



How Does Dyslexia Influence Academic Achievement?

Qianyu Zhou^(✉)

Department of Applied Psychology, New York University, New York, NY 10003, USA
qz990@nyu.edu

Abstract. Dyslexia is a learning disability characterized by problems with reading, with symptoms including accurate and fluent word recognition, poor spelling, and reading comprehension, despite adequate intelligence level and appropriate education opportunities. While the primary effects of dyslexia are mostly associated with students' difficulty with reading, there are also secondary effects of dyslexia, such as low academic performance, low self-esteem, anxiety disorders, and so on. This paper conducted a literature review on the causes, impacts, and possible interventions of dyslexia, aiming to explore the impact on students' academic achievement brought by dyslexia. The result showed that children with dyslexia typically display a low achievement in academics and have a higher school drop-out rate. The impairment of self-esteem also leads to a decrease in confidence, further resulting in failures in academic achievements. This paper offered insights for possible and effective interventions to cope with dyslexia and help students with dyslexia in academics.

Keywords: Dyslexia · learning disability · academic achievement · education

1 Introduction

Dyslexia is one of the most common types of learning disability, affecting about 80% of those who are identified as learning-disabled [1]. The term 'dyslexia' is derived from Greek, 'dys' means hard or difficult, and 'lexia' derives from 'lexicos' which is related to words, thus dyslexia mean difficulty with words, particularly the ability to decode written text [2, 3]. Despite adequate intellectual ability and educational opportunities, people with dyslexia struggled with reading, spelling, writing, and even arithmetic [3–5]. Some specific symptoms include inaccurate word recognition, slow reading comprehension, and poor spelling [5].

There are different types of dyslexia, either acquired, which is often referred to as alexia or developmental, which is referred to as developmental dyslexia [4]. Dyslexia can also be categorized as visual word-form dyslexia, which is related to the difficulty in the visual recognition of words, and central dyslexia, which refers to difficulty in the comprehension and pronunciation of reading [4]. Yet there was not a universal system of classification, and this learning disability does not have distinct categories.

As one of the most prevalent learning disabilities, however, dyslexia had different prevalence rates in different countries. It was estimated that the prevalence among children in the United States is 5% to 17% while 3% to 6% in the United Kingdom [3]. In Europe, the prevalence of dyslexia or similar type of learning disorder was as high as 15% of the population [6]. Comparatively, the prevalence of dyslexia was significantly lower in non-English speaking countries like China and Japan, where the prevalence was reported as low as 1% [3]. There is also a gender difference in the prevalence of dyslexia. The prevalence of reading problems was typically greater in males than in females, with an approximate ratio of 3.4 to 1 [7–9]. As suggested by Shaywitz, a possible reason is that boys are perceived as more disruptive by teachers and thus they are more referred to as having special problems like reading problems [10]. Moreover, this imbalance in gender might also be attributed to the participant selection process or the statistical methods that research has used [8, 10].

The signs and symptoms of dyslexia largely differ from person to person, ranging from skipping of words, difficulty to recognize letters, poor spelling, poor reading comprehension and so on [3]. The signs and symptoms can appear as early as preschool, and children with dyslexia often show a unique combination of characteristics. During preschool years, children with dyslexia might exhibit difficulty in learning alphabetical letters, recognizing rhyming patterns in the alphabet, and pronouncing familiar words [5]. For children in kindergarten or early elementary school, signs generally become more obvious; they may read and write slowly and with more errors, be unable to connect letters with the correct sounds, and struggle to understand sentences [11]. Children with dyslexia may also have weaknesses in other areas like short-term memory, attention deficits, and motor skills [3]. From elementary school to high school, children with dyslexia may have trouble writing in a clear way; they exhibit difficulty in choosing the right words in writing and finishing assignments on time [11]. Adults with dyslexia may require great effort in reading and they tend to read very slowly; they may also find it hard to do the math, stay organized and meet deadlines [11]. Generally, individuals with dyslexia are behind peers in terms of reading and language.

Further, dyslexia affects individuals more than the ability to read and write. The problem in reading and spelling enables students to fail to cope with tasks that require reading, which in turn affects their overall academic achievements. Moreover, experiencing failures in academics can further provoke a lack of self-esteem and feelings of inferiority and anxiety.

Although reading skills were viewed as important in academic achievements in school, limited research has directly discussed this topic and how dyslexia influences students' academic achievements [12]. Moreover, little attention was paid to the relationship between dyslexia, self-esteem, and academic achievement. Psychological factors like self-esteem are likely to serve as an intermediate factor in the relationship between dyslexia and academic achievement. Dyslexia can lead to low self-esteem when students experience failures in academics, and this low self-esteem further results in resistance to learning and trying to improve academic performance [12].

Therefore, this paper aimed to review the potential factors of dyslexia, including neurological and genetic factors, cognitive factors, environmental factors, cultural differences, impacts (including academic achievement and self-esteem), and possible

interventions (including small group intervention with regular reading support and encouragement).

2 Causes

2.1 Neurological and Genetic Factors

To start with, while research on the specific origin of dyslexia is still ongoing, many theories have been proposed regarding the aetiology of dyslexia. A wide consensus was that dyslexia is attributed to irregularities in the brain at a neurological level, instead of a mere result of a lack of motivation, sensory impairment, emotional problems, and so on [4, 13]. Specifically, an asymmetry in the planum temporale, which is responsible for speech and language, potentially contributes to dyslexia [3]. The overly dense distribution of ectopias in the cerebral cortex also make it challenging for neurons to reach their appropriate targets during fetal development, potentially leading to the manifest of dyslexia [3]. Furthermore, the corpus callosum's nerve fibers have been discovered to develop more slowly in people with dyslexia, which leads to a slow development of language [3]. Genetic factors also greatly influence how a person acquires language and people with dyslexia often have a family history of dyslexia. Genetic markers have been found in chromosomes 18, 6, and 15, which have been reported to be associated with the transmission of dyslexia [3].

2.2 Cognitive Factors

A dominant theory, the phonological theory, underpins the cognitive basis of dyslexia. The phonological theory states that impairment in reading ability is caused by a cognitive defect in the representation and processing of speech sounds, notably the capacity to correlate letters with the proper sounds [13, 14]. Many scholars, however, believed that this phonological deficit is only secondary to the manifestation of dyslexia and believe it is unlikely that phonological impairments alone can explain the complexity of dyslexia. They thus proposed another popular theory that stresses the role of auditory impairment [13]. According to this theory, the phonological deficit and visual deficit are both direct causes of reading disability, which have an origin in general auditory impairment, thus viewing dyslexia as a general sensorimotor syndrome [13, 15].

2.3 Environmental Factors

In addition to neurological and genetic factors, environmental factors also potentially lead to the onset of dyslexia and delayed development of literacy skills [16]. For example, problems during pregnancy or complications after childbirth may cause problems and affect children's normal cognitive and behavioral development [3]. Substance abuse, such as cocaine and alcohol, during pregnancy can impair a child's development and put them at risk for a number of issues, including problems with learning and attention [3]. Additionally, it has also been hypothesized that families with a history of autoimmune disorders, including Grave's disease, are more likely to experience literacy issues [3]. Malnutrition is also potentially a risk factor in affecting children's language development and is associated with problems like intelligence and academic achievement [3].

2.4 Cultural Differences

Additionally, cultural difference is important in the understanding of dyslexia since dyslexia is defined differently from country to country, due to differences in languages, regulations, diagnostic procedures, etc. [17]. According to Maunsell, differences in linguistic properties, including pronunciations, alphabets, and scripts, play an important role in the manifestation of dyslexia [17]. Therefore, symptoms vary in various cultures and languages. For example, whether a language is transparent in orthographies, meaning a high regularity and less variation in sound-symbol correspondence in speech, such as German and Italian, may influence the prevalence of dyslexia [17, 18]. This makes the language more straightforward, making it easier to read and write, and achieve a fluent level due to the high correspondence between sound and letter [17, 19]. Yet this does not mean that dyslexia is less prevalent in those languages; rather, dyslexia is more likely to be manifested in symptoms like reduced reading rate, or problems in short-term memory, concentration, etc. [17, 20]. Comparatively, in languages that are more opaque in orthographies, or less consistent in grapheme-to-sound correspondence, such as English and French, problems with literacy are more common in slow reading, reading accuracy, and phonemic awareness [21]. Therefore, orthographic complexity in language influences reading development, how prevalent literacy problems are, and how they are manifested in different symptoms [22].

Moreover, dyslexia was shown to be less prevalent in China and Japan which is reported to be as low as 1% [3]. However, as discussed by scholars, perhaps this is due to the different symptoms in Chinese dyslexia, which are more typical of dyspraxia rather than dyslexia. Symptoms include having difficulty coping with Chinese characters, and bad pen-holding position, which attributes to poor visual memory and motor skills [23]. Additionally, as mentioned above, English is more inconsistent in the relationship between letters and sounds, while non-alphabetic languages like Chinese and Japanese have fairly regular correspondences between letters and sounds [3]. Consequently, the prevalence rates of dyslexia vary somewhat across cultures, which is rooted in the fundamental difference in writing systems.

3 Impacts

3.1 Impacts on Academic Achievements

Dyslexia impacts individuals in a variety of ways, most obviously the ability to read and write. Children with dyslexia have trouble grasping abstract concepts and may be slow at recalling words [24]. When they are reading, they may reverse letters and read words backward, which increases the difficulty of comprehending texts. These struggles lead to delays in learning and in academic progress. They may also have difficulty processing and remembering information which in turn affects their literacy skills. Moreover, it is common for individuals with dyslexia to experience cognitive impairment, such as poor memory, particularly in reading or recalling a specific word [24].

Struggling with problems with regard to the learning experience, dyslexia can affect students' academic achievement and performance [25]. In a study on primary students from Kenya conducted by Kaluyu and Ooko, there is a statistically significant relationship

between dyslexia and students' academic achievement [25]. Dyslexia influences children's ability to read, spell, organize and comprehend ideas, which greatly influences their academic performance since reading, comprehension, and writing are involved in all subject courses [25]. Tops et al. also show that students with dyslexia are more likely to experience study delays, and dyslexia affects both study continuance and study success [26]. The problems in dyslexia would end up making students struggle with tests, examinations, and overall academic low grades [25, 26]. Consequently, the huge challenges that dyslexia presents lead to a high drop-out rate in school and less chance to finish school than peers who are not suffering from dyslexia [26].

3.2 Impacts on Self-Esteem

The relationship between dyslexia and academic achievement is further mediated by changes in self-esteem. Although dyslexia is not an emotional disorder, it may also lead to frustration, feelings of anxiety, low self-esteem, and depression. They often center on children's inability to meet normal expectations [27]. Compared to peers, children with dyslexia are immature both physically and socially, which is likely to lead to poor self-image and less peer acceptance [27]. Furthermore, children with dyslexia have difficulty reading social cues and body language, and may have problems with boundaries in social interactions [27]. Struggling with oral language functioning, moreover, children with dyslexia may have trouble speaking fluently, finding the right words, and so on, which makes them awkward and anxious in social situations and lose self-esteem gradually [24, 27]. The anxiety would make them anticipate failure and not expect themselves to learn better, which enables them to become more anxious when entering new situations; they may even develop anxiety disorders which are common among children with dyslexia [24, 28]. Frustration in school or social situations may further produce anger, especially towards parents [27]. Children may experience a feeling of inferiority and powerlessness due to failures and frustration, which makes it difficult for them to build a positive self-image and start to generate negative thoughts towards themselves. They may easily become depressed despite adequate intelligence [24]. They need to struggle to catch up with peers, which leads to delays in learning, frustration, and low self-esteem. Consequently, as noted by Armstrong and Squires, "a vicious circle is created in which failure leads to further erosion of self-belief and self-esteem and this, in turn, leads to more resistance to learning" [12]. It can thus be seen that dyslexia has a variety of impacts on individuals [24].

4 Intervention

Developing effective interventions for children with literacy and dyslexic difficulties and implementing them thoroughly is essential in helping students to adjust to school and increase self-esteem [12]. It is also helpful to implement policies that incorporate interventions, including adjusting the curriculum and providing assistance [25]. Teachers should provide clear, systematic, and explicit instructions for students with dyslexia and adapt to their needs [12]. One-to-one or small group intervention with regular reading support targeting reading and spelling difficulty, emphasizing phonics instruction,

phonological awareness, writing exercises, and so on, is also effective [29]. The effective intervention seems to promote normal activity in the left hemisphere and language network and has shown reduced symptoms in dyslexia [29].

For parents and teachers, it is important for them to provide ongoing encouragement and support for children. According to Dr. Ryan in the International Dyslexia Association, four elements should be included in encouragement [27]. First, to listen to children's feelings, including anxiety, anger, and depression which are normal for children with dyslexia. Second, teachers and parents should reward effort over product and value progress more. Third, teachers and parents should not discourage children with dyslexia when facing some unacceptable behaviors, since words of discouragement, although inadvertently, may damage children's self-esteem. Finally, to help children establish realistic and attainable goals. These attainable goals allow students to achieve success, which helps to increase self-esteem and change the cycle of failure [27].

Though opinions on interventions differ, it has been a consensus that it is crucial to acknowledge the challenges, including emotional, behavioral, and social impacts of dyslexia, and provide chances for individuals with dyslexia to feel better about themselves and deal with feelings.

5 Conclusion

To conclude, this paper reviewed the causes, impacts, and interventions for addressing dyslexia, examining the relationship between dyslexia and students' academic achievement. The results showed that the progression of dyslexia and changes in kids' academic performance is thus directly and positively correlated. Problems with reading, writing, and spelling are linked to poor academic performance. Additionally, there is a negative correlation between learning difficulties in kids and their low self-esteem. The manifestation of dyslexia is caused by a variety of factors, including neurological, genetic, prenatal, environmental factors, and so on. Researchers suggest using educational and psychological interventions to help kids receive the right guidance and treatments in order to solve these problems.

A limitation of current studies on dyslexia is that almost 90% of the studies were published in medical, neuropsychological, or psychological journals, while only 6% of the studies were published in educational journals [30]. While the effective interventions of dyslexia should base on educational practices, this unbalanced distribution of academic journals shows that relatively low and limited consideration was given to the effective teaching methods in education while more attention was given to the medical and neuropsychological aspects [30]. In addition, more attention could also focus on cultural differences of dyslexia since there is less research on cultural differences and how they contribute to the manifest of dyslexia. Moreover, future studies could also focus on how interventions could target students' self-esteem and confidence, thus helping students to improve their academic performances or the other way around.

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