

# DYSLEXIA AND DYSCALCULIA: ARE THEY RELATED?

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The International Dyslexia Association (IDA) defines dyslexia as a neurodevelopmental:

**"specific learning difference that is characterised by difficulties with accurate and/or fluent word recognition, and by poor spelling and decoding abilities" (2002).**

Current research suggests that dyslexia stems primarily from a phonological deficit, where individuals with dyslexia have difficulties connecting letter-sounds to their individual letters.

**On the other hand, dyscalculia is defined as a learning difficulty in comprehending and learning arithmetic and mathematics (WebMD, 2015). A numerosity representation deficit (aka "number sense" deficit) is thought to be the core deficit in dyscalculia (Wilson et al., 2015).**

## DYSLEXIA AND DYSCALCULIA CO-OCCUR

At first glance, it appears that dyslexia and dyscalculia are learning differences that affect different academic domains. However, Dirks et al. (2008) found that there is a higher than expected comorbidity rate of students who have both dyslexia and dyscalculia. These children also seem to have more difficulties in their spelling and reading comprehension skills than children who only have either dyslexia or dyscalculia. This has also been supported by (Wilson et al., 2015). What then, contributes to the high comorbidity rates of dyslexia and dyscalculia? Are there similar underlying processes that contribute to the difficulties faced by dyslexic and dyscalculic learners? Although research regarding this is still in its infancy, we look at the underlying cognitive functions, working memory and rapid automatized naming (RAN), to help us understand how implications in these areas could account for the literacy and arithmetic difficulties in individuals with dyslexia and dyscalculia.

## WORKING MEMORY

Working memory is an executive function that is frequently implicated in individuals with dyslexia and dyscalculia (Moll et al., 2016; Wilson et al., 2015). Working memory refers to one's ability to simultaneously retain and manipulate visual and verbal information in conscious awareness. This cognitive ability is important especially in the academic

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setting, where students are required to actively use the information in their minds to carry out specific tasks (e.g. reading a lengthy Math problem and solving it). What then, is the impact of a weak working memory in carrying out literacy and mathematics tasks? For literacy tasks such as writing, we use our working memory to help us compose and connect ideas in written text. We also utilize our working memory to remember what we read in a reading comprehension passage and answer questions thereafter. For mathematical tasks, we need our working memory to help us store the information we read in a word problem, and help us track which part of the problem we have solved and how we solved it.

While working memory helps us to "keep track" of the information we read, RAN is concerned with how quickly we can identify "highly familiar visual stimuli" such as digits, letters, objects and colors (Wolf & Bowers, 1999). Within academic research surrounding dyslexia, the slow naming speed of letters and numbers have been found to distinguish poor and competent readers (Willburger et al., 2008). In the case of dyscalculia, current research similarly posits that it is highly likely for dyscalculic individuals: Landerl et al., (2004) found that slow naming speed for digits were one of the indications of a numerosity representation deficit. The implication of a slower RAN in school could be students taking a longer time to decode a word, or being slower in their computational fluencies.

In this article, we discussed how the underlying cognitive processes of working memory and RAN could potentially explain some of the learning difficulties that dyslexic and dyscalculic learners face. It is also important to note that while working memory and RAN are frequently implicated functions in individuals with dyslexia and dyscalculia, not every individual has weaknesses in these areas. Individual differences are what makes each and every person unique and special. The best way to support individuals with learning differences is to identify their strengths and weaknesses, so that we can aid them in honing their strong suits while plugging the gaps in their weaker attributes.

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