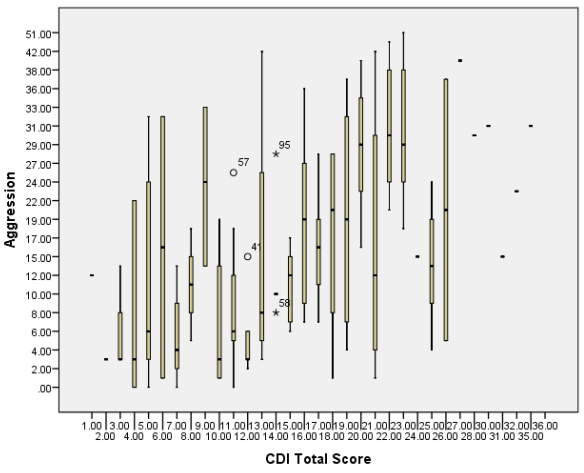

Figure 1: Boxplot CDI Total Score versus Aggression

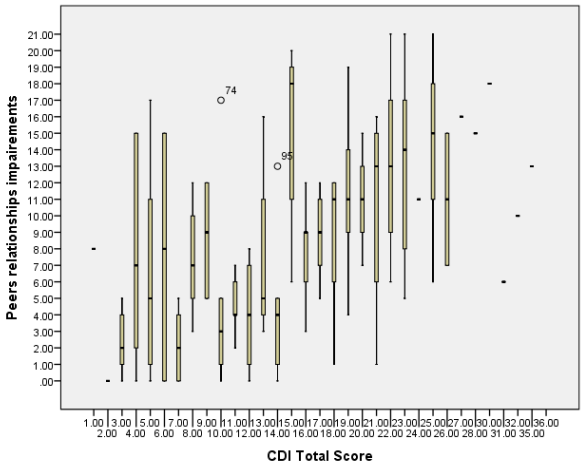

Figure 2: Boxplot CDI Total Score versus Peers relationships impairments

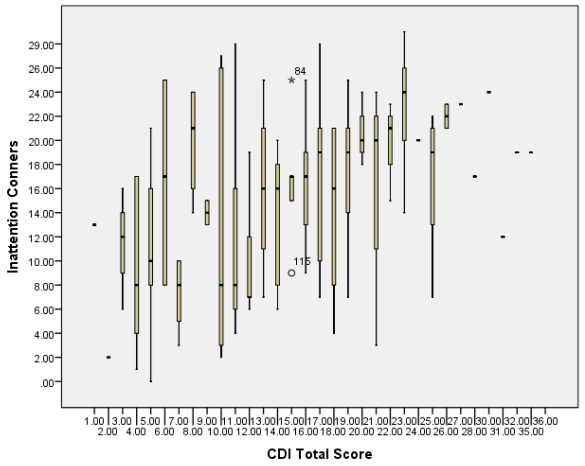

Figure 3: Boxplot CDI Total Score versus Inattention

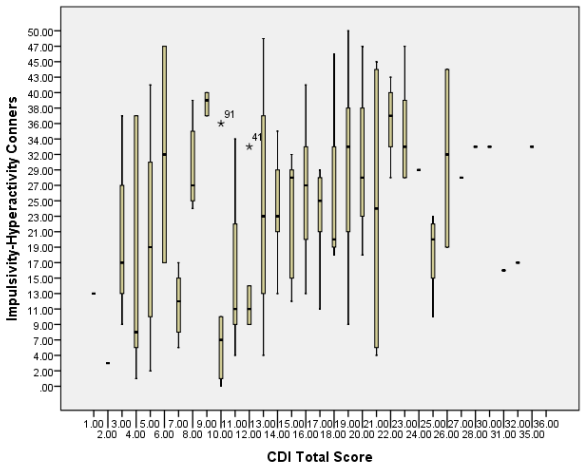

Figure 4: Boxplot CDI Total Score versus Impulsivity/ Hyperactivity

The high level of depressive symptoms was associated with a very high level of impairments in peers relationships (r=.457; p=.00), a very high level of aggression (r=.455; p=.00), a very high level of inattention (r=.417; p=.00), and a very increased level of impulsivity-hyperactivity (r=.298; p=.00). This means that the children diagnosed with ADHD from the present study who display high levels of impairments in peer relationships, aggression, inattention and impulsivity-hyperactivity also have a very high level of associated depressive symptoms.

Multiple linear regression analyses for the prediction of depressive symptoms

A series of hierarchical multiple regression analyses predicting depressive symptoms were conducted. The criterion variable was the depressive symptoms level, and the explanatory variables were the level of impairments in peer relationships, inattention, and impulsivity-hyperactivity.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537[a]	.289	.264	6.23
2	.516[b]	.266	.247	6.31
3	.502[c]	.252	.239	6.34

a. Predictors: constant, aggression, peer relationships impairments, inattention, and impulsivity-hyperactivity
b. Predictors: constant, aggression, peer relationships impairments, inattention
c. Predictors: constant, aggression, peer relationships impairments

Table 3: Multiple linear regression for the prediction of depressive symptoms in children diagnosed with ADHD, oppositional defiant disorder or conduct disorder

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1810.291	4	450.323	11.570	.000[a]
	Residual	4436.927	114	38.920		
	Total	6238.218	118			
2	Regression	1659.024	3	553.008	13.888	.000[b]
	Residual	4579.194	115	39.819		
	Total	6238.218	118			
3	Regression	1571.366	2	785.683	19.529	.000[c]
	Residual	4666.852	116	40.231		
	Total	6238.218	118			

a. Predictors: constant, aggression, peer relationships impairments, inattention, and impulsivity-hyperactivity
b. Predictors: constant, aggression, peer relationships impairments, inattention
c. Predictors: constant, aggression, peer relationships impairments
d. Dependent variable: depressive symptoms

Table 4: Significant differences between the prediction models of the level of depressive symptoms in children diagnosed with ADHD, oppositional defiant disorder or conduct disorder

The authors chose the most significant multiple linear regression model in order to explore the relationship between four explanatory variables (impairments in peer relationships, inattention, and impulsivity-hyperactivity) and the criterion variable represented by the level of depressive symptoms. The goal was to find out if the level of impairments in peer relationships, inattention, and impulsivity-hyperactivity significantly predicted depressive symptoms in children diagnosed with ADHD. Table 3 presents the results of the linear regression model, Table 4 presents the significant differences between the prediction models of the level of depressive symptoms, and Table 5 presents the standardized and non-standardized coefficients for the prediction of depressive symptoms.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.715	1.428		6.104	.000
	Inattention	.245	.115	.242	2.128	.036
	Impulsivity-Hyperactivity	-.146	.076	-.257	-1.912	.058
	Aggression	.204	.081	.352	2.531	.013
	Peer relationships impairments	.292	.138	.228	2.115	.037
2	(Constant)	7.852	1.370		5.732	.000
	Inattention	.159	.107	.157	1.484	.141
	Peer relationships	.304	.139	.238	2.181	.031
	Aggression	.117	.067	.201	1.738	.085
3	(Constant)	9.154	1.057		8.659	.000
	Peer relationships	.357	.135	.279	2.638	.009
	Aggression	.159	.062	.273	2.577	.011

a. Predictors: constant, aggression, peer relationships impairments, inattention, and impulsivity-hyperactivity

b. Predictors: constant, aggression, peer relationships impairments, inattention

c. Predictors: constant, aggression, peer relationships impairments

d. Dependent variable: depressive symptoms

Table 5: Standardized and non-standardized coefficients for the prediction of depressive symptoms in children diagnosed with ADHD, oppositional defiant disorder or conduct disorder

The results show the superiority of the prediction model 3, meaning that 25.2% of the variance in the level of depressive symptoms is significantly explained by the level of peer relationships impairments and aggression. In other words, children exhibit more depressive symptoms when they have important difficulties in establishing adequate relationships with their peers and a high level of learning aggressive behaviors.

The prediction equation is:

$$Y_{\text{level of depressive symptoms}} = 8.659 + 2.638 \text{ x peer relationships impairments} + 2.577 \text{ x aggression}$$

V. Discussions

The findings suggest that high depressive symptoms in children diagnosed with ADHD are correlated with an increased level of aggressive behavior, impairments in peer relationships, inattention, and impulsivity-hyperactivity. This conclusion is consistent with previous research about co-occurrence between depressive symptoms and ADHD in children. Treuting and Hinshaw (2001) examined depressive symptoms among a group of 114 boys diagnosed with ADHD and comparison boys, aged 7-12 years old. They found out that aggressive boys with ADHD reported more symptoms of depression than nonaggressive boys with ADHD did, who, in turn, reported more depression symptoms than comparison boys (Treuting & Hinshaw, 2001). In their study on 96 children diagnosed with ADHD, aged 6 to 12 years old, Weber and his colleagues concluded that children with both depressive symptoms and executive functions weakness had higher rates of ADHD than children displaying only depressive symptoms (Weber et al., 2018). These findings emphasize the importance of emotional evaluation for children suspected of ADHD.

The second part of the study was a multilevel investigation, examining how the level of aggressive behavior, impairments in peer relationships, inattention, and impulsivity-hyperactivity in children diagnosed with ADHD, predicted depressive symptoms. The author found that the model including aggressive behavior and impairments in peer relationships explained important levels of variance (25.2%) of the children's depressive symptoms. The findings indicate a very high risk for ADHD children with aggressive behavior and impairments in peer relationships to develop depressive symptoms associated with their cognitive problems.

VI. Implications for practice

A model of clinical assessment protocol for diagnosing ADHD in school-aged children

Clinical experience reveals the need to conduct an extensive psychological evaluation of the child and his/ her family before designing the treatment plan for children with ADHD. One reason is that often these students have comorbid mental health issues as: oppositional defiant disorder, anxiety, depression, learning disabilities or autism spectrum symptoms. A comprehensive clinical assessment should reveal the associated problems and help to design the appropriate treatment plan.

Another reason is that, most frequently in Romania, as a consequence of the lack of a standardized diagnosis protocol, ADHD is not always correctly identified and often can be confused with some of these other mental health issues. Students with attachment disorders or emotional problems can exhibit behavior problems, inattention and/ or hyperactivity, but they do not have neuropsychological impairments in executive functions, working memory or attention. One frequent attachment disorder in children is disinhibited social engagement disorder (DSED), which is defined by DSM-5 as a condition in which the child meets at least two of the following: reduced or absent reticence in approaching unfamiliar adults, overly familiar verbal or physical behavior, diminished or absent checking back with the adult caregiver after venturing away and wiliness to go off with un unfamiliar adult with little or no hesitation (DSM-5, 2013).

In other situations, one child may meet the criteria for two or more conditions, and this is known as comorbidity. For example, a child with disinhibited social engagement disorder (DSED) may manifest symptoms of attention-deficit/ hyperactivity disorder (ADHD), such as "a lack of safe social boundaries, a willingness to leave, disregard of the primary caregiver or engagement with complete strangers in an overly familiar verbal or physical manner" (Losinski, Katsiyannis, White & Wiseman, 2015).

The most effective treatment in attachment disorders is family therapy, with focus on developing positive interactions between the child and the caregiver (Losinski et al., 2015), and the behavior management strategies that work in ADHD can undermine the emotional child-parent relationship. On the other hand, a student with ADHD may also have attachment disorder, and in this case the treatment should include family therapy, so we need to look both ways when we make the evaluation.

The multi-method assessment protocol for students suspected of ADHD is comprised of three perspectives: child individual evaluation, teacher perspective evaluation and parent perspective evaluation.

The child individual evaluation includes: neuropsychological evaluation, behavior evaluation and emotional evaluation.

The neuropsychological evaluation is conducted with *The Developmental Neuropsychological Assessment Battery NEPSY I, Romanian version* (Korkman, Kirk & Kemp, 2007). This test is based on the view of cognitive processes as dynamic functional systems carried out by inter-connected subcomponents (Luria, 1973). The test has as aim to identify primary and secondary deficits that might be responsible for the observed impairments in complex tasks (Cheie, Veraksa, Zinchenko, Gorovaya & Visu-Petra, 2014). In the ADHD evaluation we use subtests from the attention and executive function area, such as "Tower", "Statue", "Additive attention and response set", "Visual attention", and from the memory and learning area. The "Tower" subtest measures the child's ability to plan, organize and monitor his/ her activities, as well as his/ her problem-solving strategies. The "Statue" subtest measures the child's motor persistence and ability to inhibit responses from distracting stimuli.

The behavior evaluation includes *Conners Rating Scale – Third Edition, Romanian version, Self-evaluation form*, if the child is aged over 10 years old (Conners, Pitkanen & Rzepa, 2011), clinical interview and in session observation.

The emotional evaluation includes the *Multidimensional Anxiety Scale for Children (MASC), Romanian version, Child Depression Inventory (CDI), Romanian version, Self-evaluation form*, experiential provocative situations using drawing, painting and projective tests. Both MASC and CDI tests are adapted for the Romanian population and are commonly used in the main clinics of the country for the assessment of children's emotional problems. In a recent study, the conclusion was that behavior problems were associated with emotional difficulties, such as perfectionism, harm avoidance, anxious coping, anhedonia, anxious coping mechanisms, separation anxiety and negative self-esteem (Cucu-Ciuhan, 2017).

The teacher perspective evaluation includes behavior and emotional assessment. The behavior evaluation includes *Conners Rating Scale – Third Edition, Teacher-report form, Romanian version* (Conners et al., 2011), and in school observation made by a clinical psychologist. The emotional evaluation includes *Child Depression Inventory, Teacher-report form, Romanian version* and also in school observation made by a clinical psychologist.

The parent perspective evaluation includes behavior evaluation and emotional assessment. The behavior evaluation includes *Conners Rating Scale – Third Edition, Parent-report form* (Conners et al., 2011), *Romanian version,* clinical interview and anamnesis. The emotional evaluation includes *Child Depression Inventory, Parent-report form, Romanian version,* clinical interview and anamnesis.

A model of psychological intervention with school-aged children diagnosed with ADHD

The psychological intervention protocol for students diagnosed with ADHD follows a three-perspective plan: individual child intervention, family centered intervention and school centered intervention. In a study from 2006, researchers concluded that a complex intervention plan, involving child individual experiential psychotherapy and professional optimization groups for teachers consisting in teaching them behavior modification techniques to use in the classroom, had a significant effect on children ADHD symptoms (Cucu-Ciuhan, 2006).

The **child intervention program** is comprised of two main directions: cognitive and executive remedial activity functions and emotional centered intervention. The clinical experience has shown that children with ADHD have important emotional symptoms associated, such as anxiety and depression (Cucu-Ciuhan, 2017). Recent evidence-based studies have also found that, since the executive functions are related to a myriad of adaptive behaviors, their impairment causes socio-emotional problems (Dajani et al., 2016).

When designing the remedial activities for *cognitive and executive functions* for an individual child, we start from the NEPSY test results as well as from the qualitative analysis of that child's performance in different tasks. For example, students with ADHD have poor performance in *executive function* tests such as "Tower" or "Statue". If the performance in the "Tower" test is weak, we design intervention tasks to increase the student's ability to plan, organize and monitor his/ her activities, and we also teach them problem-solving efficient strategies, such as the Phillip Kendall self-instructional procedure for impulsive children – "Stop and think" (Kendall & Braswell, 1993). If the performance in the "Statue" is weak, we have designed intervention tasks to increase the student's motor persistence and ability to inhibit responses in order to distract stimuli, such as role play with distractors with the therapist.

The *emotion centered intervention* is driven from the humanistic experiential therapy perspective and focuses on involving the child in provocative exercises based on art therapy techniques (drawing, painting, modeling), psychodramatic techniques (role-playing, playing with puppets), metaphors and storytelling. These exercises facilitate the identification of negative dysfunctional emotions, their causes and effects and also replace them with more functional and adaptive emotions.

The **family centered intervention** is comprised of two main directions: improving the parent-child communication and emotional bond and implementing a home-based behavior management program.

The *improving of the parent-child communication and emotional bond* part of the program involves weekly parenting meetings with the following goals: understanding the child's mental health issues, establishing the therapeutic goals, addressing the parent's particular needs and concerns about the child, learning assertive communication strategies, designing particular activities in order to improve the parent-child emotional bond.

In a Romanian study, Ștefan and Miclea (2010) identified as important factors that can enhance the risk of children to develop mental health problems: poor development of social and emotional competencies in children, harsh and/ or inconsistent parenting strategies, low socio-economic status, parental mental health problems and educational factors.

According to Barkley (2013), raising a child with ADHD is incredibly challenging for any parent, because of the increased effort the parent must do in supervising and monitoring the child but also to protect and nurture his/ her emotional needs. This is why addressing the particular concerns of the parents and coaching them to understand their child's mental health issues and to cope with their own emotional difficulties is a crucial part of the family intervention. If the parent has the ability to emotionally guide the child by helping him/ her to define and regulate their emotions effectively, then the child will have a significant higher emotional competence (Greenberg, 2015).

This part of the intervention followed the Greenberg (2015) model of coaching parents for emotional intelligence, which involves helping them become emotional coaches with their children. The scope of the intervention is to guide parents toward awareness and management of their own emotions, as well as teaching the parent how to deal with their children's emotions and how to help the child to focus on and manage his/ her emotions (Greenberg, 2015). For example, the steps the parent may follow in dealing with their child's anger are: be aware of the anger in himself/ herself and in the child, view the child's anger as an opportunity to get closer to what is happening to him/ her and to help the child learn something, validate the child's anger, assist the child in verbally labeling his or her anger and teach the child problem-solving strategies for dealing with anger-generating situations (Greenberg, 2015).

The *home-based behavior management* part of the program involves: teaching the parent efficient ways to formulate rules and instructions to the child, creating and implementing a reward and punishment system, teaching the parents how to anticipate their child's actions and how to prevent them. This part of the intervention consisted of the implementation of an adapted version of the "Eight steps for better behavior" program proposed by Barkley (2013). This program is designed to reduce stubborn, defiant or oppositional behavior, while increasing the child's cooperativeness (Barkley, 2013). The steps for parents are: learn to give positive attention to the child, be attentive in order to gain compliance, give more effective commands, teach the child not to interrupt the adult's activities, set up a home token system, implement constructive mild punishment strategies, implement a time-out system and learn strategies to manage the child's behavior in public places (Barkley, 2013).

The **school-based intervention** also is also comprised of two main directions: improving the teacher-child relationship, and implementing a school-based behavior management program.

Even if the teacher is in most cases the first person that realizes if a student may have mental health problems, he/ she cannot accurately identify the nature of the problem and understand the mental health issues of any particular child (Marsh, 2015). Despite this, if we use the proper standardized instruments completed by the teacher, we can recall important diagnostic material from the teacher's perspective about the degree in which the child's symptoms are affecting their school activities and the abilities to learn. Starting from the concerns that the teacher brings up in these tests, we can design an intervention program which can better address the particular needs of the student and teacher.

The *improving the teacher-child relationship* part of the program involves training meetings with the teacher in order for him/ her to learn the emotional and cognitive issues of the ADHD student and better ways to communicate with them. The meetings are centered on the teacher's special concerns, and practical ways to address the child are discussed and then implemented in the classroom.

The *school-based behavior management program* is also designed starting from the teacher perspective tests results, and it's inspired by Barkley's (2016) program "Managing ADHD in Schools". The classroom strategies involve: efficient ways to formulate rules and instructions to the ADHD student, rewards and consequence choices and strategies to deliver (immediate, frequent, salient), using reinforcement of the appropriate behavior before implementing punishment systems and anticipating the ADHD child's behavior (Barkley, 2016).

Additionally, the authors adapted the conjoint behavior consultation model, a collaborative consultation approach in which parents and teachers work together to address a child's problem behaviors through home and school (Sheridan & Kratochwill, 2008). This part of the intervention consisted in monthly parent-teacher meetings when they collaboratively identify and analyze the child's behavior, create an intervention plan that addresses its function, implement the intervention plan with fidelity across home and school as well as use data to evaluate plan effectiveness. This model of intervention has been proven to be effective in managing children's disruptive behavior in rural communities in the USA, by improving targeted parenting strategies and relationships and the mediational role of the parent-teacher relationship on children's adaptive outcomes (Sheridan, Witte, Holmes, Wu, Bhatia & Angell, 2017).

Declarations

Ethics approval and consent to participate. The assessments described in this paper are made in an individual psychology private office approved by the Romanian College of Psychologists. Written informed consent forms were signed by the parents of all children included in the study.

Consent for publication. Informed consent was obtained from all parents or guardians of the participants included in the study.

Availability of data and material. The authors can provide the database on request.

Competing interests. There are no competing interests.

Authors' contributions. The authors have full contribution to the data collection, data analysis and paper writing.

Acknowledgements. Not the case.

Declaration of conflicting interests. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding. The authors received no financial support for the research, authorship, and/or publication of this article.

References

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders, 5th edition.* Arlington, V.A., American Psychiatric Association.

Binhadyan B., Wickramasinghe N. (2018). The Impact of Impaired Executive Functions of ADHD Adults on the Use of IS: Psychologists' Perceptions. In N. Wickramasinghe, J. Schaffer (eds.), *Theories to Inform Superior Health Informatics Research and Practice. Healthcare Delivery in the Information Age*. Springer, Cham.

Barkley, R. (2005). *Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment, Fourth Edition*. The Guilford Press.

Barkley, R. (2013). *Taking care of ADHD. The complete, Authoritative Guide for Parents*. The Guilford Press.

Barkley, R. (2016). *Managing ADHD in School: The Best Evidence-Based Methods for Teachers*. Pesi Publishing & Media.

Cackowski, S., Krause-Utz, A., Van Eijk, J., Klohr, K., Daffner, S., Sobanski, E. & Ende, G. (2017). Anger and aggression in borderline personality disorder and attention deficit hyperactivity disorder – does stress matter?. *Borderline Personality Disorder and Emotional Dysregulation. Mar 17*; *4:6*. doi: 10.1186/s40479-017-0057-5.

Cheie, L., Veraksa, A., Zinchenko, Y., Gorovaya, A. & Visu-Petra, L. (2014). A cross-cultural investigation of inhibitory control, generative fluency, and anxiety symptoms in Romanian and Russian preschoolers. *Child Neuropsychology* (ahead-of-print), 1-29. doi: 10.1080/09297049.2013.879111.

Cha, J., Fekete, T., Siciliano, F., Biezonski, D. K., Greenhill, L. L., Pliszka, S. R., Blader, J. C., Roy, A. K., Leibenluft, E. & Posner, J. E. (2015). Neural Correlates of Aggression in Medication-Naive Children with ADHD: Multivariate Analysis of Morphometry and Tractography. *Neuropsychopharmacology, 40,* 1717-1725. doi:10.1038/npp.2015.18.

Conners, C. K. (2008). *Conners' 3rd Edition*. North Tonawanda, NY: Multi-Health Systems.

Conners, C. K., Pitkanen, J. & Rzepa, S. R. (2011). *Conners comprehensive behavior rating scale*. New York: Springer.

Dajani, D. R., Llalbre, M. M., Nebel, M. B., Mostofsky, S. H. & Uddin, L. Q. (2016). Heterogeneity of executive functions among comorbid neurodevelopmental disorders. *Sci. Rep. 9*(6), 36566. doi: 10.1038/srep36566.

European Commission. 2013. *Mental Health Systems in the Europe Union Member States, Status of Mental Health in Populations and Benefits to be expected from investments into Mental Health. European profile of prevention and promotion of mental health (EuroPoPP-MH)*. Retrieved from http://www.adhdeurope.eu/images/files/MHSystems report.pdf.

Greenberg, L. S. (2015). *Emotion-Focused Therapy: Coaching Clients to Work Through their Feelings, Second Edition*. American Psychological Association.

Guvernul României (2016). *Strategia națională pentru sănătatea mintală a copilului și adolescentului 2016-2020 (National Strategy for Mental Health of Child and Adolescent 2016-2020)*. Retrieved from http://sgg.gov.ro/new/wp-content/uploads/2016/11/Anexa-Strategie.pdf.

Kendall, P. & Braswell, L. (1993). *Cognitive-behavioral therapy for impulsive children (2nd Ed.)*. New York: Guilford Press.

Korkman, M., Kirk, U., Kemp, S. (2007). *NEPSY. Evaluarea neuropsihologică a dezvoltării – Manual (NEPSY. Neuropsychological evaluation of development – Manual)*. SC COGNITROM SRL, Cluj-Napoca: Editura ASCR.

Kovacs, M. (1992). *Children's Depression Inventory*. North Tonawanda, NY: Multi-Health Systems.

Losinski M., Katsiyannis A., White Sherry & Wiseman N. (2016). Addressing the Complex Needs of Students with Attachment Disorders, *Intervention in School and Clinic 2016, Vol. 51*(3), 184-187. doi: 10.1177/1053451215585800.

Luria, A. R. (1973). *The working brain: an Introduction to neuropsychology*. New York: Basic Books.

Marsh, R. J. (2015). Identifying Students with Mental Health Issues: a Guide for Classroom Teachers. *Intervention in School and Clinic 2016, Vol. 51*(5), 318-322. doi: 10.1177/ 1053451215606706.

Scime, M., Norvilitis, J. M. (2006). Task performance and response to frustration in children with attention deficit hyperactivity disorder. *Psychology in the School 43*: 377-386. doi: 10.1002/pits.20151.

Sheridan, S. M. & Kratochwill, T. R. (2008). *Conjoint behavioral consultation: Promoting family-school connections and interventions*. New York: Springer.

Sheridan, S. M., Witte, A. L., Holmes, S. R., Wu, C., Bhatia, S. A. & Angell, S. R. (2017). The efficacy of conjoint behavioral consultation in the home setting: Outcomes and mechanisms in rural communities. *Journal of School Psychology, 62*, 81-101. doi: 10.1016/j.jsp.2017.03.005.

Ștefan, C. A. & Miclea, M. (2010). Prevention programs targeting emotional and social development in preschoolers: current status and future directions. *Early Child Development and Care*, vol. *180*, issue *8*, 1103-1128. doi: 10.1080/ 03004430902830263.

Purper-Ouakil, D., Ramoz, N., Lepagnol-Bestel, A., Gorwood, Ph. & Simonneau, M. (2011). Neurobiology of Attention Deficit/ Hyperactivity Disorder. *Nature*. Vol. *69*, No. *5*, Pt. 2, 69R-76R. doi: 10.1203/PDR.0b013e318212b40f.

Thomas, R., Sanders, S., Doust, J., Beller, E. & Glasziou, P. (2015). Prevalence of attention-deficit/ hyperactivity disorder: a systematic review and meta-analysis. *Pediatrics 135*: e994-1001. doi: 10.1542/peds.2014-3482.

Treuntig, J. J. & Hinshaw, S. P. (2001). Depression and Self-Esteem in Boys with Attention-Deficit/ Hyperactivity Disorder: Associations with Comorbid Aggression and Explanatory Attributional Mechanisms. *Journal of Abnormal Child Psychology*, Vol. *29*, No. *1*, 23-39.

Walton, E., Pingaul, J.-B., Cecil, C., Gaunt, T. R. Relton, C., Mill, J. & Baker, E. (2016). Epigenetic profiling of ADHD symptoms trajectories: A prospective methylome-wide study. *Molecular Psychiatry (2017) 22*, 250-256. doi: 10.1038/mp.2016.85.

Weber, E. B., Studeny, J., Kavanaugh, B. C. et al. (2018). Pediatric Depression Symptoms, Executive Functioning Weaknesses, and Associated Neuropsychological and Psychiatric Outcomes. *Journal of Child and Family Studies*, vol. *27*, Issue *5*, 1661-1670. https://doi.org/10. 1007/s10826-017-0999-7.

Wu, Z. M., Bralten, J., Cao, Q. J., Hoogman, M., Zwiers, M. P., An, L., Sun, L., Yang, L., Zang, Y. F., Franke, B. & Wang, Y. F. (2017). White Matter Microstructural Alterations in Children with ADHD: Categorical and Dimensional Perspectives. *Neuropsychopharmacology (2017) 42*, 572-580. doi: 10.1038/npp.2016.223.