

An introduction to dyslexia

School resources

Developmental dyslexia is a specific learning disability that affects 3-20% of people, depending on how diagnostic criteria and severity thresholds are defined. It is commonly understood as difficulty decoding the written word. This means that children with dyslexia struggle with literacy-based activities such as reading, writing, and spelling. There are significant overlaps between those who are dyslexic and those who struggle with literacy more generally. Therefore, this overview will explore what is understood about and how best to support students that might be showing 'dyslexic-like' characteristics¹.

Biological features of dyslexia

A large amount of research has looked for biological correlates of literacy difficulties, identifying genetically predisposed brain differences. Some of these differences are present before reading onset². However, this does not mean that literacy difficulties are biologically set in stone. Instead, due to neuroplasticity, brain structure and functional connectivity continue to change throughout a person's life. These changes are highly influenced by environmental factors, including parenting, nutrition, healthcare, peer relations, and education. Therefore, in order to achieve positive outcomes for those who show dyslexic characteristics, it is necessary to view their difficulties as a developmental delay rather than a permanent deficit, and to work in ways that support them.

A relatively recent perspective in the literature around dyslexia is the concept of neurodiversity, which states that innate neurological differences represent natural human variation. From this perspective, it is the social context that determines whether or not certain types of brains are understood as disordered. For example, dyslexia can be viewed in the light of the emphasis modern society places on demonstrating learning and academic attainment primarily through reading and writing over other more practical and creative forms of expression. Therefore, neurodiversity advocates argue that we need to understand and appreciate the natural diversity of human brains instead of trying to fix or cure them (which is not to say that it is not important to teach students to read and write using explicit, structured methods that support mastery of decoding skills). A neurodiversity paradigm-affirming approach looks for ways to support divergent ways of thinking and interacting with the world. By viewing dyslexic people in this way, we can accommodate their differences in the same way that we accommodate other differences between people³.

The neurodiversity model has also been used to explain why many people with dyslexia also have other diagnoses, such as Attention Deficit Hyperactivity Disorder (ADHD), Development Coordination Disorder (DCD), or autism. These diagnoses are categories designed to enable medical professionals to prescribe treatments, and teachers to offer interventions for difficulties in specific areas of functioning, although placing different labels on individuals may be misleading as it gives the impression that each diagnosis is a separate condition with a distinctive cause. Associated underlying cognitive and processing differences often do not conform neatly to these diagnostic labels, but rather affect multiple areas of functioning⁴.

Cognitive features of dyslexia

Cognitive processes are the processes that the brain goes through in order to perform different thinking tasks. In dyslexia research, scientists focus on understanding the cognitive processes needed for reading and literacy tasks. These include working memory, rapid atomised naming (RAN – the ability to name items at speed), and auditory processing (the ability to hear sound differences). Difficulties with memory mean that the child may not retain the sounds of letters long enough to blend them into words, or find it hard to follow lengthy spoken instructions. Difficulties with RAN mean that the child may be unable to quickly identify familiar items presented on a page, such as a series of objects or colours. Difficulties with auditory processing mean that the child may have difficulty understanding speech when there is background noise or may not remember verbal instructions. Tests of all of these areas are used in dyslexia assessment⁵.

The cognitive process most strongly associated with dyslexia is phonological processing, an aspect of auditory processing that refers to the ability to hear differences between phonemes. Phonemes are the smallest unit of language that distinguish one word from another: for example, ‘cat’ differs in one phoneme from ‘cut’. This skill is crucial for reading as it enables the retrieval of letter pronunciations. Typical development includes recognising rhymes and alliterations in early childhood (such as ‘Peter Piper picked a peck of pickled peppers’), and breaking words into syllables and linking sounds to letters as the child grows older. While some children develop these skills naturally, others need more specific instruction. Difficulties with phonological processing mean the child may struggle with letter-sound correspondences, remembering sequences of sounds, or repeating non-words⁶. In recognition of the importance of phonological processing for reading, many English-speaking countries now use a phonetic alphabet (ah, ber, cuh) rather than traditional letter names (ay, bee, cee) as a component of their broader literacy strategy.

Myths about dyslexia

The above section addressed what research has demonstrated about the biological and cognitive aspects of dyslexia and literacy difficulties. There are also several commonly held beliefs about dyslexia that are not supported by research evidence. The following section will address these myths.

Dyslexia is related to visual processing: Historically, the first cases of dyslexia were recorded as ‘word-blindness’. The phrase ‘word-blindness’ linked the phenomenon of difficulty reading to problems with eyesight. With the advance of scientific research methods, these theories have been replaced by a deeper understanding of the biology and cognition around dyslexia. Nonetheless, the idea of dyslexia as a visual processing disorder continues to receive attention, particularly in relation to the concept of ‘visual stress’. Visual stress is a phenomenon associated with hyperactivation of the visual cortex. Among other effects, including dizziness and nausea when viewing high-contrast patterns, it can cause black print on a white background to be perceived in a distorted way. This is commonly described as words ‘jumping around on the page’.

Visual stress can cause reading fatigue, and the use of coloured overlays can somewhat overcome these symptoms. It is important to note, however, that a summary of the research in the area suggests that the proportion of dyslexic students who benefit from overlays is similar to that of neurotypical students⁷. Therefore, while visual stress can impact reading, it is not a characteristic of dyslexia and is not acknowledged in any formal definitions. Any child, with or without reading difficulties, can suffer from visual stress.

Dyslexia is the writing of letters backwards: Another aspect commonly associated with dyslexia is that students with dyslexia write words jumbled up or write mirrored versions of letters (for example, writing

the letter b in reverse as d). However, just because a student struggles with writing words correctly does not mean they have dyslexia. Some students with dyslexia have trouble with letter and word formation, but many do not. In fact, the majority of students who reverse letters do not have any learning issues.

Dyslexia is a discrepancy between intelligence quotient (IQ) and literacy skills: A common understanding of dyslexia is that an individual's high IQ is masked by their poor literacy ability. This understanding is based on outdated definitions of dyslexia that required the student to fail in literacy tasks but achieve in other subjects. However, meta-analyses show no evidence to suggest that phonological processing difficulties occur more frequently in those with high IQ, or that they are correlated with intelligence in any other way. In addition, dyslexia often co-occurs with other types of neurodivergence, such as ADHD or dyscalculia, which can affect a student's performance in other subjects. Even without co-occurring conditions, poor reading will affect achievement in any subject that requires study from written texts and assessment in writing. Accordingly, current definitions of dyslexia no longer require a discrepancy between the student's reading skills and their general academic achievement.

Dyslexia is caused by the inconsistency of English orthography: Some people believe that dyslexia is caused by the lack of transparency in English orthography. However, research from around the world shows that people struggle to read in many different languages with both transparent and opaque orthographies. Although symptoms of dyslexia may be different in different languages, dyslexia is not exclusive to English.

Classroom behaviour

While this guide has explored the potential underlying biological and cognitive aspects of dyslexia, it is also important to recognise how these factors may result in displays of different behaviours in the classroom. The table below presents the characteristics that people reported to have dyslexia may show at different ages. These characteristics can also be present for those experiencing difficulty with literacy in general.

Developmental phase	Difficulties and strengths of dyslexia
Preschool	<ul style="list-style-type: none"> Delayed speech Poor expressive language (baby talk, mispronounces common words) Poor recognition of rhymes, difficulty learning nursery rhymes
Early school years	<p>Difficulties:</p> <ul style="list-style-type: none"> Little interest in and difficulty learning letters Poor letter-sound knowledge Poor phoneme awareness Poor word attack skills Idiosyncratic spelling Problems copying Avoids reading time, complains about difficulty reading Resistant to traditional reading interventions Difficulty recalling sequences like the days of the week or months of the year <p>Strengths:</p> <ul style="list-style-type: none"> Curiosity and imagination May like solving puzzles and building models

<p>Middle school years</p>	<p>Difficulties: Poor decoding skills when faced with new words Phonetic spelling Reading requires great effort and causes fatigue Slow reading, needs extra time to complete tests Avoids reading out loud Mispronounces new or long words Confuses similar-sounding words Messy handwriting Rote memory difficulties</p> <p>Strengths: Big picture thinker Better ability to read in special interest areas May show a discrepancy between ability to express themselves in writing and in speaking</p>
<p>Adolescence and adulthood</p>	<p>Difficulties: Poor reading fluency Slow speed of writing Poor organisation and expression in written work Consider themselves stupid</p> <p>Strengths: May develop excellence in special interest area May be an original thinker May have developed high levels of resilience</p>

Adapted from Snowling (2008) and The Yale Center for Dyslexia and Creativity⁸

Challenges experienced by dyslexic learners

Dyslexic students will have experienced years of frustration, stress, anxiety, and exhaustion from struggling with a skill that seems easy for their peers. Many blame themselves for their difficulties and develop a negative self-image, shame, defensiveness, low self-esteem, and depression. This self-blame is exacerbated when the student's difficulties are not recognised as dyslexia and, instead, attributed to carelessness and lack of effort.

The impact of receiving the label 'dyslexia' on these emotional and mental health challenges is unclear. Qualitative interview studies have demonstrated that participants were pleased to gain the dyslexia label and to know why they struggled. On the other hand, quantitative studies have shown that those with dyslexia hold a lower academic self-concept than those without the label who similarly struggle with literacy. The latter finding suggests a negative impact of the dyslexia label that goes further than the negative impact of struggling with literacy-based tasks. Therefore, it could be argued that the label carries negative connotations that may lower the academic expectations of those who hold them. With this in mind, it is vital that those supporting students with dyslexia do not regard or call it a deficit, but instead encourage the student to see the positive aspects of dyslexia. In addition, research has identified the student's perception of how well teachers and peers understand and support them at school as a strong protective factor against dyslexia-related emotional difficulties⁹.

Positive dyslexia

Do you have a dyslexic student in your class? Great news! Dyslexia is commonly described in terms of its challenges rather than its strengths, but research increasingly shows that those with dyslexic characteristics also have strengths in many areas. Creativity, problem-solving, and communication skills are highly associated with dyslexia, and all have been acknowledged by The World Economic Forum as vital skills for workers both now and in the future. In addition, some research shows that dyslexics have excellent abstract, lateral thinking skills, with an ability to consider many layers of an issue simultaneously. This can make them more inventive and original than neurotypical thinkers¹⁰. It also explains why dyslexia appears to be common among successful scientists, innovators, artists, engineers, and entrepreneurs, such as theoretical physicist Albert Einstein, artist Pablo Picasso, author Agatha Christie, polar explorer Ann Bancroft, and Apple pioneer Steve Jobs.

Therefore, rather than viewing dyslexia in terms of its negative impact on a student, consider the student's strengths. A focus on improving strengths alongside supporting challenges is vital for all students to reach their full potential. This can help to improve both their academic outcomes and their overall self-concept.

Strategies for working with students with dyslexic characteristics

Strategies for students of all ages: Research has shown the benefits of a growth mindset in improving the motivation of students with literacy difficulties. People with a growth mindset believe their abilities and intelligence can be developed and improved through perseverance, good strategies, and support from others. Those with fixed mindsets, on the other hand, believe that their intelligence and ability are innate and fixed, and there is not much they can do to change it. Supporting students to adopt a growth mindset approach can have a positive impact on their academic resilience. Furthermore, believing that skills and strengths can be improved can help students see dyslexia in a positive light, meaning that they can harness a 'positive dyslexia' viewpoint.

Research has also shown the impact of teacher expectations on students. This can be a positive effect if the teacher holds high or positive expectations about a child, or a negative effect if the teacher holds low or negative expectations. Therefore, it is vitally important that a teacher does not think a child cannot achieve just because they show dyslexic characteristics. Teachers should have high expectations for their students and encourage them to believe that, with hard work and appropriate support, they can achieve.

In addition, these following quick tips should help students with dyslexia characteristics at any age:

- Reward effort and individual progress rather than specific learning outcomes
- Support the student in processing their emotions, including anger or frustration
- Build self-esteem
- Stick to daily routines to reduce the overall cognitive load on the student
- Teach explicitly rather than expecting the student just to 'get it'
- Review previously learned material regularly
- Support realistic goal-setting

First years of school: Once the student has started school, research shows that interventions providing explicit, systematic instruction in foundational reading skills are highly effective. The most well-founded approach in this area is called structured literacy (learn more about this approach [here](#)). It helps all students, not just those with dyslexia. It integrates all aspects of literacy learning step by step, starting with phonological awareness (sound structure of words). It then teaches phonics (sound-symbol association), syllable types, morphology (knowing what the parts of each word indicate), syntax (sentence structure), and semantics (meaning). All of these concepts are taught explicitly. Teaching is individualised, systematic, and cumulative, with each new step building on what the student has previously learned¹¹.

There are two specific factors that predict the most success in early interventions. The first is the number of intervention hours a child receives, with more hours having a greater impact. The second is including instructions on reading *and* spelling, rather than reading alone. There have also been some studies that propose a greater impact of multi-sensory interventions and one-on-one instruction for this age group. However, a recent meta-analysis does not support these conclusions, showing similar effects in small-group instruction and evidence-based instructional approaches that were not multi-sensory¹².

As phonics interventions are most effective when used with younger children who are showing the first signs of dyslexia, early screening and support in the first year of school are essential. Interventions should not be withheld until reading difficulties are apparent or an official diagnosis is made. Most early literacy screeners involve a cost, which may be unrealistic for some teachers. However, there is one validated screener, DIBELS (Dynamic Indicators of Basic Early Literacy Skills), which offers free testing resources [here](#).

In addition to the above interventions, some accommodations that may help students succeed include:

- Allowing extra time for reading and writing tasks
- Allowing extra breaks
- Presenting verbal directions one at a time and asking the student to repeat the direction
- Offering extra opportunities for practice, using a variety of options to suit the student (such as games, peer teaching, and software)
- Seating the student at the front of the class to reduce distractions¹³.

Later school years: Interventions with a focus on comprehension have the greatest impact in later school years¹⁴. In addition to the accommodations listed above, the following may also be beneficial:

- Allowing the student to audio- or video-record lessons and instructions so they can review them later
- Providing written lesson notes or assistance with note-taking (such as a printed lesson outline for the student to fill in, or support using a graphic organiser)
- Providing alternative assessment options that do not rely on reading and writing (such as video projects and oral exams)
- Offering assistive technology such as text-to-speech or speech-to-text, tablets, and audiobooks
- Presenting information in multiple ways, including visually
- Presenting written instructions in a visually clear format (one idea per line rather than a continuous paragraph, keywords and most important questions highlighted, wider line spacing, larger print, irrelevant or distracting information covered or removed)

- Breaking complex tasks down into smaller components and only presenting one at a time
- Providing glossaries and writing new terms on the whiteboard ahead of the lesson
- Making expectations explicit by offering samples for completed assignments¹⁵.

This research review was originally written by Dr Cathryn Knight and updated in 2024 by Dr Romy Hume.

Endnotes

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