



**The centrality deficit in readers with Dyslexia:
Evidence from a think-aloud study**

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Abstract

The specific reading disorder, also termed developmental dyslexia, is a learning disorder of neuro-biological origin, characterized by reading and writing problems such as difficulty in deciphering, slow and effortful reading, a tendency to guess written words and spelling difficulty (American Psychiatric Association, 2013; Goswami, 2015; Katarzyna, Grażyna, & Katarzyna, 2016; Lyon, Shaywitz, & Shaywitz, 2003). In addition to these difficulties, a strong association has been found between dyslexia and broad academic difficulties that involve reading skills (American Psychiatric Association, 2013), and specifically in reading comprehension (Laing & Kamhi, 2002 ;Tomasello, 2000). Studies that examined the nature of this difficulty in reading comprehension found that readers with dyslexia experience difficulty in identifying and processing central text ideas (Miller & Keenan, 2009, 2011).

A central idea is perceived as such when it is connected with many ideas in the text. The more central the idea (more connected with other ideas), the greater the chance it will be recalled. This phenomenon is called *centrality effect* (Brown & Smiley, 1977). Although readers with dyslexia exhibit the centrality effect in text recall (i.e., recall more central than peripheral information), they recalled fewer central ideas compared to normally developed readers, whereas the gap in recall of peripheral ideas is smaller than that found among normal readers. This phenomenon is termed *centrality deficit* (Miller & Keenan, 2009, 2011).

The present study examined which cognitive dysfunctions underlie the basis of reading comprehension difficulties in general, and specifically the centrality deficit among adolescents with dyslexia. By using the think-aloud procedure (Kendeou & van den Broek, 2007; Linderholm & van den Broek, 2002) and centrality estimations of text ideas during reading, we examined whether surface coding of central ideas in long term memory and/or difficulty in identifying these ideas underlie the difficulties that individuals with dyslexia experience in understanding and recalling text ideas after reading. To that end, participants in the study read two informative texts during which they were asked to state aloud whatever comes to their mind while reading, and also to rank the level of centrality of ideas in the text on a 5 point scale. When finished reading, participants were asked to recall the texts and to answer five multiple choice comprehension questions.

Results showed that while reading, participants with dyslexia employed surface text processing, formed fewer connections between text ideas, and also differentiated less between central and peripheral information units, compared to typically developed readers. By contrast, when they finished reading, no difficulties were observed in recall of central ideas by readers

with dyslexia. In other words, the centrality deficit was not replicated. When answering the comprehension questions, participants with dyslexia were less accurate compared to normal readers, although no difference was found in response duration.

These results suggest that activating surface text processing, and particularly the difficulty in making connections between text ideas, are the direct causes of centrality deficit among readers with dyslexia, at the level of connectivity and identification of central ideas during reading. Nevertheless, their ability to recall after reading is not affected, and that could be ascribed to a compensatory strategy which includes ability to identify the textual structure and the location of central ideas within it. Another possibility that supports their intact recall ability is connected with the fact that prior to their reading, the purpose of the reading was defined explicitly, by requesting participants to summarize the main ideas of the text, thus focusing on central ideas. These findings have important implications for development of designated instructional interventions with expository texts for readers with dyslexia, based on making connections between ideas in the text, and encouraging deeper text processing by means of explicit definition of the reading goal.