

CREATIVE THINKING OF CHILDREN WITH ADHD AND THEIR PERFORMANCE IN LANGUAGE AND MATHEMATICS

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Abstract

The purpose of this research is to study the relationship between the creative thinking of children with ADHD and their performance in Language and Mathematics. That is, we sought to explore the creative possibilities in speech and drawing of children with ADHD and the relationship of the individual factors of their creative thinking such as fluency, flexibility, originality, the abstract form of the titles, etc. with the performance of these children in selected factors in language and mathematics such as reading proficiency, reading comprehension, calculations, solving mathematical problems, etc. The sample of our study was a total of 13 primary school children from the 5th and 6th grade (9 boys and 4 girls) attending schools in the city of Rethymno in Crete, Greece. All children had been diagnosed with ADHD. For the collection of research data, the Test Torrance of Creative Thinking (TTCT, 1998, Verbal and Figural) was used for creative thinking, the Reading Test Test-A (Panteliadou & Antoniou, 2007) for language while the Psychometric criterion of Mathematical Proficiency for children and adolescents (Barbas, Vermeoulen, Kioseoglou, & Menexes, 2008) for mathematics. The SPSS22 statistical program and the non-parametric Spearman rho test were used to analyze the collected data. According the research findings, there is a positive statistically significant relationship between the most factors of figural creative thinking of children with ADHD and their performance in mathematics. The language performance of children with ADHD seemed to have a positive statistically significant correlation only with two factors of figural scale (fluency and originality) of the TTCT. We hope that the results of our research, although based on a relatively small sample, will contribute to the understanding and study of the special characteristics of children with ADHD and their education.

Keywords: *Creativity, ADHD, school performance, creative thinking.*

1. Introduction

1.1. Creativity and creative thinking

Creativity is considered one of the most controversial concepts, although it has been the subject of research and study in several scientific domain. According to Barron and Harrington (1981), the term creativity refers to the ability of the individual to invent something innovative, activating in a specific time a specific mental function. For Anwar, Shamim and Hap (2012) creativity, is that characteristic of people related to the production of new and original ideas. However, one of the derivatives of creativity is the creative thinking. According to Kampylis and Berki (2014) all people seem to have creative thinking abilities and creative ideas, however children have the ability to think in a more creative, open and playful way and their thinking tends to diverge.

1.2. Relationship between creativity, school performance and ADHD

Creativity and the creative way of thinking consist of the basic skills of children, for the cultivation of which the modern school plays a pivotal role. It was found that creativity is not only related to school performance but can predict to a satisfactory level the success rates of students in learning processes (Kozbelt, Beghetto, & Runco, 2010). According to Mendelsohn (1976), creative people often show signs of distraction, which also characterizes people with Attention Deficit Hyperactivity Disorder (ADHD). Barkley's (2005) research claims that the prevalence of ADHD in the student population on a scale of 5% to 7%. However, according to Leroux and Levitt-Perlman (2000), studies on children with ADHD often focus on the problems, diagnosis, and treatment of the disorder and rarely refer to the fact that the characteristics of the disorder have an impressive resemblance to areas of creativity. As a result, in many cases giftedness overshadows ADHD and vice versa. Shaw and Brown (1991), who examined a group of

16 children with ADHD and a control group of 16 typically developing children concluded that children with ADHD used more imagination in problem solving and achieved quite higher scores than the typically developing children in a creative drawing test. In another study, Gracia, Juan, and Marta (2017), examined a group of 34 children, aged 8 to 13, diagnosed with ADHD and a group of 34 typically developing children and concluded that children with ADHD achieved higher ratings in fluency, in originality and creative strengths (story-telling, feelings expression, humour, imagination). The above finding created the need to study the tripartite ADHD, creativity and school performance.

2. The problem and the purpose of the study

Despite the encouraging results of the above research on the relationship between the creativity of children with ADHD and school performance, research in this domain is lacking. The evaluation of creative thinking in speech and drawing of children with ADHD, as well as the evaluation of their performance in language and mathematics were correlated in our research to study their creative skills and their connection with their academic performance.

3. Methods

3.1. Research hypotheses

The present research examined four research hypotheses based on the research tools which used and the performance of children with ADHD in tests of creative thinking, language and mathematics:

1st research hypothesis: The children with ADHD, who achieve high performance in language, will also achieve high performance in creative thinking in speech (TTCT-Verbal).

2nd research hypothesis: The children with ADHD, who achieve high performance in language, will also achieve high performance in creative thinking in drawing (TTCT- Figural).

3rd research hypothesis: The children with ADHD, who achieve high performance in mathematics, will also achieve high performance in creative thinking in speech (TTCT- Verbal).

4th research hypothesis: The children with ADHD, who achieve high performance in mathematics, will also achieve high performance in creative thinking in drawing (TTCT- Figural).

3.2. Participants

The sample of our study was a total of 13 primary school children (9 boys and 4 girls) attending schools in the city of Rethymno in Crete. All children had been diagnosed with ADHD.

3.3. Research tools

The performance of the research tools was done individually for each child and was completed in two meetings. In the first meeting, were given them the Reading Test (Test-A) (Panteliadou & Andoniou, 2007) and the Psychometric Criterion of Mathematical Proficiency for children and adolescents (Barbas, Vermeoulen, Kioseoglou, & Menexes, 2008) and in second meeting were given them the Torrance Test of Creative Thinking (Verbal and Figural) (TTCT, Torrance, 1998). More specifically, the creative thinking in speech was tested by three main factors: fluency, originality and flexibility. The creative thinking in drawing was tested by six mains factors: fluency, originality, flexibility, abstractness of titles, resistance to premature closure and creative strengths total. Performance in language was tested by four mains factors: reading decoding, reading fluency, morphology- syntax and reading comprehension. Finally, Performance in mathematics was tested by three mains factors: vocabulary, calculations and maths-problem-solving.

4. Research results

The analysis of the research data was carried out with the statistical package SPSS22. In order to investigate the relationship between the performances of children with ADHD, in creative thinking (verbal and figural) and in language, as well as in creative thinking (verbal and figural) and mathematics, a correlation analysis was carried out with the Spearman rho index, due to the small number of the sample. The results showed that regarding the first and third research hypotheses, there are no statistically significant relationships between the factors of creative thinking in speech and the linguistic and mathematical factors in children with ADHD. Then the results of the research that presented statistically significant correlation with individual factors of the variables under study are detailed. The results showed that there is a positive statistically significant correlation in some factors of the second and fourth research hypotheses. More specifically, regarding the second research hypothesis, positive statistically significant correlation in the language test are observed in the morphology-syntax set with the variables: fluency and

originality in the drawing scale of the TTCT-Figural ($\rho(11)=0.64$, $p=0.019<.05$ and $\rho(11)=0.56$, $p=0.049<.05$ respectively). Also, positive statistically significant correlation are observed in the reading comprehension set of the language test with the fluency set in the drawing scale of the TTCT-Figural ($\rho(11)=0.60$, $p=0.031<.05$) (Table 1).

Table 1. Correlations (Spearman rho) between the variables of language performance and creative thinking, through the design scale in the TTCT-Figural.

	1	2	3	4	5	6	7	8	9	10
1. Total fluency_figural	-									
2. Total originality_figural	.915**	-								
3. Total flexibility_figural	.588*	.396	-							
4. Total abstractness of titles_figural	.783**	.712**	.621*	-						
5. Total resistance to premature closure_figural	.749**	.580*	.691**	.809**	-					
6. Total creative strengths_figural	.829**	.724**	.792**	.832**	.722**	-				
7. Total reading decoding_Test-A	.439	.398	.084	.477	.349	.194	-			
8. Total reading fluency_Test-A	.281	.236	.203	.387	.394	.192	.731**	-		
9. Total morphology- syntax_Test-A	.637*	.555*	.178	.427	.432	.255	.653*	.515*	-	
10. Total reading comprehension_Test-A	.599*	.375	.374	.368	.528	.355	.466	.562*	.831**	-

*** $p<.001$ ** $p<.01$ * $p<.05$

Regarding the fourth research hypothesis, the results showed that there is a positive statistically significant correlation between two factors, the mathematic performance and the creative thinking by the drawing scale of the TTCT-Figural ($\rho(11)=0.79$, $p=0.001<.05$). Also, positive statistically significant correlation are observed between the total vocabulary set with the variables: fluency, originality and abstractness of titles in the drawing scale of the TTCT-Figural ($\rho(11)=0.73$, $p=0.005<.05$, $\rho(11)=0.68$, $p=0.01<.05$, and $\rho(11)=0.56$, $p=0.049<.05$ respectively). Furthermore, the total calculations set with the variables: fluency, originality, abstractness of titles, resistance to premature closure and creative strengths in the drawing scale of the TTCT-Figural ($\rho(11)=0.80$, $p=0.001<.05$, $\rho(11)=0.67$, $p=0.011<.05$, $\rho(11)=0.69$, $p=0.009<.05$, $\rho(11)=0.72$, $p=0.006<.05$ και $\rho(11)=0.64$, $p=0.019<.05$ respectively). Finally, total of maths-problem-solving set with the variables: fluency and originality in the drawing scale of the TTCT-Figural ($\rho(11)=0.70$, $p=0.008<.05$ and $\rho(11)=0.80$, $p=0.001<.05$ respectively) (Table 2).

Table 2. Correlations (Spearman rho) between the variables of mathematics performance and creative thinking, through the design scale in the TTCT-Figural.

	1	2	3	4	5	6	7	8	9
1. Total fluency_figural	-								
2. Total originality_figural	.915**	-							
3. Total flexibility_figural	.588*	.396	-						
4. Total abstractness of titles_figural	.783**	.712**	.621*	-					
5. Total resistance to premature closure_figural	.749**	.580*	.691**	.809**	-				
6. Total creative strengths_figural	.829**	.724**	.792**	.832**	.722**	-			
7. Total vocabulary_mathematics	.727**	.683*	.150	.556*	.402	.486	-		
8. Total calculations_mathematics	.803**	.677*	.387	.688**	.712**	.636*	.722**	-	
9. Total maths-problem-solving_mathematics	.699**	.798**	.278	.438	.364	.396	.597*	.599*	-

*** $p<.001$ ** $p<.01$ * $p<.05$

5. Discussion

The purpose of the present research is to examine the connection of the creative thinking performance of children with ADHD in speech and drawing with their performance in language and mathematics. The results research showed that there is no statistically significant correlation between the total scores of children with ADHD in their language performance and their creative thinking, which was tested through the TTCT-Figural. The above finding is confirmed by the research of Zbainou, Belogianni, and Katsampanis (2019), which studied the relationship between creativity and school performance of 5th and 6th grades children. The results showed that there is no correlation between the students' performance in the Torrance test and their performance in the language course. However, in the further processing of the correlations made to the in-dividual factors of the drawing scale, it appeared that in our research, there is a statistically significant correlation between reading comprehension and the fluency of the drawing scale examined by the TTCT. The above finding is confirmed by the research of Sur and Ates (2022), who studied the relationship between the reading and listening comprehension of texts and the creative thinking of children studying in the 5th grade. The results of their research showed there is also a significant correlation between reading comprehension and fluency, which is one of the factors of creativity examined by the TTCT. According to the fourth research hypothesis, it was found that there is a positive statistically significant correlation between the two variables, mathematical performance and creative thinking through the drawing scale of the TTCT-Figural. The research of Klavir and Gorodetsky (2009) agrees with the above findings, who compared the performance of gifted and non-gifted students in mathematics with their performance in the areas of fluency, flexibility and originality. The results of the specific research showed that students with high performance and gifted abilities in mathematics presented a more readiness to engage in the creative process, a high ability to think of different mathematical ideas, which were directly related to the stimulus as well as a very good performance in processing of their ideas but also in the originality of the solutions they proposed. Although the above research refers to children with typical development, the research by Gracia, Juan, and Marta (2017) was studied the creative thinking of the 34 children with ADHD and the 34 children of typical development through the TTCT, showed that children with ADHD scored higher percentages in fluency and originality, giving more and more unusual answers as well as having higher performance compared to children with typical development in creative powers (telling stories, expressing emotions, humor, imagination). It would be useful at this point to mention that in the present research all three areas examined by the Psychometric criterion of Mathematical Proficiency (Vocabulary, Calculations and Mathematical Problem Solving) show a significant correlation with two specific areas of creative thinking, which are examined by the drawing scale of the TTCT, fluency and originality. In conclusion, we find that the academic performance of children with ADHD in language and mathematics was related in our research to creative thinking in drawing. More specifically, mathematics appears to be associated with most of the factors of the drawing scale (fluency, originality, abstractness of titles, resistance to premature closure, and the set of creative advantages), while language with the factors of fluency and originality.

6. Conclusions

Despite the small sample of our research and its inability to generalize, we hope to enrich the data of previous studies in an effort to understand the child with ADHD and highlight his creative potential. The study of the creative thinking of children with ADHD needs to be continued as it can radically and essentially contribute to finding new methods of approaching children diagnosed with the disorder, thus providing them with the possibility for personal development in other areas as well.

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