

Dyslexia and Other Reading Difficulties in Adults: Where Are We Now and Where Are We Headed?

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The scientific study of dyslexia has a long history, dating back to the 19th century (Stein, 2018). Despite intensive study in the fields of neuroscience, psychology, genetics, and education, simple truths about dyslexia have been slow to emerge, with some early results not holding up to further scientific scrutiny. As a result, many misconceptions persist in the public and among educators. Further, the research conducted with and applied to adult learners is especially thin, as intensive scientific scrutiny has increasingly focused on children and developing readers. In this brief article, I review some of the established findings about dyslexia, its diagnosis, and instructional implications for adult learners. I also briefly review the emerging debate among researchers about the social value of dyslexia as a diagnosed condition, given the social impact on attitudes and services provided to learners of all ages. Finally, I consider the changing nature of reading literacy in light of emerging technologies and research methods that are changing how we both research and understand the cognition of reading.

What We Know About Dyslexia and Reading Difficulties

Dyslexia is at its core a difficulty with word

reading. Typically, it is a language-based difficulty impacting the functioning of the visual to phonological network that non-dyslexic readers develop to recognize visual words with ease and fluency (Shankweiler & Liberman, 1989). Dyslexia is not directly a comprehension problem, but difficulties in reading printed words can result in subsequent reading comprehension difficulties upstream in the cognitive system. There is no reason, however, to believe that an individual with dyslexia could not understand and learn something by listening (Seidenberg, 2017).

Dyslexia is distinguishable *theoretically* from poor word reading that results from inadequate learning opportunities or low instructional quality. In practice, this distinction may be difficult to demonstrate in adults. Despite public perception, dyslexia is not a visual processing problem per se that results in letter or word reversals, but rather some combination of language (phonological), visual temporal processing, and sequencing factors (Stein, 2018).

Dyslexia is a continuum condition that ranges from mild to extreme, not all or none. There is currently no test that definitively shows that one is positive for dyslexia, and it does not appear likely there will be one soon (though see Stein,

2018). Dual deficits in tests of phonological and rapid naming (a sequential processing task) skills are associated with more severe cases of reading difficulty, though disentangling the neurocognitive mechanisms for why and how is a work in progress (Catts et al., 2002; Vukovic & Siegel, 2006).

There is a genetic component to dyslexia, but precisely which genes are necessary or sufficient to make one dyslexic is not known. At best, certain genes may predict an individual's increased risk for dyslexia, though this risk is moderated by one's language learning environment. Current research suggests that there may be more than one variant of gene clusters (genotypes) that can result in the manifesting characteristic (phenotype) of word reading difficulties characterizing dyslexia (Carrion-Castillo et al., 2013; Olson, 2006). True, genetic research may eventually isolate a set of genes that are strong predictors of dyslexia. However, determining whether a case of dyslexia is mild or extreme in severity seems like it will always require interactions with learning progress to diagnose with any level of precision. With dyslexia, there is a nature-nurture trade-off. An individual with mild dyslexia but strong early instruction and practice may end up with the same reading proficiency as an individual with a strong genetic disposition towards reading, but poor learning opportunities and instruction. In contrast, a hyperlexic child may learn to read with no direct instruction, just experience and modeling reading texts. Their brains are wired to learn complex statistical patterns, like sight to sound correspondences (and vice versa) (Ostrolenk et al., 2017).¹

Diagnosis and Instruction

This nature-nurture interaction is the basis for identifying children, adolescents, or adults with dyslexia and for providing a clear, definitive prognosis for learning to read. Fowler and Scarborough (1993) posed the question, "Should reading-disabled adults be distinguished from other adults seeking literacy instruction?" On the basis of their review of theory and the research, they concluded "that while the distinction may still be valuable for theoretical purposes, it may not be as clear-cut or useful as it once was for most practical situations" (p. 63). They also concluded that research with reading-disabled children and more generally, diagnostic assessments and effective instruction for students with reading difficulties of all ages, could be gainfully adapted for use with adult learners, as long as the adaptations were sensitive to adult needs and maturity (for an updated review, see Sabatini et al., 2020).

In elementary students, there are multiple indicators that a child is *at-risk* of dyslexia, but the ultimate test is providing strong, intense, quality decoding instruction and monitoring the trajectory of word skill learning that ensues. Children that are not dyslexic at all are likely to respond to intervention and acquire age-appropriate word reading skills and fluency. Those with mild dyslexia may require more practice; their reading growth trajectory may be slower, but the prognosis is good. Meanwhile, even intense interventions of lengthy duration may fail to help individuals with severe dyslexia to achieve proficiency; and assistive technologies (e.g., text-to-speech reader) to allow the individual to compensate may be warranted.

¹ Note: due to complexity and space limitations, I have simplified discussion especially of other moderating and mediating factors – like other related cognitive skills such as attention, executive function, working memory. See reference list of sources that discuss these issues in greater detail.

The preceding paragraph describes elementary children's learning to read. For most children, the texts are short and mostly narrative; the printed words are mostly simple and frequently occurring in the language; sentence structures are straightforward; and comprehension questions are not very demanding. If you read the texts aloud to learners, they would probably comprehend fairly well; a middle grades student would nearly always understand the text.² As a student matures, however, texts grow exponentially in complexity. The breadth of vocabulary that appears in texts expands, sentences become longer and more complex, texts get longer, and comprehension questions become more demanding. These textual changes partly explain the difficulty in accelerating learners who fall behind grade level in reading comprehension early in their K-12 careers. They are chasing after a skill set while grappling with an increasingly demanding print world. Even slow reading (dyslexia's most prevalent symptom in highly spelling-sound consistent languages like Spanish or Finnish) can be highly disruptive to maintaining the pace of grade level changes in text demands.

Back to adult learners. We cannot recreate either the assessment indicators that we might have collected when adults were children first learning to read or their instructional experiences. So, we have no record of dyslexia risk when the reading and text learning environment was relatively simple and finite. Adults live in a literacy world with innumerable texts of every size and kind – not only texts of a few thousand words conveying simple narrative stories. We do not know whether adults received adequate instruction nor how much they practiced. They likely acquired multiple compensatory strategies, but these strategies

may be maladaptive for sustained growth, and therefore may need to be unlearned for the adult to recover a more typical word learning skill trajectory. Further, we cannot expect adults to commit to immersion learning and instruction in reading so that we can monitor their individual growth trajectory (and perhaps infer the presence and/or severity of dyslexia).

The Dyslexia Debate - What Is the Public Value in a Diagnosis of Dyslexia?

This brings us to what has been referred to recently in the literature as “the dyslexia debate” (Elliott & Grigorenko, 2014): is there even value in diagnosing dyslexia? Problems the research community expected to be relatively simple (e.g., creating a brief, valid test for dyslexia; identifying behavioral, neurocognitive, or genetic indicators) have turned out to be vexing and complex, taking decades to unravel. For example, research began by looking for visual processing problems (letter and word reversals) only to uncover a mix of phonological, serial processing, language, cognitive, and affective factors.

While the causes of dyslexia and reading difficulties are multiple, the treatment has turned out to be so far singular - quality instruction, especially in decoding and word recognition, with increasing intensity and duration in response to the student's learning progress. The slower that progress, the stronger the evidence supporting a dyslexia diagnosis, with perhaps a cocktail of other cognitive, socio-emotional, and environmental risk factors compounding the challenges of learning to read proficiently.

Individuals with a diagnosis may receive

² Here, I am assuming native speakers of the print language, not non-native children learning a second language.

additional services. Labeling the cause of the reading difficulties may validate an individual, the parents of children, or a teacher searching for reasons that a learner fails to make progress. For those who overcame reading difficulties to become successful readers, the diagnosis may be a source of pride. These potential positives must be weighed against the experiences of those with the same reading challenges who do not receive the diagnosis. Researchers do not want to give up the scientific pursuit of understanding dyslexia as a distinct condition. However, the pace of learning, change, and conclusive implications of research on dyslexia and reading challenges has been slow. As a result, the question posed by Fowler and Scarborough (1993) is still relevant, for adults and learners of all ages.

Future Directions

Earlier, I noted the challenges of identifying reading difficulties/dyslexia in adults and the prognosis for learning to read proficiently. To address these challenges, we can begin to conduct the research needed with adult learners to build rich datasets that allow us to detect not only the presence of reading difficulties/dyslexia, but also its severity. With recent data science analytics and techniques, we could produce learning trajectories that help us predict what kind and how much instructional support is warranted, as well as how much practice is needed to see substantial achievement gains. For the first time, we have technologies that can closely monitor an individual's reading and language instruction, experience, and practice. With the learner's consent, we can encrypt the data and share with the wider research community. To conduct this microlevel research, we would draw upon: the digital revolution in electronic print sources, increasingly accessible/affordable interactive

devices (e.g., smart phones, tablets), response capture technologies (e.g., speech recognition, eye tracking apps), computational linguistics and natural language processing techniques, data analytics, the learning sciences, and AI algorithms. These elements could be aligned to build the infrastructure to test and evaluate theoretical models and practical instructional approaches to improving adults' reading proficiency.

This would be a massive undertaking, but with the knowledge produced, we can imagine a learning environment wherein adults can choose the learning regimen that works best for their needs. Having the choice may encourage a learner's commitment, by which learning outcomes may be accelerated. The prospects for those with severe dyslexia (unaided by assistive technologies) may be less encouraging, but at least we can counsel them early on their prognosis so that they can make informed choices about their lifelong learning goals.

Conclusions

It is not uncommon to read news stories about successful adults with dyslexia. Sometimes the adults were diagnosed in childhood; other times not. On the one hand, this can be viewed as a positive - whether these individuals meet clinical diagnostic criteria or not, the consequent public discussion could encourage less stigma and anxiety surrounding reading difficulties. On the other hand, if the conversation devolves into a comparison of individual accomplishments and circumstances, then it perpetuates the social context that has led to the dyslexia debate. With current estimates of dyslexia at 7-15% of the U.S. population, we can conclude that there are millions of undiagnosed or hidden dyslexics in the adult population. National surveys of adults show basic reading, fluency, and comprehension



skill gaps (Baer et al. , 2009; Grotlüschen et al. , 2016). This implies that there are many adults with reading difficulties, many with dyslexia, and many leading successful lives even while keeping

their reading skills hidden from public view. Thus, as we move forward, how we address issues of dyslexia diagnosis, treatment, and research are likely to have broad societal implications.

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