Psychiatr. Pol. 2024; 58(5): 789–799
PL ISSN 0033-2674 (PRINT), ISSN 2391-5854 (ONLINE)
www.psychiatriapolska.pl
DOI: https://doi.org/10.12740/PP/OnlineFirst/163595

Randomized clinical trial evaluating the effect of metacognitive interventions on planning skills in children with attention-deficit/hyperactivity disorder (ADHD) with mixed symptom presentation. Pilot trial design

Natalia Kajka[1, 2], Agnieszka Kulik[2]

[1] 1st Department of Psychiatry, Psychotherapy and Early Intervention, Medical University of Lublin

[2] Chair of Psychotherapy and Health Psychology John Paul II Catholic University of Lublin

Summary

Aim. The aim of this experimental pilot study is to evaluate the effects of 25 metacognitive interventions on planning skills in children with ADHD.

Method. Forty-five children with ADHD aged 7–12 years ($M = 10.41$; $SD = 1.42$) participated in the experiment along with a parent. The children were randomly assigned to one of three groups, determining the type of metacognitive technique used in the training: (1) Mind Maps, (2) Sketching, or (3) Control. They participated in 25 thematic meetings. They were measured at the beginning and at the end of the trainings using the *Conners Questionnaire 3* and the *Park Map Test* tools.

Results. Significant differences were found in the intensity of the mean scores for the "Planning" variable between the first and second measurements ($M1 = 6.13$; $SD1 = 0.35$; $M2 = 5.67$; $SD2 = 0.82$) in the control group, and non-significant differences in the intensity of the mean scores for the groups with Mind Maps and Sketching. The effect size for the significant outcome is high ($rc = 0.53$).

Conclusions. In the children who did not participate in the training, the score worsened, while the score of children in the experimental groups was unchanged.

Key words: metacognitive strategies, planning skills, ADHD

Introduction

Planning is recognized as one of the key executive functions responsible for higher-order processes: thinking about future events, predicting the correct way to perform

a task, and achieving a specific goal [1]. Improving these processes is important especially for children who, due to neurodevelopmental deficits, need special support in this area [2, 3]. Children with attention-deficit/hyperactivity/impulsivity disorder (ADHD) are among those at risk.

In Barkley's neuropsychological model of executive function in children with ADHD, planning is referred to as internalizing speech [4]. This element in the model is conceptualized as the ability to create self-controlled instructions (a.k.a. inner speech). By means of internalized speech, children can give themselves practical instructions to help both in planning and in completing motor activities that have been started, creating internalized rules of behavior [5]. In the case of children with ADHD, problems with self-management in time and thus the ability to plan and make appropriate choices, are among those more frequently cited by parents, teachers, and researchers [6, 7]. Children have difficulty with planning longer written forms, homework and note-taking in class [8, 9], as well as the ability to read silently with comprehension and to reflect on the text they are reading, multitasking unrelated to the task, and managing themselves in time [4].

Barkley reviewed a selection of (in)effective ADHD therapies/interventions [10] and noted that stimulation of executive functions can lead to their enhancement and thus a reduction in ADHD symptoms [4]. Barkley [10] and DuPaul and Eckert [11] indicated that time management strategies and academic interventions are more effective for changing the behavior of children with ADHD than traditional cognitive-behavioral strategies. The significant impact of school-based interventions in the form of ready-made educational programs is also recognized [2, 12].

Metacognitive interventions

Metacognition is understood as an approach that helps to recognize one's cognitive (in)abilities, monitor them, and choose strategies that can help to solve the difficulties one encounters during the learning process [13]. Mind Maps and Sketching are recognized as interventions to enhance memorization, planning and organization of material, and metacognition [14–17]. Research confirms that their regular use enhances selected executive functions (working memory, response inhibition processes, emotional-motivational self-regulation) in children with ADHD [8, 14, 18, 19]. Visual modalities for effective learning help children and adults to structure content, have greater control over the issues being written down, and critical thinking or creativity [15, 19, 20]. In addition, visual methods have become a useful tool for teachers assessing the level of understanding of the issues students are working on [16, 21]. Until recently, visual techniques were used to reinforce school skills; currently, they are increasingly used in psychoeducation and (psycho)therapy [19, 22, 23].

In the Mind Maps technique, which was developed by Tony Buzan, the main concept is represented by a radial structure; the most important issue has correspondingly consecutive key words departing from the original category. Consequently, a radial sun is formed in the middle of the page [16]. The drawing note, whose authorship is attributed to Mike Rohde, is less structured. Its main advantage is the free representa-

tion of content through images and words [14, 17]. The literature indicates that the effectiveness of these tools is based on Allan Paivio's dual coding process (word and image) [17]. The regular use of visual techniques (metacognition strategies) may be related to neuroplasticity, the ability of the nervous system to regenerate and create new connections, functions and structures resulting from stimulation or learning new skills [14, 24, 25]. Morphometric changes (focal increases in grey matter volume in the bilateral middle frontal cortex and right inferior-posterior cerebellum) have been reported following cognitive (school) training for children with ADHD. These areas are associated with attentional activity and reduced ADHD symptoms [25]. The reports are consistent with experimental studies on the effects of metacognitive training in children with ADHD [26, 27].

Aim of the study

The aim of the present pilot study was to evaluate the effects of two metacognitive interventions (Mind Maps and Sketching) on planning skills in school-aged children with ADHD compared to a control group (without intervention). It was hypothesized that participation in the Mind Maps training would enhance the executive functions responsible for planning in children with ADHD more than in children participating in the Sketching training. There would be no significant improvement in planning skills in the control group (without intervention).

Method

Study design

This randomized controlled trial (RCT) was designed according to *Consolidated Standards of Reporting Trials* (CONSORT) guidelines [28]. The design procedure should be divided into two phases: (1) the establishment of the Empirical ADHD Research Team and its preparation to conduct classes with children, the development of handouts for 25 thematic classes, the preparation of information leaflets for Lublin primary schools and psychological-educational counseling centers (list downloaded from the website of the Board of Education in Lublin), and the establishment of a Facebook Fanpage where the promotion of the event took place; and, (2) the phase in which children were invited to the first meeting, during which the clinical interview and the assessment of the child's inclusion in the study with randomization took place. The researchers formulated the following question: "Would the participation of school-aged children with ADHD in metacognitive training enhance their executive functions responsible for planning relative to children who did not participate in the training (the control group of children with ADHD), and would participation in the Mind Maps training enhance executive functions responsible for planning in children with ADHD more than in children participating in the Sketching training?" For this purpose, children were randomized into three groups: (1) with the Mind Maps intervention, (2) the Sketching intervention, and (3) control children with ADHD without an intervention.

Randomization of participants

A representative sample of 300 children with ADHD aged 7–12 (criterion: 2–3.4% of children aged 7–12 have ADHD) [29, 30]. In the pilot study, it was assumed that a sample size of 3x15 would be sufficient for exploration of the issue, preparing for the study as outlined in the California Evidence-Based Clearinghouse for Child Welfare (CEBC) protocols [31]. Participants who applied for the study were first invited to an initial meeting with a psychologist. When a participant met the inclusion criteria, a random number generator assigned them a number from 1 to 45 (1–15 being the Mind Maps group, 16–30 the Sketching group, and 31–45 the control group). When the drawn number had already been assigned to another participant in the study, the draw was repeated. Once the participant was allocated to group 1 or 2, an appointment schedule was agreed upon with the parent and child. The child with a number between 31–45 was invited three months later for a second measurement and then could take part in the training, outside the project. The whole randomization procedure was carried out by the researcher, who did not conduct the training.

Training

The content of the activities and the way they were carried out in both groups was identical (according to the lesson outlines), the only difference being the two types of metacognitive interventions. In group 1, the children drew a Mind Map in accordance with the topic of the lesson, which had a clear structure and followed Buzan's principles [17]. In group 2, the children were expected to make a Sketching appropriate to the topic of the class, which had no clearly defined structure and in which no words were allowed. For groups 1 and 2, classes were held twice a week and lasted 60 min. One child attended classes taught by 3 coaches, who rotated periodically in delivering classes to different children (a safeguarding mechanism against the influence of uncontrollable variables such as rapport). The coaches signed up a week in advance for classes with different children (the rule was not to have classes with one child twice in a row). The coaches did not know the results of the survey from the first measurement of the children. The thematic meetings were conducted according to the effective learning principle of the Kolb cycle: a short experience related to the topic, a child's reflection from the activity, another activity, a theoretical completion of the topic (trainer), a task for the child using the knowledge and skills acquired during the activity. In between these elements, the child made parts of a Mind Map/Sketching. The course of the exercises was the same in both groups. There was a total of 25 thematic meetings and two meetings in which the children were examined with psychological tests (at the beginning and at the end of the training) by an independent researcher who did not conduct the training. Children in the control group were tested twice, at the beginning of the project and after three months (equivalent to metacognitive training).

The research project was conducted at a university. It met the guidelines of the Declaration of Helsinki and the Research Ethics Committee of the Institute of Psychology of the Catholic University of Lublin (protocol code 09.06.2016).

Participants

Overall, 47 children and their parents (N = 47) were enrolled in the project; however, two children and parents from the intervention groups were excluded from the study due to difficulties in meeting on time. In the end, 90 participants took part; 45 children with ADHD (M = 10.41; SD = 1.42) and their parents (N = 45). Children who were 10–12 years old were eligible for the study. The mean age of the participants (M = 10.41; SD = 1.42) was comparable in all three groups (M = 10.25–10.46; SD = 0.82–1.02). Most participants were boys (13 participants each in groups 1 and 3, 12 participants in group 2). Inclusion criteria: intellectual norm (documented on the basis of a psychological and pedagogical opinion), psychiatrist-documented ADHD (according to the ICD-10 Classification applicable during recruitment, defined as F.90 Hyperkinetic disorder), no other neurological diseases or chronic physical complaints (exception: allergies). Medication taken was a controllable variable in this study. The way in which the medication affected the child's cognitive functioning was determined from the medical leaflet. Medication with a positive effect on cognitive function was taken by one child in group 1. Neutral medication (a set of vitamins) was taken by 3 participants (one child in each of the three groups).

Research tools

A toolkit was used separately for parent and child.

Parent: a clinical interview with the parent of a potential study participant, a questionnaire on the child's health status and family situation, and the *Conners ADHD Diagnosis Questionnaire Set* (3rd edition) used to diagnose ADHD, assess symptom severity and presentation, and detect co-occurring disorders. The questionnaire contains 108 items to which the person is asked to respond on a scale from 0 (not true) to 3 (definitely true). In addition, two descriptive questions were introduced. The psychometric properties of the tool are high (internal consistency (0.84–0.95) and stability for most scales (0.85–0.93). The test has a Polish adaptation and norms [32].

Child: the *Park Map* test belongs to the *Cognitive Function Diagnosis Battery* (PU-1) used to assess planning skills. The test is administered using a sheet and pencil. The children are asked to draw a walking route on the Park Map according to the instructions they have heard to go past the designated points. The assessment of the test is based on the number of conditions met in the appropriate time. There are 7 conditions. When interpreting the results, it is possible to analyze both indicators (time and conditions met). In this project, the analysis of the fulfilled conditions by the children is taken as a planning indicator. The psychometric properties of this test are satisfactory (Cronbach's $\alpha = 0.61$) [33]. The battery has Polish standardization and recommendation for psychological clinical diagnosis of children and adolescents [34]. The theoretical basis of the test is based on Barkley's neuropsychological model of executive functions of children with ADHD [4], which provides a consistent theoretical foundation for the present project.

Results

Calculation strategy

The data analysis in this study was performed in the statistical software IBM SPSS Statistics, version 26. The study assumes a confidence level of 0.05. Descriptive statistics will be presented in the first step, followed by a one-way analysis of variance (ANOVA) to test whether there are statistically significant differences between the groups before and after the intervention. Due to the number of subjects, the Games-Howell *post-hoc* test will be applied. In the next step, the non-parametric Wilcoxon sign test and measures of central tendency determine the direction of difference. To indicate the effect size of a given test, a rank biserial correlation coefficient was calculated for matched pairs – *rc*.

Children with ADHD with mixed symptom presentation

The scores obtained by the tested children ranged from 6 to 60 (Table 1), therefore all children met the criterion for ADHD with mixed subtype (min. 6). The mean number of severity of the mixed ADHD index obtained by the subjects in the whole group (M = 40.13; SD = 14.31) exceeds the number of at least 6, thus indicating the presence of this symptom above the accepted norm.

Table 1. **Characteristics of mean scores on the Conners Questionnaire 3 for children with mixed symptom presentation**

ADHD with mixed symptom presentation		
	N = 45	Norms*
M	40.13	0–6
SD	14.31	
Min	6	
Max	60	

* The given norms were adopted on the basis of the average age of the children (M = 10.41).

Planning

The scores obtained by the tested children ranged from 2 to 7 (Table 2). The mean number of conditions met across the group (M = 5.78; SD = 1.04) is within the age-approved norms. The cut-off point between low and high scores is a value of 6 (Me = 6). In the first measurement, the lowest number of fulfilled conditions was obtained by children classified in the Sketching group (M = 5.40; SD = 1.24) and the highest number was obtained by children in the control group (M = 6.13; SD = 0.35). Despite this, there were no statistically significant differences between the study groups in both the first and second measures ($F_{I}(2.42) = 1.942$; p = n.s.; $F_{II}(2.42) = 2.124$; p = n.s.).

In the next step, a non-parametric Wilcoxon sign test was performed. The result shows significant differences in the intensity of the means for the "Planning" variable between the first and second measurements ($M_1 = 6.13$; $SD_1 = 0.35$; $M_2 = 5.67$; $SD_2 = 0.82$) in the control group, and non-significant differences in the groups with the Mind Maps and Sketching. A rank biserial correlation coefficient indicating the effect size index for the significant outcome was also calculated ($rc = 0.53$). Its value indicates that the effect is large. This means that the children who did not participate in the training achieved significantly fewer conditions in the second measurement than in the first one that should have been met, and the quantitative effect size is large.

Table 2. **Presentation of mean and difference scores for the "Planning" variable as measured by the Park Map Test**

Planning							
Group	Mind Maps		Sketching		Control		Norms
Measurement	I	II	I	II	I	II	0–6
M	5.8	6.27	5.4	5.67	6.13	5.67	
SD	1.21	0.59	1.24	1.23	0.35	0.82	
M_e	6	6	6	6	6	6	
Min	2	5	2	3	6	4	
Max	7	7	6	7	7	7	
ANOVA (measurement I, II)			$F_I(2.42) = 1.942$; p = n.s. $F_{II}(2.42) = 2.124$; p = n.s.				

Discussion of results

The aim of this pilot study was to evaluate the effects of two metacognitive interventions (Mind Maps and Sketching) on planning skills in school-aged children with ADHD compared to a control group (no intervention). It was hypothesized that participation in the Mind Maps training would enhance the executive functions responsible for planning in children with ADHD more than in those participating in the Sketching training, while there would be no significant improvement in planning skills in the control group.

The present study revealed several interesting points: 1) the results of the conducted experimental study did not support the postulated research hypothesis and the 25 hours of metacognitive training did not enhance the executive functions responsible for planning; and 2) the children who did not participate in metacognitive training for three months worsened their planning executive functioning. Studies available in the literature assessing planning function indicate that it is impaired in children with neurodevelopmental disorders [6, 30]. However, there is a lack of reports that recommend specific strategies to develop planning skills in children with ADHD. Available programs based on a set of differentiated interventions often show enhancement of

selected executive functions, such as response inhibition or working memory, but planning in these studies is unchanged or report very little improvement [26, 27, 35, 36]. Mind Maps and Sketching should ultimately influence the development of planning skills, in line with results in healthy children and adults. The reason for the lack of significant differences between the measures may be due to the baseline level of scores falling within the normal range in children with ADHD. An argument for this is the data showing that children with the lowest executive function scores tend to gain the most from programs targeting these functions [37]. Another reason could be the predictability of the training structure (activity, Mind Map/Sketching, reflection, Mind Map/Sketching, theory, Mind Map/Sketching, application – activity, Mind Map/Sketching, summary), which created a situation of working in an imposed order and did not require the child to self-organize. Another reason could be the duration of the intervention, which was sufficient to sustain this skill, but insufficient to achieve a positive reinforcement of planning skills in relation to the first measurement.

The observed effect of deterioration in planning performance that occurred in the group of children without intervention deserves more research attention and a larger sample size in future studies. Indeed, if confirmed in the future, it could indicate regression of skills related to executive functions by lack of stimulation. Similar effects have been found in patients with frontal lobe disorders [38].

Research limitations and directions for further research

The assumption of a positive effect of metacognitive training on planning skills in children with ADHD was not confirmed. Nevertheless, the pilot study presented here suggests that it is worthwhile to undertake research on a larger sample, focusing on the effect of regression of planning scores in the control group relative to the other groups with the intervention and using more differentiated planning measurements [1, 6].

However, it should be borne in mind that the performed analyzes of non-parametric tests are less conservative and the obtained results cannot be generalized to the entire population. Therefore, the obtained results should be treated with caution. In the future, it is worth examining children with other psychological tools measuring the ability to plan, as well as enriching this dimension with the analysis of parents' and teachers' assessments. The possibility of including neurophysiological indicators in the research also seems to be a valuable idea.

References

1. Boyer BE, Geurts HM, Van der Oord S. *Planning skills of adolescents with ADHD*. J. Atten. Disord. 2018; 22(1): 46–57. doi:10.1177/1087054714538658
2. Breaux RP, Langberg JM, Molitor SJ, Dvorsky MR, Bourchtein E, Smith ZR et al. *Predictors and trajectories of response to the Homework, Organization, and Planning Skills (HOPS) intervention for adolescents with ADHD*. Behav. Ther. 2019; 50(1): 140–154. doi:10.1016/j.beth.2018.04.001

3. Bikic A, Reichow B, McCauley SA, Ibrahim K, Sukhodolsky DG. *Meta-analysis of organizational skills interventions for children and adolescents with attention-deficit/hyperactivity disorder*. Clin. Psychol. Rev. 2017; 52: 108–123.
4. Barkley RA. *Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD*. Psychol. Bull. 1997; 121(1): 65–94. doi:10.1037/0033-2909.121.1.65
5. Barkley RA. *Impaired delayed responding: A unified theory of attention-deficit hyperactivity disorder*. In: Routh DK, editor. *Disruptive behavior disorders: Essays in honor of Herbert Quay*. New York: Plenum; 1994. P. 11–57.
6. Salcedo-Marin MD, Moreno-Granados JM, Ruiz-Veguilla M, Ferrin M. *Evaluation of planning dysfunction in attention deficit hyperactivity disorder and autistic spectrum disorders using the zoo map task*. Child Psychiatry Hum. Dev. 2012; 44(1): 166–185. doi:10.1007/s10578-012-0317-y
7. Shimoni M, Engel-Yeger B, Tirosh E. *Executive dysfunctions among boys with attention deficit hyperactivity disorder (ADHD): Performance-based test and parents report*. Res. Dev. Disabil. 2012; 33(3): 858–865. doi:10.1016/j.ridd.2011.12.014
8. Kajka N, Kulik A. *Application of metacognitive strategies in the development of emotional and motivational self-regulation of students with special educational needs. Research on children with ADHD*. Curr. Probl. Psychiatry. 2021; 22(4): 284–293. https://doi.org/10.2478/cpp-2021-0020
9. DuPaul GJ, Evans SW, Owens JS, Cleminshaw CL, Kipperman K, Fu Q et al. *School-based intervention for adolescents with attention-deficit/hyperactivity disorder: Effects on academic functioning*. J. Sch. Psychol. 2021; 87: 48–63. doi:10.1016/j.jsp.2021.07.001
10. Barkley RA. *Adolescents with attention-deficit/hyperactivity disorder: An overview of empirically based treatments*. J. Psychiatr. Pract. 2004; 10(1): 39–56.
11. DuPaul GJ, Eckert TL. *The effects of school-based interventions for attention deficit hyperactivity disorder: A meta-analysis*. Sch. Psychol. Dig. 1997; 26: 5–27. doi:10.1080/02796015.1997.12085845
12. Abikoff H, Gallagher R, Wells KC, Murray DW, Huang L, Lu F et al. *Remediating organizational functioning in children with ADHD: Immediate and long-term effects from a randomized controlled trial*. J. Consult. Clin. Psychol. 2013; 81(1): 113–128. doi:10.1037/a0029648
13. Pezzica S, Vezzani C, Pinto G. *Metacognitive knowledge of attention in children with and without ADHD symptoms*. Res. Dev. Disabil. 2018; 83: 142–152. doi:10.1016/j.ridd.2018.08.005
14. Kajka N, Kulik A. *The influence of metacognitive strategies on the improvement of reaction inhibition processes in children with ADHD*. Int. J. Environ. Res. Public Health 2021; 18(3): 878. https://doi.org/10.3390/ijerph18030878
15. Joshi R, Hadley D, Nuthikattu S, Fok S, Goldbloom-Helzner L, Curtis M. *Concept mapping as a metacognition tool in a problem-solving-based BME course during in-person and online instruction*. Biomed. Eng. Educ. 2022; 2(2): 281–303. doi:10.1007/s43683-022-00066-3
16. Martín-García R, López-Martín C, Arguedas-Sanz R. *Collaborative learning communities for sustainable employment through visual tools*. Sustainability 2020; 12(6): 2569. https://doi.org/10.3390/su12062569
17. Tidy H, Burnham R, Elkington S. *Using sketchnoting as a revision aid with forensic students*. Sci. Justice 2022; 62(6): 822–826. https://doi.org/10.1016/j.scijus.2022.04.008
18. Kajka N. *The influence of metacognitive training on the improvement of working memory in children with ADHD*. Curr. Probl. Psychiatry 2019; 20(3): 217–227. https://doi.org/10.2478/cpp-2019-0015

19. Alsuraihi AA. *The effect of implementing mind maps for online learning and assessment on students during COVID-19 pandemic: A cross sectional study*. BMC Med. Educ. 2022; 22(1): 169. doi:10.1186/s12909-022-03211-2

20. Chen Y, Xiao H, Lin X. *Developing a mind map-based life review program to improve psychological well-being of cancer patients: A feasibility study*. Psychooncology 2018; 27(1): 339–342. doi:10.1002/pon.4406

21. Ellozy AR, Mostafa HMH. *Making learning visible: Using E-maps to enhance critical reading skills*. MERLOT J. Online Learn. Teach. 2010; 6(3); 634–646.

22. Kajka N, Szymona K. *Terapia ADHD. Trening sukcesu w pracy z dzieckiem nadpobudliwym*. Lublin: Czelej; 2014.

23. Ziadat AH. *Sketchnote and working memory to improve mathematical word problem solving among children with dyscalculia*. Int. J. Instr. 2022; 15(1): 509–526. doi: 10.29333/iji.2022.15129a

24. Carey L, Walsh A, Adikari A, Goodin P, Alahakoon D, De Silva D et al. *Finding the intersection of neuroplasticity, stroke recovery, and learning: Scope and contributions to stroke rehabilitation*. Neural. Plast. 2019; 2019: 5232374. doi:10.1155/2019/5232374

25. Hoekzema E, Carmona S, Ramos-Quiroga JA, Barba E, Bielsa A, Tremols V et al. *Training-induced neuroanatomical plasticity in ADHD: A tensor-based morphometric study*. Hum. Brain Mapp. 2011; 32(10): 1741–1749. doi:10.1002/hbm.21143

26. Tamm L, Nakonezny PA, Hughes CW. *An open trial of a metacognitive executive function training for young children with ADHD*. J. Atten. Disord. 2014; 18(6): 551–559. doi:10.1177/1087054712445782

27. Qian Y, Chen M, Shuai L, Cao QL, Yang L, Wang LW. *Effect of an ecological executive skill training program for school-aged children with attention deficit hyperactivity disorder: A randomized controlled clinical trial*. Chin. Med. J. 2017; 130(13): 1513–1520. doi: 10.4103/0366-6999.208236

28. Hopewell S, Clarke M, Moher D et al. *CONSORT for reporting randomized controlled trials in journal and conference abstracts: Explanation and elaboration*. PLoS Med. 2008; 5(1): e20. doi:10.1371/journal.pmed.0050020

29. Bryńska A, Pęska A, Wolańczyk T. *Współwystępowanie zespołu nadpobudliwości psychoruchowej i zaburzeń tikowych – implikacje terapeutyczne*. Psychiatr. Dypl. 2017; 14(6): 35–40.

30. Ostaszewski K, Kucharski M, Stokwiszewski J. *Wyniki badania dzieci i młodzieży (wiek 7–17 lat). Konferencja projektu EZOP II Warszawa, 15–16 listopada 2021*. https://ezop.edu.pl/wpRandomizowanebadanie kliniczne oceniające wpływ interwencji metapoznawczych 11-content/uploads/2021/12/EZOPII_Wyniki-badania-dzieci-i-mlodziezy-7-17-lat.pdf (retrieved: 1.06.2023).

31. Wennberg B, Janeslätt G, Kjellberg A, Gustafsson PA. *Effectiveness of time-related interventions in children with ADHD aged 9–15 years: A randomized controlled study*. Eur. Child Adolesc. Psychiatry. 2018; 27(3): 329–342. doi:10.1007/s00787-017-1052-5

32. Wujcik R, Wrocławska-Warchala E. *Conners 3 ®. Zestaw kwestionariuszy do diagnozy ADHD i zaburzeń współwystępujących*, 3rd ed. *Podręcznik*. Warsaw: Psychological Test Laboratory of the Polish Psychological Association; 2018.

33. Borkowska AR, Sajewicz-Radke U, Lipowska M, Kalka, D. *Bateria diagnozy funkcji poznawczych dzieci w wieku 10–12 lat: PU1. Podręcznik*. Gdansk: Psychological and Pedagogical Test Laoratory; 2016.

34. Sitnik-Warchulska K, Izydorczyk B, Lipowska M. *Wyzwania klinicznej diagnostyki psychologicznej dzieci i młodzieży. Rekomendacje konsultantów w dziedzinie psychologii klinicznej*. Psychiatr. Psychol. Klin. 2019; 19(1): 54–62. DOI: 10.15557/PiPK.2019.0008

35. Chu L, Zhu P, Ma C, Pan L, Shen L, Wu D et al. *Effects of combing group executive functioning and online parent training on school-aged children with ADHD: A randomized controlled trial*. Front. Pediatr. 2022; 9: 813305. Published 2022 Feb 11. doi:10.3389/fped.2021.813305
36. Boyer BE, Geurts HM, Prins PJ, Van der Oord S. *Two novel CBTs for adolescents with ADHD: The value of planning skills*. Eur. Child. Adolesc. Psychiatry 2015; 24(9): 1075–1090. doi:10.1007/s00787-014-0661-5
37. Tamm L, Nakonezny PA. *Metacognitive executive function training for young children with ADHD: A proof-of-concept study*. Atten. Defic. Hyperact. Disord. 2015; 7(3): 183–190. doi:10.1007/s12402-014-0162-x
38. Szepietowska EM, Gawda B. *Mechanizmy neuronalne fluencji semantycznej i literowej: badania z użyciem fMRI. Implikacje kliniczne*. Polskie Forum Psychologiczne 2016; 21(2): 170–187. doi:10.14656/PFP20160202
39. Kajka N, Kulik A. *The assessment of the impact of training with various metacognitive interventions on the enhancement of verbal fluency in school-age children with ADHD*. J. Atten. Disord. 2023; 27(1): 89–97. doi:10.1177/10870547221121289.

Address:
e-mail: akulik@kul.pl