

# Dyslexia: An overview

School resources

Dyslexia is commonly known as a problem with decoding the written word. This means that children with dyslexia typically struggle with literacy-based activities such as reading, writing and spelling. In fact, there has recently been academic debate about whether there is sufficient evidence to suggest that there are key differences between those that are dyslexic and those who struggle with literacy more generally. Therefore, this overview will explore what we understand about dyslexia, and literacy difficulties more generally, and how we can best support students that might be showing 'dyslexic-like' characteristics.

## Biological features

A large amount of work has been conducted that looks for biological correlates of literacy difficulties. Research has found evidence of structural and functional differences in the brains of those who struggle with literacy. Furthermore, certain genes have been found to be associated with dyslexia. However, knowledge of the exact impact of these of these genes is still being researched.

While there is evidence of some underlying biological determinants of literacy difficulties, it is also important to note that this is not always one-directional. While genes are important, the plasticity of the brain means that a child's environment can also impact their biological development. Aspects such as parenting, nutrition, healthcare, peer relations and education can influence the expression of genes. This suggests that the child's environment may also affect their brain structure. Therefore, in order to positively influence those who show dyslexic characteristics, it is arguably necessary not to view their difficulties as predetermined, and to work in ways that can positively shape their outcomes.

## Neurodiversity

An additional biological perspective that is beginning to emerge in the literature around dyslexia is the concept of neurodiversity. This is the idea that diverse neurological conditions are the result of natural human variation rather than a disorder or deficit. The neurodiverse model suggests that trying to understand dyslexia, and other conditions, by looking for weaknesses and difficulties is ineffective. Rather, diversities are accepted as natural differences and should not be seen as problems to be found and cured.

This perspective argues that dyslexia emerges due to the emphasis that modern society places on academic attainment above other forms of attainment (such as being practical or creative). Were practical and creative achievements accorded an equivalent status to academic achievement, dyslexia might not necessarily be regarded as a disorder. Therefore, it could be argued that we are all neurodiverse, and it is the social context that determines whether or not the diversity is understood as a disability.

The neurodiversity model of disability has been used to explain why many people with dyslexia show 'overlapping conditions' with other diagnoses. For example, many individuals with attention deficit hyperactivity disorder (ADHD) are also diagnosed with dyslexia, dyspraxia or Asperger's. It is argued that individuals may have a particular neurodiversity that presents with different 'symptoms' in different people. This will then interact with the environment and lead to a particular diagnosis. For example, a person may have difficulties with sequencing: if the difficulties appear to affect sound processing

then an individual may be diagnosed with dyslexia, whereas, if they affect muscle control, they may be diagnosed as dyspraxic<sup>1</sup>. Therefore, placing different labels on these individuals may be misleading as it gives the impression that each diagnosis is a separate problem with a distinctive cause.

Leading neurodiversity researcher Thomas Armstrong argues that we need to appreciate the vast natural differences in human brains<sup>2</sup>. By viewing dyslexic people in this way, we can appreciate the different ways that dyslexic people learn and accommodate these differences in the same way that we accommodate other differences between people.

## Cognitive features

Cognition refers to the process of thinking. Cognitive processes are the processes that the brain goes through in order to perform different tasks. In dyslexia research, cognitive researchers are particularly interested in the cognitive processes needed for reading and literacy tasks. Many different cognitive functions have been associated with dyslexia and literacy difficulties. These include short-term and working memory, rapid atomised naming (RAN - the ability to name items at speed), and auditory processing (the ability to hear the differences in sounds). Tests of these areas are commonly used in dyslexia assessment. A key cognitive skill that has been strongly associated with dyslexia is phonological processing ability. While interventions developed around other cognitive skills have shown mixed findings in their benefit to dyslexic learners, interventions developed around phonological processing are proven to help those showing dyslexic characteristics. Given its dominance in the research around dyslexia, it is important for teachers to know what phonological processing is.

## Phonological deficit hypothesis

The phonological deficit hypothesis was developed by Margaret Snowling, who found that dyslexic individuals showed more difficulty with complex phonological patterns than non-dyslexics. Phonemes are the smallest unit of sounds that distinguish one word from another: for example, 'cat' differs in one phoneme from 'cut'. This theory argues that children who are struggling with dyslexic-like characteristics find it difficult to make these letter-sound correspondences. Phonological awareness is needed to retrieve the pronunciation of letters and letter strings, and therefore to read the word. Typical phonological skills in younger children involve identifying if words rhyme, and being aware of alliteration (such as, Peter Piper picked a pair of peck of pickled peppers). As the child grows older, phonological skills are noticeable in how a child is able to break words down into syllables and pair sounds with written letters. While some children develop these skills naturally, others need more instruction, which has led researchers to link difficulties in phonological processing with dyslexia.

A key article from 2012 summarises what we currently understand about dyslexia. It argues that, whilst phonological deficits are common in individuals with dyslexia, a single phonological deficit is probably not sufficient to cause the disorder<sup>3</sup>: therefore, while the phonological deficit is important, it is not sufficient on its own to cause dyslexia. However, and perhaps most importantly, interventions promoting phonological skills are effective for teaching children with dyslexia and literacy difficulties.

Due to the importance of phonological processing in learning to read, children in some countries are now commonly taught using a phonetic alphabet (ah, ber, kuh) rather than (ay, bee, cee) when learning to read.

## Myth busting

The above section addressed what research has told us about the biological and cognitive aspects of dyslexia and literacy difficulties. However, there are a number of commonly held beliefs about dyslexia

which are not supported by research evidence. The following section will therefore attempt to address these myths around dyslexia.

- **Dyslexia is related to visual processing**

Historically, the first cases of dyslexia were recorded as being 'word-blindness'. The phrase 'word-blindness' linked the phenomenon of difficulty reading to problems with eyesight. However, with the advance of scientific research methods, these theories have been replaced with 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' whereby a person may see a page differently due to distortions of black print on a white background. Commonly discussed is how dyslexic people see words 'jumping around on the page' when reading black text on a white background.

Visual stress has been reported to cause reading fatigue, and these symptoms can be somewhat overcome by the use of coloured overlays. It is important to note, however, that a summary of the research in the area suggests that the proportion of dyslexic children who benefit from overlays is similar to that in neurotypical children<sup>4</sup>. Therefore, while visual stress can impact reading, it is not a characteristic of dyslexia and is not acknowledged in any formal definitions of dyslexia. 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 children with dyslexia write words jumbled up or write mirrored versions of letters (i.e. the letter in reverse 'b-d'). However, just because a child struggles with writing words correctly doesn't mean they have dyslexia. Some children with dyslexia have trouble with letter and word formation, but many do not. In fact, the majority of children who reverse letters don't have any learning issues.

- **Dyslexia is a discrepancy between intelligence quotient (IQ) and literacy skills**

A common understanding of dyslexia is that the individuals' ability is masked by their poor literacy ability. Were this correct, those with dyslexia would have a high IQ with a low literacy ability. However, meta-analyses show no evidence to suggest that difficulties such as phonological processing show any preference according to IQ. In particular, they are not more apparent in those with higher general ability levels. Furthermore, if dyslexia were to be understood as a difficulty that affects only those with higher ability, it would mean that those with lower ability who may also struggle with the same processing difficulties would not be able to access the resources that they need due to the lack of diagnosis. Therefore, it is incorrect to assume that dyslexia is an IQ-ability discrepancy.

- **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. Whilst how a person displays symptoms may be different in different languages, dyslexia is not exclusive to English.

## Classroom behaviour

While we have 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 who are reported to have dyslexia may show at different ages.

### Dyslexia characteristics through development

DEVELOPMENTAL PHASE	CHARACTERISTICS OF DYSLEXIA
Preschool	Delayed speech Poor expressive language Poor rhyming skills Little interest/difficulty learning letters
Early school years	Poor letter-sound knowledge Poor phoneme awareness Poor word attack skills Idiosyncratic spelling Problems copying
Middle school years	Slow reading Poor decoding skills when faced with new words Phonetic spelling
Adolescence and adulthood	Poor reading fluency Slow speed of writing Poor organisation and expression in written work

(Adapted from Snowling, 2008)

These characteristics can also be considered to be present for all those experiencing difficulty with literacy and may be a sign that additional intervention may be needed.

### Challenges faced by dyslexic learners

As discussed, those showing dyslexic characteristics can be disadvantaged in literacy tasks. Given the importance that the education system places on acquiring literacy skills from a young age, it is of no surprise that research has shown that those with dyslexia and literacy difficulties have been found to hold lower academic self-concepts. Yet, interestingly, research has also shown contradicting findings on how the dyslexia label impacts those who hold it. Qualitative interview studies have demonstrated how people with dyslexia were pleased to gain the dyslexia label and to know why they struggled. On the other hand, quantitative survey-based research has 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 itself 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 it. With this in mind, it is vital that those supporting students with dyslexia do not acknowledge it as a deficit, but instead encourage the child to see the positive aspects of dyslexia. The following section will discuss 'positive dyslexia'.

### Positive dyslexia

Do you have a dyslexic student in your class? Great news! Dyslexia is commonly viewed for its challenges rather than its strengths, but research increasingly shows that those with dyslexic characteristics also have strengths in a number of areas. Particularly associated with dyslexia are creativity, problem solving and communication skills, all of which have been acknowledged by The World Economic Forum as being

vital skills for workers both now and in the future. Therefore, rather than viewing dyslexia in terms of the negative impact it has on a student, consider the strengths that the student shows. 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 dyslexia characteristics

### Growth mindset

Research has shown the benefits of holding 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. This differs from those with fixed mindsets, who believe that their intelligence and ability are innate and fixed, and there's not much they can do to change that. 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.

### Teacher expectancy effect

Research has shown the impact that teacher expectations can have 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 about a child. As we have discussed, while dyslexia can impact literacy skills, there are also many positive aspects of dyslexia. Furthermore, with supportive intervention and different learning styles, there is no reason why someone showing dyslexic characteristics can't achieve in all areas of academia. Therefore, it is vitally important that a teacher does not think that a child can't achieve just because they show dyslexic characteristics. Teachers should have high expectations for their students and encourage them to believe that, with hard work, they can achieve.

### Phonological processing

As discussed, vast research evidence has pointed towards phonological processing skills being correlated with dyslexic characteristics. Furthermore, interventions that target phonological processing skills have been found to be effective in helping to improve dyslexic characteristics. Many interventions have been developed to help to improve phonological processing. Furthermore, with the advance of technology, computer assisted programmes have been developed to help children practice this skill. Phonological processing interventions have been found to be particularly effective when used with younger children who are showing the first signs of phonological awareness difficulties. Therefore, early intervention is particularly effective. Teachers should familiarise themselves with the programmes used in their area, and for the age group that they work with.

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## Endnotes

1 Cooper, R. (2006). *Neurodiversity and dyslexia: Challenging the social construction of specific learning difficulties*. London: South Bank University.

2 Armstrong, T. (2011). *The power of neurodiversity: Unleashing the advantages of your differently wired brain*. Da Capo Lifelong Books.

3 Peterson, R.L., & Pennington, B.F. (2015). Developmental dyslexia. *Annual Review of Clinical Psychology*, 11, 283-307.

4 Wilkins, A. (2003). *Reading through colour: How coloured filters can reduce reading difficulty, eye strain, and headaches*. Chichester: John Wiley & Sons.

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