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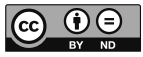

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Creativity in Children and Pupils With Dyslexia

Abstract

This literature review analyzes ten specialized papers which focus on the issue of higher creativity among children and pupils with dyslexia. The aim of the article is to determine the level of creativity in this group, what may might affect the level of creativity among them, and whether there are significant differences in some areas between children and pupils with dyslexia and intact (typically developed) children and pupils. In connection with dyslexia, its possible advantages – and not only disadvantages – are beginning to be discussed, which are developing in the context of possible shortcomings. In children and pupils with dyslexia, increased creative potential and excellent visualization skills have been reported. Based on foreign research, a significantly higher level of creativity was not clearly demonstrated in children and pupils with dyslexia in comparison with intact children and pupils.

*Keywords***:** literature review, creativity, dyslexia, originality of thinking, positive aspects

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Introduction

Dyslexia is a limited ability to learn to read despite normal intelligence, satisfactory mental and physical health, adequate motivation and education, and the efforts of the individual in question. The disorder is caused by a disruption of neural brain structures, due to which abnormal connections between neurons in the cerebral cortex are formed. There are differences in the structure of the brain; in the different organization of cerebral activities in the processing of verbal information, the structure of the cells of the left and right hemispheres changes. These differences are especially noticeable in the cerebral cortex. The ratio of grey matter to white matter is higher in the left hemisphere than in the right. Deviations can also be observed in the cerebellum. Functional deficits in the cerebellum can result in fluctuations in fluency and the interplay of free movements, disturbances in balance, changes in muscle tension, disturbed perception of rhythm, disturbed time estimation, or problems in the automation of motor and cognitive processes. Dyslexia has a linguistic, cognitive, and perceptual dimension (Guyer, 2007; Lerner & Johns, 2015; Wajuihian & Naidoo, 2012). According to Helmuth (2001), dyslexic difficulties are manifested in the speed of reading (deciphering letters, spelling, disproportionately long syllables or, conversely, conjecture of words/end of sentences), errors (exchanging sounds and similarly-shaped letters in the analytical/synthetic method of reading, the persistent habit of double reading, which in the long run can cause difficulties in combining syllables into words and sounds into syllables), and in comprehension of texts (dependent on agile decoding and synthesis of individual letters). In contrast to intact pupils, pupils with dyslexia have executive functions that affect visual and verbal functions, working memory, and problem-solving skills (Hargreaves, 2008; Nicolson & Fawcett, 2008; Reiter et al., 2005).

In addition to the above deficits of dyslexia, certain positive aspects can also be mentioned. Davis and Braun (2010) outlined the basic abilities of all pupils with dyslexia: they strongly understand the value of the environment, they can use their mental ability to create and change

perception (primary ability), they are more inquisitive than average pupils, instead of words they think especially in pictures, they perceive and think multidimensionally (through all the senses), their experience is very real, and they have vivid imagery. These eight abilities, if they are not neglected, suppressed, or thwarted by the educational process or parents, will be represented by two characteristics: extraordinary creative abilities and higher intelligence. The gift of dyslexia can thus become a gift of mastery, which can be developed in various ways and in many areas. There are certain general characteristics that pupils with dyslexia usually have in common, namely, developed intuition, nonverbal thinking, and a rich potential for creativity. Compared to intact pupils, pupils with dyslexia have a much stronger creative drive; multidimensional thinking, intuitive thinking, curiosity, and image thinking increase the creativity of pupils with dyslexia (Berninger & Wolf, 2009; Reid, 2016). Everatt (1997) conducted a research study mapping the differences in the results of thinking creativity tests between individuals with dyslexia and intact individuals. Both groups were tested by word processing tests targeting auditory synthesis ("spelling test") – notation based on dictation, quick naming with interference, comprehension, spatial abilities, and creativity (which included verbal and drawing tasks). The results showed a significant difference between the experimental and control groups with a tendency for individuals with dyslexia to score higher in creativity tests (verbal tasks: $p = 0.04$; drawing tasks: $p = 0.02$).

Creativity represents an extensive area of human abilities that is specifically examined in psychology and other scientific disciplines. Creativity is perceived as a process of creating something valuable and original. Creativity can be defined as originality that is adapted to a problem and at a certain point in time appropriate to a certain group of people (Hong & Milgram, 2010). Claxton et al. (2005) described creativity as the opposite of stereotypical activity, which is repeated by inertia, and as the opposite of traditional thinking and the rigid use of previously tested methods. Creativity can be described as a complex ability that is the result of a successful combination of cognitive abilities, personality, and other motives. Creativity is an essential component of specifically human

potential, helping everyone to adapt while contributing to the information explosion (Runco, 2014).

Extraordinary creativity, which is necessary to create a certain revolutionary invention, comes from the same source as everyday creativity (Csikszentmihalyi, 2013). In this sense, creativity can be evaluated on two levels. On an individual level, creativity is a new mental combination that appears in the world. Creativity at the sociocultural level is a period of product development that is classified as innovative, beneficial, and at the same time valuable for a certain social group. Then this product is useful on an individual and societal scale (Sawyer, 2012). Creativity is one of the skills that can be further developed. A certain degree of hypothetical creative abilities is typical for each pupil, although some pupils may be more creative than others. Recently, there has been more and more discussion of the specific abilities of pupils with dyslexia, not only in connection with the widely known deficits and symptoms. Generally, the following specific abilities of pupils with dyslexia are mentioned: logical thinking, excellent visualization skills, insight, an innovative approach to problem-solving, and higher creativity in everyday life and in artistic and professional activities (Barlett et al., 2010; Sternberg, 2006; West, 2008).

Methodology

The literature review represents a basic tool or means of research in special education. It is a method that is essential for the further development of science in inclusive and special education. Another benefit of the literature review is the fact that no current research can be left without a detailed analysis and mapping of what has been found and how researchers have done it before. Through literature reviews, it is possible to orient oneself in the areas of research that are planned to be continued. A form of narrative (traditional) review was chosen for this literature review, which summarizes a wider range of studies on a given topic for a selected period. In this review, the selected research questions or aspects are observed. The literature review describes the findings of

previous research, summarizing and identifying differences in the published results and opinions of previous researchers. Thus, literature reviews may contain conclusions and recommendations of a more general nature (Bearman et al., 2012; Ridley, 2012).

This literature review deals with the positive aspects of dyslexia, specifically the higher creativity of children and pupils with dyslexia. We have defined two basic thematic criteria: creativity of thinking and children and pupils with dyslexia. We searched for titles in the Web of Science, ERIH+, and SCOPUS databases. The collection and study of professional literature of foreign origin was carried out at the beginning of 2021. We tried to approach the chosen topic in a comprehensive way. We decided to determine through analysis and synthesis of the findings the level of creativity in children and pupils with dyslexia, what may affect the level of creativity in children and pupils with dyslexia, and whether there are any significant differences in certain areas between children and pupils with dyslexia and intact children and pupils.

The criteria for including the study depended on specific definitions and guidelines. Firstly, to be able to choose a study with children and pupils with dyslexia, the definition of dyslexia (the diagnostic criteria according to ICF-10) had to have been met. Secondly, to be selected for this review, a study in which creativity was objectively evaluated had to include standardized testing to evaluate creativity. The psychological, neuropsychological, and pedagogical treatment of children were not considered in the selection of studies. Thirdly, for a study containing a control group of intact children and pupils to be selected for this review, the definition of intact children and pupils had to have been met. Finally, all studies selected had to be written in English and published in peer-reviewed journals between 1995 and 2020.

From the initial search results, studies in which the research was presented in the form of letters, non-original articles, or case studies – rather than peer-reviewed research – were excluded ($n = 38$). Furthermore, studies were excluded where the authors used non-standardized tools (qualitative tests) to measure creativity. After narrowing down the selection, we worked with the resulting 10 empirical studies. Based on the criteria

established for selecting texts and according to the analysis, we synthesized the findings from the relevant studies into the literature review. In the bibliographic review, we tried to analyze the individual papers, to briefly describe their characteristics, to distinguish and highlight their differences, to evaluate their contribution to theory and practice, and to include the knowledge about the topic of higher creativity of children and pupils with dyslexia. Table 1 provides the general overview of the selected studies.

Table 1. Overview of the Selected Studies on the Higher Creativity of Children and Pupils With Dyslexia

Author(s)	Title	Year, country	Sample	Results
LaFrance, E. B.	The Gifted/Dyslexic Child: Characterizing and Addressing Strengths and Weaknesses	1997, Canada	90 pupils (gifted with dyslexia, gifted, and with dyslexia), aged 9–14 years	The pupils with dyslexia and gifted pupils with dyslexia were more prone (significant differences) to intuitive aspects of creative thinking than gifted pupils.
Everatt, J., Steffert, B., & Smythe, I.	An Eye for the Unusual: Creative Thinking in Dyslexics	1999, United Kingdom	17 pupils with dyslexia and 16 intact pupils, aged 7–9 years; 20 pupils with dyslexia; and 25 intact pupils, aged 11–13 years	No significant difference was demonstrated in the scores of pupils with dyslexia versus the intact pupils.
Cockcroft, K. & Hartgill, M.	Focusing on the Abilities in Learning Disabilities: Dyslexia and Creativity	2004, South Africa	36 pupils (10 girls and 26 boys) with dyslexia, aged 10–14 years	The pupils with dyslexia were significantly better (statistical differences) than the intact pupils in generating many ideas.
Çorlu, M., Özcan, O., & Korkmazlar, Ü.	The Meaning of Dyslexic's Drawings in Communication Design	2009, Turkey	A group of pupils with dyslexia and a control group: both groups had 50% girls and 50% boys and the average age was 9 years	The pupils with dyslexia were more creative and imaginative (statistical differences).
Tafti, M. A., Hameedy, M. A., & Baghal, N. M.	Dyslexia, a Deficit or a Difference: Comparing the Creativity and Memory Skills of Dyslexic and Nondyslexic Students in Iran	2009, Iran	26 pupils with dyslexia and 26 intact pupils, average age 9 years	The pupils with dyslexia performed better (statistical differences) in tasks of visual memory and creativity (limited to originality).

Alves, R. J. R. & Nakano, T. C.	Creativity and Intelligence in Children with and Without Developmental Dyslexia	2014, Brazil	13 pupils (8 boys and 5 girls) diagnosed with developmental dyslexia, aged 9–11 years, and 13 pupils (4 boys and 9 girls) without reading and writing difficulties, aged 10–11 years	There were no significant differences in creativity between the group of pupils with developmental dyslexia and the group of pupils without reading and writing difficulties.
Bigozzi, L., Tarchi, C., Pinto, G., & Donfrancesco, R.	Divergent Thinking in Italian Students with and Without Reading Impairments	2016, Italy	95 pupils with dyslexia (67 boys and 28 girls), aged 9–13 years, and 95 intact peers (67 boys and 28 girls), aged 9–13 years	The pupils with dyslexia surpassed their intact peers in the overall creativity score and in three sub-scores: processing, titles, and originality.
Cancer, A., Manzoli, S., & Antonietti, A.	The Alleged Link between Creativity and Dyslexia: Identifying the Specific Process in which Dyslexic Students Excel	2016, Italy	Study I: 19 pupils with developmental dyslexia, aged 12–15 years, and 33 intact pupils, aged 12–15 years	The pupils with developmental dyslexia performed significantly better in the connecting task; most pupils with developmental dyslexia scored below the average of the control group of intact pupils.
			Study II: 10 pupils (5 girls and 5 boys) with developmental dyslexia aged 10–13 years	No significant correlations were found between creativity and attention and working memory.
Kapoula, Z., Ruiz, S., Spector, L., Mocorovi, M., Gaertner, C., Quilici, C., & Vernet, M.	Education Influences Creativity in Dyslexic and Non-Dyslexic Children and Teenagers	2016, France	91 pupils (27 girls and 64 boys) with dyslexia and/or other dysfunctions, aged 8–15 years, and 26 intact pupils (14 girls and 12 boys), aged 12–15 years	The pupils with dyslexia may show significantly higher creative tendencies compared to the intact pupils much earlier than in adulthood.
Martinelli, V. & Camilleri, D.	Creative Giftedness and Dyslexia	2016, Malta	38 pupils (16 girls and 22 boys) diagnosed with dyslexia, aged 12–14 years, and 38 intact pupils (16 girls and 22 boys), aged 12–14 years	Despite the slightly higher score of pupils with dyslexia compared to the intact pupils, there were statistically insignificant differences in creativity.

Results of the Review

LaFrance (1997) described a study from Ontario on how gifted pupils with dyslexia compared to age-matched adolescents who were dyslexic or gifted, but not both. Using qualitative and quantitative methods, cognitive and creative differences in thinking were analyzed in 90 pupils aged 9 to 14 years. The results of this study provide information in four areas: intellectual, academic, social/emotional, and creative thinking. The intellectual profile differed in all three groups of pupils. Although academic difficulties were similar for the dyslexic pupils and gifted dyslexia pupils, the gifted dyslexia pupils were stronger in expressing humor, problem-solving, capturing the essence of an idea, and synthesizing different concepts. In their writing, this group also expressed the feeling that they had everything under control; in their drawings, they expressed other positive and negative feelings towards themselves and the future. Like the pupils with dyslexia, the gifted pupils with dyslexia were more prone to intuitive aspects of creative thinking. In addition, they were more open to new ideas and more willing to accept ambiguity. The group of gifted pupils was the strongest in all the cognitive and physical aspects of creative thinking. Interestingly, originality as a factor did not differentiate the groups, being the same in the pupils with dyslexia, the gifted pupils, and the gifted pupils with dyslexia.

Everatt et al. (1999) examined the relationship between developmental dyslexia and creativity. The research sample consisted of 17 pupils with dyslexia and 16 intact pupils, aged 7–9 years, and 20 pupils with dyslexia and 25 intact pupils, aged 11–13 years. The research assessed the originality of the pupils' drawings, which each pupil created during art lessons in the same year and which were evaluated by three independent jurors (art teachers) who did not know about the nature of the study or the pupils who had created the drawings, only the school grade of each pupil. Separate analyses based on each juror's evaluations did not show any difference between the pupils with dyslexia and the intact pupils. The subjects were tested in smaller groups. As part of data collection for this research, the pupils received written examples and verbal descriptions

of the task and a time limit of 15 minutes. Two independent evaluators then assessed the originality of each drawing on a five-point scale; the number of drawings created within the period was also taken into account. For the purposes of analysis, the evaluations were averaged across the drawings and evaluators for each pupil. The results showed a minimal difference ($p = 0.46$) between the pupils with dyslexia and the intact pupils, regardless of whether creativity was evaluated by the number of drawings produced or by the originality of the drawings.

Cockcroft and Hartgill (2004) investigated whether pupils with dyslexia were more creative than intact pupils of the same age. The Torrance Tests of Creative Thinking were administered to a group of 36 pupils with dyslexia (10 girls and 26 boys) in grades 4 through 7 who attended the same private special school in Gauteng, South Africa. The scores obtained on these tests by pupils with dyslexia were then compared with those obtained by the normative sample. The results showed that the pupils with dyslexia in all grades were significantly better than the respective intact group at generating many ideas. The pupils with dyslexia in the sixth grade also produced significantly more original answers than the intact sample, while the intact fourth grade group received significantly higher scores in the dimension of abstractness of titles than the group of pupils with dyslexia. All grades of the intact sample, except for the seventh grade, were significantly better than their dyslexic counterparts in the dimension of elaboration. No significant difference was found in this dimension between the two samples of the seventh grade. The dimension of resistance to premature closure was not statistically different for any grade, either, except in the sixth grade, where the intact sample scored higher than the group with dyslexia. The frequency dimension was related to the abstractness of the titles, while elaboration was related to both originality and resistance to premature closure. The pupils with dyslexia in the study may have above-average abilities in certain dimensions of creativity and these abilities can be linked to their education.

Çorlu et al. (2009) examined pupils with dyslexia in primary school (with a control group) regarding their communication design ability. The difference between the frequency of using navigation markers to express

destinations and using different symbols for them was compared. The percentage of female and male participants was 50% each and the mean age was 9 years in both groups. Each group included two left-handed pupils. The participants were tested directly through a design proficiency test; the tests were then evaluated by a panel of jurors with extensive experience in evaluating the performance of communication design. During the test, a control group of pupils with dyslexia was asked to create drawings in response to 20 different notional concepts on a blank A4 sheet of paper. These verbs included the interaction terms used in computer interface design (open, close, zoom in, zoom out, go forward, go back, delete, copy, carry, and call) as well as the concepts of everyday activity that can be used in communication design (listen, look, talk, draw, stop, eat, feel, drink, look, and ask for help). Frequent use of "navigational signs" was found, strongly in favor of the dyslexia group (45% in the dyslexia group versus 5% in the control group). In addition, 70% of the group of pupils with dyslexia produced various symbols for questions concerning opposition (open–close, zoom in–zoom out, or go forward–go back). Only 40% of the control group created new symbols. Also, the pupils with dyslexia responded faster and the jurors noted that they were more imaginative and creative.

Tafti et al. (2009) examined the positive and negative aspects of dyslexia in Iran. This study compared 26 pupils with dyslexia with 26 intact pupils in second through fifth grades in Tehran elementary schools. The participants were girls and boys with an average age of 9 years, who came from a similar socioeconomic background. The Torrance Test of Creative Thinking (Image Subtest) and the Cornoldy Working Memory Test (Visual-Spatial and Verbal Memory) were used. First, the pupils' test creativity (i.e., fluency, flexibility, originality, and processing skills) was evaluated, followed by their verbal and image memory (recognition and processing), using two tasks, one spatial (recognizing the location of images and words in a matrix) and the other verbal (processing words/images that were shown to them). Thus, each participant received two scores for the final test. The intact pupils significantly outperformed the pupils with dyslexia in the visual and verbal memory of words for specific

concepts and abstract concepts and in the auditory-verbal memory of words for abstract concepts. There was no significant difference between the two groups of pupils in the auditory-verbal memory of words for specific terms. The pupils with dyslexia achieved significantly better results in the visual and auditory memory of specific words than in that of abstract concepts. Their visual-spatial memory was better than their visual-semantic memory, and their visual (nonverbal) memory was also better than their verbal memory. In terms of creativity, the pupils with dyslexia scored higher in overall creativity and all its subscales, except for processing skills. However, only their superiority in originality and synthesis reached statistical significance.

Alves and Nakano (2014) investigated whether the creativity of pupils with developmental dyslexia differs from that of pupils without reading and writing difficulties. Furthermore, the authors investigated how creativity can relate to intelligence. The sample consisted of 26 participants: 13 pupils (8 boys and 5 girls) diagnosed with developmental dyslexia, aged 9 to 11 years, and 13 pupils (4 boys and 9 girls) without reading and writing difficulties, aged 10 to 11 years. The group of pupils without reading and writing difficulties consisted only of pupils from public schools. Raven's Coloured Progressive Matrices and the Children's Figural Creativity Test were applied in both groups of pupils. This creativity test consists of three activities. First, the pupil is asked to create a drawing based on a poorly defined stimulus; then, the pupil is asked to create pictures based on 10 incomplete stimuli; and in the third activity, the pupil is asked to create as many pictures as possible based on 30 repeated stimuli. Thus, it is possible to process a total of 41 answers in the form of images. Based on these images, 12 creative characteristics are evaluated: fluency, flexibility, processing, originality, expression of emotions, imagination, movement, unusual perspectives, inner perspective, use of context, extension of boundaries, and expressive names. These characteristics are made up of four factors: enrichment of ideas, emotions, creative preparation, and cognitive aspects. And these factors make it possible to identify stronger and weaker areas of the pupil's creative potential. There were no significant intergroup differences in creativity, although the group of pupils

without reading and writing difficulties had higher overall creativity scores and higher average scores for most of these dimensions, except for the "emotions" factor. In the group of pupils without reading and writing difficulties, the majority received an average score in the factors for "enrichment of ideas," "emotions," and "creative preparation," as well as for overall creativity. Average, below average, and lower scores were obtained in the dimension of "cognitive aspects." The majority of the pupils with developmental dyslexia received an average score in the factors for "enrichment of ideas" and "cognitive aspects" and for overall creativity. Most got a higher score in the "emotions" dimension and a lower score in the "creative preparation" factor. Strong and significant correlations were found between intelligence and creativity in both groups.

Bigozzi et al. (2016) addressed the creativity of dyslexic pupils and their intact peers. The study involved 190 Italian pupils between the ages of 9 and 13 years, of whom 95 had dyslexia (67 boys and 28 girls) and 95 were intact (67 boys and 28 girls). Williams' Test of Divergent Thinking was used to evaluate their creativity. First, the pupils were asked to examine a series of 24 incomplete drawings, more specifically, frames containing lines and/or shapes. They were then asked to complete the frames by drawing objects and interesting characters in an original way. In the end, the pupils had to create a clever and captivating name for each frame. The tests were evaluated by two independent jurors who had undergone training. Overall, the agreement between the jurors was 92%; the disagreements were resolved by discussion. Pupils were assessed for all creative skills (fluency, flexibility, originality, processing, and titles) and overall creativity scores. The results showed that the pupils with dyslexia outperformed their peers in the overall score and in the sub-scores of originality, processing, and titles, while no differences were found in the subscores of fluency and flexibility.

Cancer et al. (2016) sought to identify the alleged link between creativity and dyslexia. The research involved two different studies. In the first study, the WCR Creativity Test was administered to 52 Milan public school pupils aged 12–15; 19 of them were diagnosed with developmental dyslexia and the remaining 33 of whom made up the control

group. This test makes it possible to identify three basic skills of creative thinking: the ability to expand, the ability to connect, and the ability to reorganize. The test consists of nine items, which are made up of visual (pictures of objects, geometric shapes, and sketches) and verbal stimuli (words or short phrases). No time limit was set during the test administration. Before the test itself, the pupils received an information booklet explaining the unmarked nature of the test. The test was administered and all questions were scored by a researcher who had previously been trained to use the test. The results showed that the pupils with developmental dyslexia performed significantly better in the connecting task, which was to convey an unusual combination of ideas. Most pupils with developmental dyslexia scored below the average of the control group. These findings were supported by a second study involving 10 pupils with developmental dyslexia (5 girls and 5 boys), ranging in age from 10 to 13 years. The pupils were admitted as patients of the neuropsychiatric units of two institutions in Milan. Their overall intelligence quotient ranged between 86 and 128. The testing conditions were the same as in the first study. Due to the limited number of pupils in the study, non-parametric correlations were calculated. Regarding general intelligence, no significant correlation was observed between the WCR Creativity Test score and the overall intelligence quotient. The reading performances measured by different tests (reading texts, words, and pseudo-words) proved to be coherent with each other. There were some significant positive correlations between reading speed and accuracy, especially between word speed and word accuracy, word speed and pseudo-word speed, word speed and text speed, word accuracy and text speed, pseudo-word speed and text speed, and pseudo-word accuracy and text accuracy. However, there was a significant negative correlation between connecting skills and reading skills (reading accuracy and reading speed); that is, lower reading performance corresponded to higher skills in connecting different elements. Finally, no significant correlations were found between the WCR Creativity Test and the attention and working memory scores. Therefore, it seems unlikely that attention and working memory could be involved in the relationship between reading and creativity.

Kapoula et al. (2016) addressed the degree of creative ability in pupils with dyslexia and/or other dysfunctions versus intact pupils. The research was aimed at pupils in three schools – one in Brussels, Belgium and two in France (Paris and Oise) – which educate pupils with dyslexia and offer specially adapted curricula. The pupils were included in this research after a comprehensive diagnosis of dyslexia, which was based on an extensive examination of psychological, neurological, and phonological skills. It included measuring reading skills, writing, attention, and memory. The inclusion criterion was a standard level of intellectual abilities, no lower than the standard range. In Paris, the study included pupils with dyslexia ($n = 54$) and those with other dysfunctions (dyspraxia, dysphasia, attention deficit disorder, dysgraphia, difficulty with written language, difficulty with reading language, and cognitive inhibition [$n = 12$]) in the age range of 11–14 years. In Brussels, 15 pupils with dyslexia and 26 intact pupils, aged 12–15 years, were included in the study; in Oise, they study group was pupils with dyslexia ($n = 4$) and pupils with dyslexia associated with comorbid dysfunctions (dysphasia, attention problems, and dyscalculia [$n = 6$]) in the age range of 8 to 12 years. The research sample consisted of 91 pupils (27 girls and 64 boys) with dyslexia and/or other dysfunctions and 26 pupils (14 girls and 12 boys) from the intact population. In a research survey, the Torrance Figural Test of Creative Thinking was chosen as a diagnostic tool. The test consisted of three tasks, each lasting 10 minutes. All tasks required the creation of unusual drawings starting with standard shapes, such as a pair of lines or an oval. The results were analyzed by three authors who are students of psychology and are trained in the analysis of this test. The scores provided four different cognitive components of creativity: fluency, flexibility, originality, and processing. The pupils with dyslexia in Brussels achieved statistically better results in all areas of the Torrance Figural Test of Creative Thinking compared to the control group. A comparison of the three schools showed statistically better results for pupils with dyslexia in Brussels than for those in Paris. The participants with dyslexia in Oise scored, apart from one cognitive component of creativity – processing, significantly higher than the pupils with dyslexia in Paris. The educational approach had an impact on

the creativity of pupils with dyslexia. The resulting creativity scores did not differ significantly between the pupils with dyslexia and/or other dysfunctions in the research sample.

Martinelli and Camilleri (2016) determined the creativity of pupils with dyslexia, measured by a standardized test battery (Torrance Tests of Creative Thinking) in comparison with their intact peers. The study involved 38 pupils (16 girls and 22 boys) diagnosed with dyslexia and 38 intact pupils (16 girls and 22 boys) between the ages of 12 and 14 from three different schools in Malta. All 38 participants with dyslexia had average intelligence quotients (85–115). The participants of the group with dyslexia were compared with the group of intact participants in terms of age, socioeconomic status, abilities, and the type of school attended. Although there were clear indications that the pupils with dyslexia rated themselves as less creative than their intact peers, they did better in most of the subscales of the Torrance Test of Creative Thinking. Despite the slightly higher scores of the pupils with dyslexia, the differences in the creativity were not statistically significant. The hypothesis that pupils with dyslexia perceive themselves as highly creative was not confirmed. In the context of this study, dyslexia was not associated with increased nonverbal creativity.

Conclusion

Based on research on the relationship between dyslexia and creativity, it can be stated that the results of the studies were rather mixed. Some studies found a more significant relationship between the creativity of pupils with dyslexia and their creative abilities (Everatt et al., 2008; McManus et al., 2010; Wolff & Lundberg, 2002). LaFrance (1997) pointed to a higher propensity for the intuitive aspects of creative thinking in both dyslexic and gifted dyslexic pupils. Cockcroft and Hartgill (2004) came to a similar conclusion, when their survey showed significantly better results in generating many ideas in pupils with dyslexia compared to the intact group. Çorlu et al. (2009) noted that the pupils with dyslexia in their study

were more creative and imaginative, responding much more quickly to the tasks assigned to them. The pupils with dyslexia performed better in the roles of visual memory and creativity (limited to originality) in the study by Tafti et al. (2009). Bigozzi et al. (2016) reported that pupils with dyslexia surpassed their intact peers in the overall creativity score and in the three sub-scores of processing, titles, and originality. A similar evaluation was reported by Cancer et al. (2016), namely, that pupils with developmental dyslexia performed significantly better in the connecting task and that most pupils with developmental dyslexia scored below the average of the control group of intact pupils.

In contrast, Everatt et al. (1999) did not show significant differences in the scores of dyslexic and intact pupils. Alves and Nakano (2014) also found no significant differences in creativity between the pupils with developmental dyslexia and those without reading and writing difficulties, but strong, significant correlations were found between creativity and intelligence in both groups of pupils. Although Kapoula et al. (2016) reported that the resulting creativity scores did not differ significantly in pupils with dyslexia and/or other dysfunctions in the research sample, they also pointed to a possible higher creative tendency in pupils with dyslexia compared to intact pupils much earlier than in adulthood. Despite the slightly higher score of pupils with dyslexia compared to intact pupils, no statistically significant differences were found in creativity in the survey by Martinelli and Camilleri (2016).

Thus, it is possible that the creative potential of a dyslexic individual develops gradually in the context of social situations and problem-solving, and that specific peculiarities may then manifest to different degrees at a certain stage of development. In childhood, the increased creative tendency of people with dyslexia may not be clearly visible, but in adolescence the differences may become more pronounced and adults with dyslexia may show significant differences in creative thinking compared to intact individuals.

Torrance's Figural Test of Creative Thinking was not primarily designed to work with individuals with dyslexia. It is therefore possible that such individuals could be at a disadvantage compared to their intact

counterparts in working with a fixed time allowance for each of the tasks. Therefore, we cannot rule out that the slower work pace observed in people with dyslexia compared to the intact population – which is probably the result (or real manifestation) of their deficit – may be a significant handicap due to the limit of 10 minutes imposed on processing each test task. This could then be reflected in all four mapped areas, but above all in the elaboration.

One possibility for verifying the results in a follow-up study would be to increase the number of participants in individual groups so that a significant difference between them would be more likely to be found and the indicated tendency of individuals with dyslexia to score higher could be confirmed by a statistically significant difference. Also, allowing more time for individual test tasks (for individuals with dyslexia or the entire research group) and the inclusion of "non-standard" or abstract drawings showing a creative tendency in a possible alternative evaluation could contribute to interesting and more authoritative conclusions.

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