Chapter One

UNDERSTANDING DYSLEXIA

> In the first half of this century, the story of dyslexia has been one of decline and fall; in the second half, it has culminated in a spectacular rise. From being a rather dubious term, dyslexia has blossomed into a glamorous topic; and rightly so, for with a prevalence of around 5%, the condition is remarkably common.
>
> —Dr. Uta Frith, 1999, p. 192

> A substantial number of well-intentioned boys and girls—including very bright ones—experience significant difficulty in learning to read, through no fault of their own. This frustrating and persistent problem in learning to read is called *dyslexia*.
>
> —Dr. Sally Shaywitz & Dr. Jonathan Shaywitz, 2020, p. 3

INTRODUCTION

Steven, a second-grade student, knows only four letters of the alphabet. His teachers have tried to help him memorize letters and their sounds, but he always seems to forget what he has learned the next day. Lately, he has started to say that he is dumb, and that's the reason he can't learn to read and spell.

Maria is in middle school. She is often confused by letters that have similar sounds, such as spelling *every* as *efry*. These subtle sound confusions are also apparent in her speech when she pronounces certain multisyllabic words, for example, saying "puh-si-fic" when she meant to say "specific." She sometimes confuses words that have similar sounds. Even though she has a good vocabulary, she may say "that book really memorized me" when she really meant to say "mesmerized." At times, she avoids saying certain words because she is unsure about their pronunciation.

Jeff is a junior in high school. He recently took the Scholastic Aptitude Test (SAT) and only finished half of each section. He said he knew how to do the rest of the questions, but he didn't have enough time to attempt them. He wonders why his peers seem to always have plenty of time when reading takes him so long.

Mr. Brogan has just attended his fifth-grade son's Individualized Education Program (IEP) meeting at the local elementary school. His son, Matthew, is having great difficulty learning to read and spell. Even though he has an adapted spelling list, Matthew still forgets how to spell the words when the weekly spelling test is given. He spells words just the way they sound, not the way they look, such as spelling *they* as *thay*. When Mr. Brogan hears Matthew's fifth-grade teacher, the special education teacher, and the school psychologist describing his son's severe reading and spelling difficulties, he immediately thinks: "That was just like me."

What do these individuals who struggle with certain aspects of literacy have in common? They all have dyslexia. Although this seems to be an accurate label to explain difficulty in learning to read and spell, confusion exists regarding what having dyslexia actually means.

WHAT IS DYSLEXIA?

What is dyslexia? This simple question is asked every day by both parents and teachers as they struggle to understand why a child is not learning to read with ease. It is a question asked by Matthew who wonders why reading and spelling are so difficult for him. It is also a question asked by older students like Jeff as they attempt to determine why reading is so effortful and why they read so much more slowly than their peers. Although Mr. Brogan was well aware that he had always struggled with reading, when he hears the description of Matthew's difficulties and that the school team thinks that Matthew has dyslexia, he realizes that he too has dyslexia that was never diagnosed. He now understands the reasons why he never reads for pleasure and why the stack of books that others have suggested he read sits undisturbed by his bedside.

Essentials of Dyslexia Assessment and Intervention, Second Edition. Nancy Mather and Barbara J. Wendling.

Over the last century, researchers who are concerned with the diagnosis and treatment of dyslexia have attempted to answer the following three questions (Tunmer & Greaney, 2010, p. 229):

1. What is it?
2. What causes it?
3. What can be done about it?

The goal of this book is to attempt to answer these three questions in a straightforward way so that dyslexia can be easily understood by educational professionals and parents alike, as well as by individuals who have dyslexia. Although we still do not have conclusive answers to the abovementioned questions, fortunately, over the last century, researchers, medical professionals, and practitioners have learned a lot about dyslexia, as well as how this disorder affects reading and spelling development.

The word dyslexia comes from the Greek words δυσ- dys- ("impaired") and lexis ("word"). Although numerous definitions exist, dyslexia can be most simply defined as a neurobiological disorder that causes a marked impairment in the development of reading. More specifically, dyslexia is manifested in weaknesses in word-level reading skills; it affects decoding (pronouncing printed words), reading rate and fluency, and encoding (spelling) (Pennington et al., 2019; Vellutino & Fletcher, 2007). Thus, dyslexia is a complex cognitive disorder of neurobiological origin that affects the development of literacy (Pennington et al., 2019; Shastry, 2007; Vellutino & Fletcher, 2007).

For teachers and parents just learning about dyslexia, the book, *Dyslexia: A Very Short Introduction*, provides an accessible overview of research discussing history, the role of both genetic and environmental factors, brain scanning techniques, and effective interventions (Snowling, 2019). In addition, the University of Michigan has a comprehensive website that provides numerous resources for parents, professionals, and individuals with dyslexia, including research, case studies, recommended books, apps, and success stories (http://dyslexiahelp.umich.edu/).

DON'T FORGET

Dyslexia is a neurobiological disorder that affects the development of decoding (pronouncing written words), reading rate and fluency, and encoding (spelling).

Both parents and professionals are often confused regarding the difference between a specific learning disability (SLD) and dyslexia. They often wonder, if a student is diagnosed with an SLD in reading, does this mean that the student has dyslexia? The answer to this question is: Maybe. Essentially, SLD is a broader category that encompasses several different types of disorders, including dyslexia, the most common and carefully studied SLD (Shastry, 2007). In addition, the terms dyslexia, specific developmental dyslexia, specific learning disorder with an impairment in reading (*Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision,* DSM-5-TR), specific reading disability, and reading disability are often used interchangeably to describe this neurodevelopmental disorder (DeFries et al., 1978; Pennington et al., 2019). DSM-5-TR clarifies that dyslexia is an alternative term that may be used to describe difficulties with accurate or fluent word recognition, decoding, and spelling (American Psychiatric Association, 2022).

In some school districts, school psychologists and special and general educators do not use the word dyslexia when describing students with severe reading disabilities. In fact, the term dyslexia has fallen in and out of popularity since the early 1930s (Rooney, 1995). Many states have comprehensive laws that must be adhered to regarding both assessment and service delivery to school children with dyslexia. In fact, as of 2022, all 50 states of the United States of America have some type of dyslexia law. Rapid Reference 1.1 lists several websites that describe the dyslexia laws for each state.

Rapid Reference 1.1

Resources for Dyslexia Laws

National Center on Improving Literacy

State of Dyslexia: Explore dyslexia legislation and related initiatives in the United States of America.

improvingliteracy.org/state-of-dyslexia

Dyslegia: A Legislative Information Site

Dyslegia.com tracks the progress of legislation specifically related to dyslexia throughout the United States.

dyslegia.com

Dyslexic Advantage

Reviews dyslexia laws in the US.

dyslexicadvantage.org/dyslexia-laws-2018/

In addition to increased awareness of dyslexia, in the coming years, we are likely to see the term "dyslexia" being used more often. One reason that the term is becoming more commonplace is the memo that was issued by the United States Office of Special Education Programs in May of 2015, encouraging schools to use the terms, dyslexia, dyscalculia, and dysgraphia. The memo states:

"In implementing the IDEA requirements discussed above, OSERS encourages SEAs and LEAs to consider situations where it would be appropriate to use the terms dyslexia, dyscalculia, and dysgraphia to describe and address the child's unique, identified needs through evaluation, eligibility, and IEP documents. OSERS further encourages states to review their policies, procedures, and practices to ensure that they do not prohibit the use of the terms dyslexia, dyscalculia, and dysgraphia in evaluations, eligibility, and IEP documents."

Note: IDEA = Individuals with Disabilities Education Act; OSERS = Office of Special Education and Rehabilitative Services; SEAs = State Education Agencies; and LEAs = Local Education Agencies.

THE SIMPLE VIEW OF READING AND DYSLEXIA

Not all types of reading difficulties are considered to be dyslexia. Gough and Tunmer (1986) developed a model that they called the Simple View of Reading (SVR). This model has two major components, decoding (reading words) (D) and listening comprehension (LC), resulting in this simple equation: reading comprehension (RC) = D × LC. This equation suggests that reading performance is influenced by both decoding (D) and linguistic comprehension, or the ability to understand what is being read orally (LC). Hoover and Gough (1990) explained that the term linguistic comprehension refers to ". . .listening to language for the purpose of comprehension" (p. 157).

Aaron et al. (2008) modified the formula slightly to RC = WR × LC, where RC is reading comprehension, WR = word recognition, and LC = listening comprehension. The only difference in this modification is that word recognition (WR) replaces decoding (D). These two components vary by grade level with word recognition having more influence in the earlier grades, and language comprehension in the later grades (Hoover & Tunmer, 2018). The SVR model is particularly applicable to a basic understanding of dyslexia. The model indicates that three different types of poor readers exist: (1) those who can understand the text when it is read aloud, but have trouble reading the words (dyslexia); (2) those who can read words accurately, but do not comprehend what they read (poor comprehenders); and (3) those who have trouble with both (mixed reading disability). Readers with mixed reading disability often have developmental language disorders or limited exposure to language and experiential opportunities during their preschool years (Tunmer & Greaney, 2010). Although readers with dyslexia do have impairments in reading comprehension, these difficulties are the result of significant decoding difficulties, whereas for readers with developmental language disorders, the difficulties result from poor language comprehension (Snowling et al., 2020a, 2020b). Thus, the term dyslexia is reserved for individuals who have trouble learning to decode, the print part of reading, but spoken-language comprehension is within the age-appropriate range (Seidenberg, 2017).

More recently, several revisions to the SVR model have been proposed (e.g., Duke & Cartwright, 2021; Francis et al., 2018). For example, Duke and Cartwright described three key advances that have emerged in the scientific research since the original formulation of the SVR: (a) word recognition and language comprehension are not the only causes of reading difficulty; (b) considerable overlap exists between word recognition and language comprehension with bridging variables such as vocabulary, reading fluency, and morphological awareness influencing both; and (c) active self-regulatory processes, including executive functioning skills, motivation, engagement, and strategy use, also play an important role in reading. They proposed an expansion of the SVR called the active view of reading. Within this model, active self-regulation contributes to word recognition, bridging processes (e.g., vocabulary, reading fluency, morphological awareness), and language comprehension. Each element within the model can be improved through instruction. In examining the results of a meta-analysis of 333 reading interventions, Burns et al. (2023) found moderate effects for interventions that focused on word recognition, language comprehension, self-regulation, and bridging processes (reading fluency, motivation), and large effects on reading comprehension for interventions that focused on text structure, verbal reasoning, and vocabulary.

Although a subset of poor readers has adequate word reading skills but poor comprehension and requires interventions directed toward improving both oral language and reading, the focus of this book is on readers with dyslexia who often have listening comprehension and verbal abilities that are higher than their word reading and spelling skills. The SVR captures what reading is at the broadest level of analysis (Hoover & Tunmer, 2018). It captures the fact that when compared to other readers, readers with dyslexia have poor phonological awareness that affects word reading skill (Sleeman et al., 2022).

DON'T FORGET

Self-regulation influences all aspects of reading and can be improved through targeted instruction.

DON'T FORGET

Dyslexia is not primarily a problem in reading comprehension, but rather a problem in reading and spelling words.

CHARACTERISTICS OF DYSLEXIA

As with SLD, in order to understand dyslexia, a key aspect is explaining what it is not (Tunmer & Greaney, 2010). Although the clinical features of dyslexia can co-occur with other disorders, such as attention deficit hyperactivity disorder (ADHD) and developmental language disorder (DLD), dyslexia is a distinct disorder that has specific characteristics. With dyslexia, the primary problem is with written language, not spoken language, and the core impairment is in reading accuracy, reading fluency, and spelling (Pennington et al., 2019). Rapid Reference 1.2 provides a list of conditions, that may be comorbid (coexist), but would not be considered defining features of dyslexia.

Rapid Reference 1.3 provides an overview of the most common characteristics of dyslexia. Some of these characteristics are most likely to be present in young children (e.g., trouble rhyming words), whereas others are more apparent in secondary students and adults (e.g., a slow reading rate or poor spelling). The earliest warning signs of dyslexia are sometimes noted in the child's spoken language, although sometimes oral language development is perfectly normal. As the individual ages, warning signs are noted in the slowness of reading and spelling development. In addition, students with deficient word reading skills often avoid reading, and as a result, they spend less time practicing reading (Tunmer & Greaney, 2010). Individuals with dyslexia are likely to have some of these symptoms and

Rapid Reference 1.2

What Dyslexia Is Not

- A pervasive oral language impairment
- A primary problem in attention
- A primary emotional or behavioral problem
- A primary problem in reading comprehension or written expression
- Low motivation or limited effort
- Poor vision or hearing
- Autism
- Related to ethnic background or family income
- A result of poor teaching
- A result of limited educational opportunities

Rapid Reference 1.3

What Dyslexia Is: Symptoms and Characteristics

- Difficulty learning to rhyme words
- Difficulty learning the sounds of letters
- Confusions of letters and words with similar visual appearance (e.g., ***b*** and ***d*** and ***was*** and ***saw***)
- Confusions of letters with similar sounds (e.g., /f/ and /v/)*
- Reversals and transpositions of letters and words that persist past the age of 7 (e.g., ***p*** and ***q***, and ***on*** and ***no***)
- Trouble sequencing letters in the correct order when spelling
- Difficulty retaining the visual images of irregular words for reading and spelling (e.g., ***once***)
- Spelling the same word in different ways on the same page (e.g., ***wuns***, ***wunce***, for ***once***)
- Spelling words the way they sound rather than the way they look (e.g., ***sed*** for ***said***)
- Mispronouncing some multisyllabic words (e.g., ***multiblication***)
- Slow speed of word perception that affects reading fluency and rate
- Poor spelling into adulthood

* Note when a letter is enclosed between two forward slashes / /, it refers to the letter sound, not the letter name.

characteristics. In addition, to learn more about dyslexia, the Sacramento County Office of Education has assembled free webinars by national experts that describe and explain many of the characteristics of dyslexia, as well as necessary interventions (https://www.scoe.net/divisions/ed_services/curriculum/cadyslexia/).

In addition to these characteristics, some individuals with dyslexia have strengths in areas that are not affected by the disorder (e.g., math, science), and their oral language and listening comprehension abilities are often higher than their reading and spelling skills. The individual with dyslexia typically has adequate achievement in areas where reading skills are not of primary importance (Betts, 1936). One central concept of dyslexia is that it is unexpected in relationship to the person's other abilities. Thus, dyslexia is often associated with underachievement in reading rather than low reading achievement per se. One would expect that the person would be reading at a higher level when considering other abilities or that the person has the intelligence to be a much better reader (S. Shaywitz & Shaywitz, 2020). Although this concept of unexpected underachievement has been the central defining feature of dyslexia (B. Shaywitz & Shaywitz, 2020; Tunmer & Greaney, 2010), Tønnessen (1997) points out that it is really our lack of knowledge that makes the underachievement "unexpected" because we have not gained enough insight into the causes of dyslexia. In other words, if we had a better understanding of the underlying causes of dyslexia, then an individual's difficulties with reading and spelling would be expected.

CAUTION

Individuals with dyslexia may show any combination of characteristics shown in Rapid Reference 1.3; however, most individuals will not exhibit all of these characteristics.

Research has indicated that intelligence tests do not predict reading for individuals with dyslexia even though they are a reasonable predictor for individuals without reading impairments (Ferrer et al., 2010). This is because some individuals with dyslexia have average or even superior intellectual abilities. Even so, individuals with any level of intelligence may have dyslexia. Thus, an intellectually gifted law student may have dyslexia that results in a compromised reading rate, as may an individual with a mild intellectual disability who struggles to learn to read even basic sight words. Because dyslexia is a neurobiological disorder, it can occur in an individual with any level of intelligence and often occurs with other disabilities, such as DLD and ADHD.

Although some definitions have suggested that dyslexia only occurs in individuals with average or above intelligence, this assertion is not true. No one ever claims that attention, articulation, or motor problems can only occur in children with average or above intelligence because it is understood that most disabilities occur across the full range of intellectual functioning. In her classic book, *Children Who Cannot Read*, Monroe (1932) explained: "The reading defects may occur at any intellectual level from very superior to very inferior, as measured by intelligence tests" (p. 6). Even so, for children with severe intellectual disabilities, learning to read may be secondary to the goals of developing life skills, such as communication, self-care, and community living skills, as these adaptive abilities are central to the individual obtaining independence and self-sufficiency.

Some children with dyslexia are identified in first grade, whereas other individuals are not diagnosed until they enter college, or even when entering an advanced graduate degree program. This is particularly true of students who have advanced verbal abilities. It is not unusual to find a medical student who navigated through high school and college with only mild difficulties, but then became overwhelmed and not able to manage the heavy reading demands of medical school (S. Shaywitz & Shaywitz, 2020; Voeller, 2004). Some individuals with dyslexia are never identified at all, and as adults they attempt to negotiate their lives so that little reading and writing are involved. In some cases, one or both of the parents learn that they also have dyslexia after attending school conferences where their child's reading and spelling problems are explained. It is not uncommon to hear a parent say: "That's just like me!" or "that's just like my dad."

Some students do not receive any early intervention, and their difficulties with reading and writing continue into their secondary years. Figure 1.1 presents a writing sample from David, a ninth-grade student, along with a translation that attempts to preserve the intent of his message as he accidentally omitted several words when writing the passage. His assignment was straightforward. During the first week of school, David's English teacher had asked the students to write something about themselves that they would like for her to know. David wrote the following paragraph regarding the impact a disability has had on his spelling development. Although he knows that he is not stupid, he is reluctant to tell his girlfriend about his disability.

PREVALENCE OF DYSLEXIA

Estimates of the prevalence of dyslexia vary and are influenced by how dyslexia is defined and identified. Earlier in the century, Betts (1936) estimated that between 8% and 15% of children have varying degrees of reading disability, with about 4% of the school population being diagnosed with word blindness, an earlier term that was used to describe severe dyslexia. Estimates by researchers suggest, however, that 5% to 10% of the school-age population is the most accurate estimate of the prevalence of individuals who have dyslexia (e.g., DeFries et al., 1978; Muter & Snowling, 2009; Sireteanu et al., 2005; Wagner et al., 2020). Some estimates, however, are higher, ranging from 5% to 20%

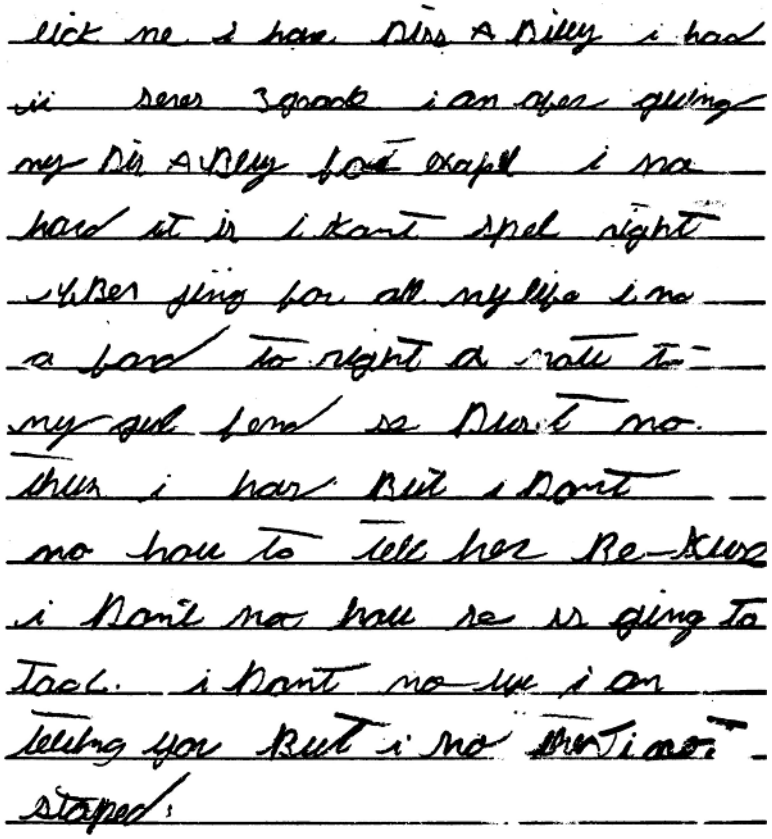

Figure 1.1 David's Note for His Ninth-Grade English Teacher

Translation: Like me, I have a disability. I've had it since third grade. I'm often quitting because of my disability. For example, I know how hard it is. I can't spell right. I've been trying for all my life. I know I'm afraid to write a note to my girlfriend. She doesn't know that I have it, but I don't know how to tell her because I don't know how she is going to act. I don't know why I am telling you, but I know that I'm not stupid.

CAUTION

Although early intervention is critical for individuals with dyslexia, it is important to keep in mind that intervention can still be effective at any age.

of the school-age population having dyslexia (Shaywitz, 2003; S. Shaywitz & Shaywitz, 2020). In addition, nearly 80% of children who are in special education diagnosed with learning disabilities are there because of reading problems. As with any disorder, the symptoms can range from mild to severe, and the impact of the disorder is influenced by the environment and appropriate early intervention and treatment.

DEFINITIONS OF DYSLEXIA

Even though researchers have been studying dyslexia for over 100 years, there is still not a strong consensus regarding a clear, useful definition (Tønnessen, 1997). Although numerous professional organizations around the world have attempted to develop a definition of dyslexia, no universally accepted definition exists. The *International Dyslexia Association* (IDA; formerly called the Orton Dyslexia Society) Research Committee, a group composed of investigators and representatives from advocacy groups, proposed the following definition of dyslexia in Rapid Reference 1.4.

The IDA Professional Standards and Practices Committee has provided a set of standards to guide the preparation, certification, and professional development of reading teachers. Rapid Reference 1.5 presents the explanation provided of dyslexia within these practice standards.

Several researchers have noted the need to update the IDA definition. For example, Brady (2019) proposed that in addition to phonological awareness, the definition should acknowledge "the widely multifactorial nature of cognitive profiles as well" (p. 18). In fact, Pennington et al. (2012) noted that adhering to only poor phonological awareness as a criterion for dyslexia would result in missing about one half of the cases.

Rapid Reference 1.6 provides several examples of other definitions or explanations of what dyslexia is from around the world. Although the emphasis is on phonological processing in the IDA definition and explanation, other cognitive and linguistic risk factors

Rapid Reference 1.4

IDA Definition of Dyslexia

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge (adopted by the IDA Board, November 2002) (Lyon et al., 2003).

Rapid Reference 1.5

Explanation of Dyslexia in the IDA 2010 Professional Standards

Dyslexia is a language-based disorder of learning to read and write originating from a core or basic problem with phonological processing intrinsic to the individual. Its primary symptoms are inaccurate and/or slow printed word recognition and poor spelling—problems that in turn affect reading fluency and comprehension and written expression. Other types of reading disabilities include specific difficulties with reading comprehension and/or speed of processing (reading fluency). These problems may exist in relative isolation or may overlap extensively in individuals with reading difficulties (Moats et al., 2010, p. 3).

Rapid Reference 1.6

Examples of Definitions and Descriptions of Dyslexia from Around the World

National Institute of Neurological Disorders and Stroke

Dyslexia is a brain-based type of learning disability that specifically impairs a person's ability to read. These individuals typically read at levels significantly lower than expected despite having normal intelligence. Although the disorder varies from person to person, common characteristics among people with dyslexia are difficulty with spelling, phonological processing (the manipulation of sounds), and/or rapid visual–verbal responding. In adults, dyslexia usually occurs after a brain injury or in the context of dementia. It can also be inherited in some families, and recent studies have identified a number of genes that may predispose an individual to developing dyslexia.

Mayo Clinic

Dyslexia is a learning disorder that involves difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding). Also called a reading disability, dyslexia is a result of individual differences in areas of the brain that process language. Dyslexia is not due to problems with intelligence, hearing, or vision. Most children with dyslexia can succeed in school with tutoring or a specialized education program. Emotional support also plays an important role. Though there's no cure for dyslexia, early assessment and intervention result in the best outcome. Sometimes dyslexia goes undiagnosed for years and isn't recognized until adulthood, but it's never too late to seek help.

First Step Act of 2019

Dyslexia means an unexpected difficulty in reading for an individual who has the intelligence to be a much better reader, most commonly caused by a difficulty in the phonological processing (the appreciation of the individual sounds of spoken language), which affects the ability of an individual to speak, read, and spell (Cassidy, 2019).

British Dyslexia Association (BDA)

The BDA adopted the Rose (2009) definition of dyslexia:

Dyslexia is a learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling. Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory, and verbal processing speed. Dyslexia occurs across the range of intellectual abilities. It is best thought of as a continuum, not a distinct category, and there are no clear cutoff points. Co-occurring difficulties may be seen in aspects of language, motor coordination, mental calculation, concentration, and personal organization, but these are not, by themselves, markers of dyslexia. A good indication of the severity and persistence of dyslexic difficulties can be gained by examining how the individual responds or has responded to well-founded intervention.

(*continued*)

Dyslexia Association of Ireland

Definition was updated in April 2022.

Dyslexia is a learning difference that can cause difficulties with learning and work. It affects approximately 1 in 10. It occurs on a spectrum with some people mildly affected and others more severely. With the right understanding, accommodations, and support, people with dyslexia can achieve success in education, the workplace, and in wider society. Everyone with dyslexia is different, but there is a commonality of difficulties with reading, spelling, and writing, and related cognitive/processing difficulties. Dyslexia is not a general difficulty with learning, it impacts specific skill areas. The impact of dyslexia can change according to the environment (i.e., what a dyslexic person is being asked to do and under what circumstances). While people with dyslexia may develop strengths due to their dyslexia such as determination, problem-solving, and resilience, dyslexia does not automatically bring specific gifts or talents. The Dyslexia Association of Ireland recognizes and respects the individual variation that all human beings display, including those with dyslexia.

European Dyslexia Association

Dyslexia is used as a term for a disorder that is mainly characterized by severe difficulties in acquiring reading, spelling, and writing skills. Based on the experience of more than 10 years of intensive research, three different disorders, a reading disorder, a spelling disorder, and a combined reading and spelling disorder, were differentiated. Many people used dyslexia as a synonym for the combined disorder. The prevalence rate of each of the three disorders is about 3–4%. Dyslexia is neurobiological in origin, its genetic factors have been identified, and the environmental factors can determine its impact. The most widely accepted theory is that it is caused by difficulties in phonological processing: verbal working memory, rapid naming, and sequencing skills are also affected. Across Europe, the diversity of languages and the multilingual demands may pose particular challenges for dyslexic children and adults given their language learning difficulties. There is no relationship between a person's level of intelligence, individual effort or socio-economic position, and the presence of dyslexia. The cognitive difficulties that cause dyslexia and different learning disorders can also affect other aspects of verbal learning including arithmetic. Difficulties in organizational skills and motor coordination are frequently observed, but these are not core to the condition.

Spanish Federation of Dyslexia

Dyslexia is the best known of learning disorders and affects around 10% of the population, and 4% severely. Specific learning difficulties are a family of related conditions with considerable overlap between them. Collectively, they are believed to affect around 15% of the population to a greater or lesser extent. Contrary to popular misconception, dyslexia is not just about literacy, although weaknesses in literacy are often the most visible signs. Dyslexia affects the way information is processed, stored, and retrieved, with problems with memory, processing speed, organization, and sequencing.

Dyslexia Association of Singapore

Dyslexia is a specific learning difference that makes it difficult for people to read, write, and/or spell. It has nothing to do with a person's intelligence. Often, weaknesses may be seen in areas such as language development, memory, and sequencing. Having dyslexia does not mean that your child's ability to learn is below average. Dyslexia is a lifelong condition that usually runs in families. You are unable to determine that someone has dyslexia just by looking at them, and some start out fine in school, but gradually schoolwork can become a struggle for them, especially the transition from preschool to primary, then primary to secondary, or secondary to tertiary.

Australian Dyslexia Association

Dyslexia is best understood as a persistent difficulty with reading and spelling. Classroom and support teachers can be trained in effective teaching practices which will not only help the student with dyslexia learn but all students can benefit by direct, explicit, and systematic multisensory instruction. Understanding and meeting the needs of dyslexia and related reading difficulties demand thorough teaching methodologies in reading and spelling. An understanding of the development and acquisition of oral language and written language (reading, spelling, and writing) is required and many general classroom teachers would benefit from specialized language training.

Maharashtra Dyslexia Association (Mumbai)

Dyslexia literally means "difficulty with words" (from the Greek "dys" meaning problem and "lexis" meaning words or language). It is a specific learning difficulty which affects a person's ability to read, spell, and understand language that he/she hears, or express himself/herself clearly while speaking or in writing. Dyslexia is not a disease; it has no cure. Dyslexia is caused by abnormalities in the way information is processed in a brain which is often gifted and productive in many other areas. Dyslexia is not the result of low intelligence. People with dyslexia are unique, each having individual strengths and weaknesses. Many individuals with dyslexia are creative and have unusual talents in areas such as arts/graphics, sports, architecture, electronics/computing, drama, music, and mechanics/engineering. They often display special talents in areas that require high levels of visual, spatial, and motor integration. Their problems in language-processing distinguish them as a group. This means that the person with dyslexia has problems translating language to thought (as in listening or reading) or thought to language (as in writing or speaking).

Dyslexia Association of Hong Kong

Dyslexia is a specific learning difficulty related to mastering and using written language. Dyslexic learners typically have difficulties in reading, writing, and spelling. Dyslexia may be caused by a combination of phonological, visual, and auditory processing deficits. It is often unexpected when compared with a child's general ability and is not due to lack of intelligence or lack of opportunity to learn.

Health Council of the Netherlands—Working Definition

Dyslexia is present when the automatization of word identification (reading) and/or word spelling does not develop or does so very incompletely or with great difficulty. The term "automatization" refers to the establishment of an automatic process. A process of this kind is characterized by a high level of speed and accuracy. It is carried out unconsciously, makes minimal demands on attention, and is difficult to suppress, ignore, or influence. The working definition used means that dyslexia is characterized in practice by a severe retardation in reading and spelling which is persistent and resists the usual teaching methods and remedial efforts. Upon examination, it will be accompanied by very slow and/or inaccurate and easily disturbed word identification and/or word spelling. The committee has operationalized these characteristics further. This working definition allows for various causes and explanatory hypotheses, with both univariate and multivariate causes and for both single (dyslexia alone) and complex presentation forms. In all cases, a partial and sometimes principal role is played by a person-bound factor. The committee believes that dyslexia can be seen as a disability (or an impairment) in the sense of the International Classification of Impairments, Disabilities and Handicaps (ICIDH).

Kuwait Dyslexia Association

People with dyslexia have difficulty matching the letters they see on a page with the sounds those letters and letter combinations make. And when they have trouble with this step, all the other steps are more difficult. Children and adults with dyslexia struggle to read fluently, spell words correctly, and learn a second language, among other challenges. But these difficulties have nothing to do with its general information. In fact, dyslexia is an unexpected difficulty with reading in an individual who has the intelligence to be a much better reader. While people with dyslexia are slow readers, they are often, paradoxically, fast and very creative thinkers with strong reasoning abilities. Dyslexia is also very common; it affects 20% of the population and represents 80–90% of all people with learning disabilities. Scientific research shows differences in brain connectivity between children who struggle with reading and typical readers, providing a neural basis for why reading fluency is such a struggle for those with dyslexia.

are mentioned as well in other definitions (e.g., dyslexia associations from Britain and Ireland). Some of the terminology (e.g., phonological awareness, rapid automatized naming) may not be familiar to all readers at this point, but these terms are explained and discussed in more detail in later chapters and are also defined in the Glossary.

Many of these definitions and descriptions of dyslexia contain similar components. Most describe dyslexia as a learning disability or neurological disorder that affects the development of word reading, reading rate, and spelling. Several of these definitions attempt to describe the two key symptoms of dyslexia: (1) poor reading and spelling ability that is unexpected in relationship to other abilities, and (2) a lack of automaticity and ease with reading and spelling words. Although problems in comprehension often result from poor decoding, dyslexia is not primarily a problem in reading comprehension. Several of the definitions attempt to specify contributing factors or correlates of dyslexia, such as poor phonological awareness or slow rapid automatized naming, whereas a few describe a limited response to treatment as a symptom. The definitions also vary regarding the concepts of unexpectedness, necessary levels of intelligence, existence of special talents, and prevalence. We address these issues in the later chapters of this book.

CAUTION

In addition to describing the weaknesses in reading and spelling, current definitions of dyslexia should reflect the fact that multiple linguistic risk factors, not just poor phonological awareness, have been associated with word-level reading problems (Brady, 2019; Pennington et al., 2019).

MISCONCEPTIONS ABOUT DYSLEXIA

It is likely that the variations in definitions of dyslexia, as well as the use and misuse of the term, contribute to many of the existing misconceptions. One common misconception is that people with dyslexia cannot read at all. As with most disorders, dyslexia occurs on a continuum, and the severity level is a matter of degree—from mild to severe. Most individuals with dyslexia can learn to read, but typically continue to have impairments in reading rate and fluency, as well as relatively poor spelling. It is critically important that educators, parents, and the individuals with dyslexia be aware of the common misconceptions about dyslexia so that they can understand the true nature of the disorder. Several of these misconceptions are presented in Rapid Reference 1.7 accompanied by a factual counterpoint.

CONCLUSION

Although a universal definition of dyslexia has yet to be developed, researchers and scientists from around the world have reached an increasing consensus regarding the characteristics and symptoms of this disorder, as well as how dyslexia affects reading and spelling development. Despite the fact that dyslexia is a lifelong condition and certain accommodations may always be needed in educational and vocational settings, the prognosis is good for individuals who receive intensive, systematic reading and spelling interventions.

Rapid Reference 1.7

Common Misconceptions about Dyslexia

- People with dyslexia cannot read.
  Most do learn to read at some level, although their reading rate is often slow.
- Individuals with high intellectual ability cannot have dyslexia.
  Dyslexia can affect an individual of any level of intelligence.
- Dyslexia is seeing things backwards.
  Dyslexia is much more complex than seeing letters and numbers backwards.
- Dyslexia is a rare disorder.
  Dyslexia is common; approximately 5% to 8% of the population has mild to severe dyslexia.
- Dyslexia cannot be diagnosed until at least third grade.
  At-risk symptoms for dyslexia may be identified in children as young as 5 years of age.
- Children will outgrow dyslexia.
  Dyslexia is a lifelong disorder, but intervention can reduce the impact.
- More boys than girls have dyslexia.
  Present estimates indicate that the prevalence rate for boys is only slightly higher than for girls.
- All struggling readers have dyslexia.
  Many other reasons than dyslexia may cause reading problems such as low intellectual ability, poor oral language, attentional problems, poor instruction, and lack of opportunity.
- Young children who reverse letters (e.g., ***b*** for ***d***) have dyslexia.
  Beginning writers often reverse letters, but most will master the formation of these letters with practice. In addition, while persistent letter reversals are often associated with dyslexia, not all individuals with dyslexia reverse letters.
- The type of instruction employed can cause dyslexia.
  Whereas the quality of instruction makes a difference in how readily a child learns to read, the use of a certain reading approach does not cause dyslexia. Dyslexia is a neurobiological disorder that is not caused by ineffective instruction, but ineffective instruction affects progress in reading development.

Unless a parent or teacher has personally experienced the pain and academic stress caused by dyslexia, it is hard to understand the impact of this disorder on self-esteem and school and vocational performance (Voeller, 2004). It is critical that both parents and educational professionals understand the plight of the child with dyslexia. Over a century ago, Hinshelwood (1917) observed: "It is a matter of the highest importance to recognise the cause and the true nature of this difficulty in learning to read which is experienced by these children, otherwise they may be harshly treated as imbeciles or incorrigibles, and either neglected or punished for a defect for which they are in no wise responsible. The recognition of the true character of the difficulty will lead the parents and teachers of these children to deal with them in the proper way, not by harsh and severe treatment, but by attempting to overcome the difficulty by patient and persistent training" (pp. 42–43).

The purpose of this book is to increase understanding of dyslexia, both the causes and treatments. In the following chapters, we discuss historic influences; the role of the brain and genetics and the relationship of dyslexia to other disorders; the cognitive, linguistic, and literacy factors that should be part of an assessment for dyslexia; and descriptions of the most effective treatment approaches for reading and spelling, including advances in technology, dyslexia in English learners, and dyslexia in the schools. Appendix A provides examples of the tests that may be part of an assessment for dyslexia. Appendix B describes a variety of evidence-based reading and spelling programs for intervention. Appendix C, by Dr. Elaine Cheesman, lists numerous apps and websites to support reading and writing instruction. The "Glossary" defines many of the terms that are used in this book.

TEST YOURSELF

1. **The terms dyslexia and specific reading disability are used to describe a neurodevelopmental disorder that primarily affects the development of:**
   a. decoding (word reading).
   b. reading comprehension.
   c. encoding (spelling).
   d. written expression.
   e. all of the above.
   f. primarily a and c.
2. **Although many definitions of dyslexia have been proposed, a universally accepted definition does not exist. True or false?**
3. **The focus of the most recent definition of dyslexia by IDA (2002) indicates that dyslexia usually results from a deficit in:**
   a. attention.
   b. phonological awareness.
   c. rapid automatized naming.
   d. all of the above.
4. **The concept of unexpected underachievement suggests that the person's:**
   a. academic areas are all high or low.
   b. other abilities are lower than predicted by the individual's reading.
   c. other abilities are often higher than the individual's reading skills.
   d. reading skills are lower than expected for the individual's age or grade.
5. **Some individuals are not diagnosed with dyslexia until reading demands become unmanageable. True or false?**
6. **Individuals with dyslexia can have any level of intelligence. True or false?**
7. **Gough and Tunmer's (1986) Simple View of Reading suggests that reading comprehension (RC) is the product of:**
   a. decoding × linguistic or listening comprehension (D × LC).
   b. decoding × reading comprehension (D × RC).
   c. phonological awareness × decoding (PA × D).
   d. listening comprehension × reading comprehension (LC × RC).
8. **The effects of dyslexia can be reduced by:**
   a. time—children will outgrow it.
   b. systematic reading instruction.
   c. nothing—it cannot be cured.
   d. early identification.
   e. both b and d.
9. **Although prevalence ranges vary, about what percent of the school-age population is estimated by researchers to have dyslexia?**
   a. Less than 1%.
   b. More than 25%.
   c. Between 5% and 10%.
   d. Over 40%.
10. **Nearly all individuals who struggle with reading have dyslexia. True or false?**

Answers: 1. f; 2. True; 3. b; 4. c; 5. True; 6. True; 7. a; 8. e; 9. c; 10. False.