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Visual Deficit Studies in Dyslexia

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1. Abstract

1.1. Introduction: The differences that have been identified in children with dyslexia in relation to children of normal development, in visual perception, are considered by some researchers to be very important. The low performance of children with dyslexia in visual tests has led some researchers to conclude that children with dyslexia have a visual deficit and that this deficit is the main cause of reading difficulties. The latter claim that people with dyslexia apply different visual processing and this leads to difficulties in visual display of letters and words. However, there are opposing views, which necessitates more studies in the future, which will examine the possibility of a visual deficit in children with dyslexia [1,2].

1.2. Aim: The aim of this study was to present visual deficit studies in dyslexia.

1.3. Methodology: Literature review was carried out in the web, which referred to researches on Special Learning Disabilities and specially in visual deficit studies in dyslexia.

1.4. Results: Review of the literature highlighted key points of visual deficits in dyslexia. Visual attention contributes to the reading performance of children with developmental dyslexia.

1.5. Conclusions: The level of visual attention is an important factor in determining reading speed. Differences in visual attention can contribute to poor reading in children with dyslexia, regardless of their ability to process individual letters.

2. Visual Deficit Studies in Dyslexia

Wanting to examine the case of an optical deficit during the process of mapping optical codes to phonological codes, Valdois, Lassus-Sangosse, & Lobier (2012), conducted 2 experiments. The first experiment involved 44 French students, 22 dyslexics (10.8 years) and 22 chronologically identified normal readers (10.8 years). Experimental tests included three types of different stimuli: letters, numbers, and colors. Overall, it appeared that children with dyslexia were worse than those in the control group in recording letters and numbers. However, their performance did not differ in the color test. Chronological analyzes were performed between chronological age, reading age, reading accuracy and speed, as well as correlation of all tests performed. Strong correlations were seen between the various measurements of reading performance and performance in the letter, digit and color tests. It was noteworthy that the performance on the stimuli of the letters and digits was correlated with all reading readings. However, color performance records were not correlated, not only with each reading measurement but also with letter and digit tests. The 2nd experiment consisted of 48 French students, 24 dyslexics (10.5 years) and 24 normal readers (10.6 years). None of the children in the 2nd experiment participated in the 1st. The dyslexic students came from a diagnostic center for children with language problems, while the control group came from neighboring schools. The two groups differed significantly in their reading age [3].

The experimental study included a phonological evaluation in which only those children with dyslexia who possessed phonological skills participated, according to the clinical examination. This was because the researchers believed that a visual deficit was primarily expected to affect a subset of children with dyslexia who did not have phonological problems. Second, their purpose was not to show that a phonological deficit could not affect letter tests, but to demonstrate that poor performance on these tests, when observed in the absence of relevant phonological awareness or short-

term verbal memory, could not be interpreted by an inability to map visual stimuli to phonological. In the experimental test, the stimuli were similar to those of the first experiment. The results showed that children with dyslexia had severe deficits when involved in both phonological and non-phonological tests. Overall, however, the results of both experiments did not confirm the view that there was a deficit in the mapping of visual stimuli to phonological ones. This finding, however, according to the researchers does not mean that there can be no problems in the visual mapping of codes in phonological, of children with dyslexia.

Ziegler et al. (2010), conducted a study with 28 children with dyslexia. Their age ranged from 8.3 to 12.4 years. The study included those children with dyslexia whose reading age was at least 18 months below their age limit, according to a standard reading test. The control group consisted of 29 typically developed children, who had no history of written or oral language difficulties. All stimuli consisted of horizontal rows of five characters. Three types of stimuli were used: letters (consonants), numbers (1 - 9) and symbols (%, /,?, @,}, <, £, §, µ). In general, the group of children with dyslexia showed significant processing deficits. letter and digit sequences (verbal stimulus) but not in symbol sequences (non-verbal stimulus). This dimension shows that deficits in verbal stimuli are much more important than non-verbal stimuli, even if the test does not involve oral pronunciation. If the deficit in children with dyslexia, according to the researchers, was visual, then the children would also have deficits in the symbol sequences, which did not happen. One hypothesis for this is that letters and digits can be processed by the word-specific optical system, located in the left hemisphere, between the occipital-parietal lobe. This area is considered non-functional for people with dyslexia, so the deficit can be explained in letters and numbers but not in the symbols. High resolution in this area, however, showed particular sensitivity to letters but not to digits [4].

Another view is that letters and numbers are affected because only they are converted to phonological codes, so there is a deficit in converting visual stimuli to phonological codes. The researchers conclude that while something that at first appears to be a visual deficit - according to the results of their research - is not, in fact, they focus again on the existence of a phonological deficit [5, 6].

One study that studied eye movement in children with dyslexia was that of Trauzettel-Klosinski, Koitzsch, Durrwachter, Sokolov, Reinhard & Klosinski (2010). In general, studies in dyslexic children have shown different patterns of eye movement, mainly in terms of number of movements and prolonged concentration duration. The length and frequency of the words seem to affect the number and duration of the concentration. The study involved 16 children with dyslexia and the control group also consisted of sixteen children. They had German as their mother tongue. The mean age of the participants was 9.5 years for children with dyslexia and 9.6 for the control group. The results showed that children with dyslexia showed reduced reading speed as well as increased concentration (fixation) and slightly increased regression rate. This was more pronounced with the more difficult text. The control group also showed a difference between the two texts. Nevertheless, the duration of concentration in children with dyslexia was higher in both texts. Phonological difficulty, according to the researchers, may play a role in the speed and number of eye movements but not during concentration, which may emphasize the existence of a visual deficit in dyslexia. Children with dyslexia seem to use a strategy in which they break down the text into smaller parts but do not increase the duration of concentration while increasing the difficulty of the text [7].

In another study (Lallier, Donnadieu & Valdois, 2010), 14 children with dyslexia (11.3 years) and 14 chronologically identified normal readers (10.8 years) participated. They attended school regularly and had French as their mother tongue. Participants were examined individually in a visual test. This research wanted to examine the possibility of defects in the visual sequence of stimuli in people with dyslexia. What was demonstrated was a different time treatment between the two groups. The researchers stressed the possibility of a double deficit in the visual sequence, in its duration and in its minimum appearance. The results of the present study showed that children with dyslexia differed from those in the control group, only in the minimal point of the visual sequence. Correlation analyzes showed a direct relationship between minimum visual sequence point and reading. Furthermore, it appeared that the greater the range of the visual sequence, the better the phonological skills. Finally, the researchers highlighted the relationship between visual impairment and phonological disorders in developmental dyslexia [8,9].

Bosse et al. (2007), after researching dyslexic students, pointed out that while dyslexia results from phonological deficits, nevertheless the heterogeneity of the dyslexic population and reports of dyslexic students without any phonological problems increase researchers' interest in examining the possibility that, some patterns in dyslexia do not address phonological cognitive deficits. In his research with French and British students, examining both phonological and visual skills, he concluded that these two variables were independent of each other, emphasizing that they come from independent cognitive mechanisms [10].

The research provided a new finding for the time. He showed that a deficit in visual attention, as shown by the tests, contributes to a deficit in reading performance regardless of phonological skills. In the first experiment performed, the visual deficit led to a unique variation in the accuracy of reading abnormal words and pseudo-words for French dyslexic students. In Experiment 2, it was found that visual impairment independently contributed to reading accuracy when age, IQ, vocabulary level, semantic fluency, and

letter recognition were checked [11,12].

3. Conclusion

The level of visual attention is an important factor in determining reading speed. Differences in visual attention can contribute to poor reading in children with dyslexia, regardless of their ability to process individual letters. Performance in tests reflects the contribution of visual attention to the coding of information in optical short-term memory [1,2].

That is, visual attention contributes to the reading performance of children with developmental dyslexia. A visual deficit first affects the reading of excluded words. Is there finally a second predominant visual deficit besides the phonological one in developmental dyslexia?

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