CHAPTER 1

What Is Dyslexia?

Introduction

One type of learning disability, formally described more than a century ago, has been estimated as being currently experienced by a billion people across the world.[1] Its nature, and the best ways for it to be tackled, have been scientifically examined for decades by researchers working in the fields of genetics, neuroscience, cognitive science, psychology, education, sociology, and social policy, leading to the publication of many thousands of research papers, books, monographs, manuals, academic theses, and technical reports. It is now one of the major areas of professional focus of educational (school) and clinical psychologists, speech and language therapists, and teachers of children with learning difficulties. Its formal diagnosis often results in more favorable educational resourcing, special accommodations for examinations, classwork, and other activities in educational and vocational settings, and more responsive and sympathetic understanding from friends, family, colleagues, and the general public. Its assessment and intervention have become a multimillion dollar industry attracting the interest of parents, teachers, lecturers, clinicians, politicians, and the general public with claims of expert analyses and wonder cures. Reference to this disability is ubiquitous within most industrialized societies and its salience has been increased by frequent reference to famous figures from history, politics, the arts, and commerce who have achieved greatly in their specialist fields despite struggles with this problem. Some have argued that this is not a disability but a difference, and, for some, it can be considered as a gift that offers many compensatory strengths and advantages. Nevertheless, its legacy in terms of social and emotional trauma and its challenge to the individual's prospects of educational and vocational success are substantial.

[1] https://dyslexiaida.org/times-square; accessed November 16, 2023.

Indeed, it is widely accepted that its prevalence severely undermines society's ability to grow and prosper.

Given the above scenario, one might expect that science would be able to provide a clear conceptualization, describe its fundamental nature and causal biological and cognitive processes, articulate how it should be assessed, highlight effective evidence-based forms of intervention, and ensure that unsubstantiated programs lacking strong empirical support were avoided or challenged. Educationalists and clinicians would ensure that not only were they familiar with this knowledge base but they would also act accordingly. Based upon the scientific literature, there would be clear and consistent criteria for its diagnosis, and the basis for clinical judgements would not differ significantly from one assessor to another. Clinical judgements would in no way be inappropriately influenced by political, economic, or client pressures. It would be questionable for professionals to persevere in the use of a diagnostic label that has been criticized for being amorphous, nebulous, variously understood and operationalized, and thus scientifically flawed. Neither would it be appropriate to offer justification on the grounds that, although these criticisms are valid, its use can nevertheless prove helpful for those so labeled. Such a stance might seem unacceptable where there is a split between diagnosed dyslexic "winners" and other poor reader "losers" that, to a significant degree, reflects existing social inequities.

Unfortunately, the scenario above describes science, policy, and practice in the field of dyslexia. Despite the phenomenal degree of attention it has attracted for decades, dyslexia remains a "very hot" topic in the scientific literature on literacy, with seemingly little resolution of a number of fundamental areas of debate (Cassidy, Ortlieb, & Grote-Garcia, 2022; Grote-Garcia & Ortlieb, 2023).

Although the first account of "word-blindness" was produced in 1676 by the physician John Schmidt, much of the early published work appeared in the latter part of the nineteenth century, a time when an inability to learn to read first became a medical concern (Kirby, 2020a). Early investigations were largely concerned to examine difficulties that had been acquired as a result of some form of brain trauma. In 1872, Sir William Broadbent reported the case of a man who, following head injury lost the capacity to read, despite being able to write with little difficulty. Although he had good conversational skills and extensive vocabulary, he struggled to name objects presented to him. Broadbent asserted that the reading failure was a result of this more general difficulty in naming objects. Five years later Kussmaul (1877) reported on the case of an adult patient with no apparent disabilities other than severe reading difficulties. Kussmaul coined the

term "word-blindness" to describe the inability to read text despite sound eyesight, intelligence, and speech.

The term "dyslexia" was first used in 1887 by Rudolf Berlin, a German opthalmologist, to describe a particular form of word-blindness found in adults that, he argued, was caused by brain lesions. Berlin contended that severe damage would result in alexia, a total inability to read, whereas, partial damage would most likely result in dyslexia, a significant difficulty in decoding written symbols. Here, the focus was upon the effect of a physical trauma of some kind, "acquired dyslexia," rather than that which develops naturally from a young age, "developmental dyslexia," the focus of almost all of the dyslexia literature.

The idea that "word-blindness" could be a developmental, as well as an acquired condition, came somewhat later. As Shaywitz and Shaywitz (2020b) note, this is unsurprising as the suddenness of an acquired loss is considerably more salient than the more subtle picture of unfolding developmental difficulties. In 1896, a paper on "Congenital Word Blindness" by a British physician, W. Pringle Morgan, described a child of fourteen years of age who had failed to learn to read despite normal intelligence and good eyesight. Noting the boy's other abilities, he observed that, "The schoolmaster who has taught him for some years says that he would be the smartest lad in the school life if the instruction were entirely oral" (Pringle Morgan, 1896: 1378). Pringle Morgan described two generations of one family with six cases that had strikingly similar symptoms and opined that the problem was congenital, involving a defective ability to store visual impressions of words.

Pringle Morgan's paper acted as a stimulus for a flurry of case studies, most notably by a Scottish ophthalmologist, James Hinshelwood, who gathered data on several cases involving both acquired and congenital word-blindness. The children he reported upon in a classic text, *Congenital Word-Blindness* (Hinshelwood, 1917) were typically male (as were the majority of similar cases of this period [Stephenson, 1904]), intelligent, had sound eyesight, and performed well on oral tasks.

Following an autopsy upon a patient whose progress he had monitored for several years, Hinshelwood (1902) attributed the cause of reading disability to the angular gyrus. He suggested that the primary disability was visual memory for words and letters and, advocated one-to-one training designed to increase visual memory as the preferred form of intervention. Noting the embarrassment and ridicule often experienced by poor readers in the classroom, he commented:

> It is a matter of the highest importance to recognize as early as possible the true nature of this defect, when it is met with in a child. It may prevent

> much waste of valuable time and may save the child from suffering and cruel treatment. When a child manifests great difficulty in learning to read and is unable to keep up in progress with its fellows, the cause is generally assigned to stupidity or laziness, and no systematized method is directed to the training of such a child. A little knowledge and careful analysis of the child's case would soon make it clear that the difficulty experienced was due to a defect in the visual memory of words and letters; the child would then be regarded in the proper light as one with a congenital defect in a particular area of the brain, a defect which, however, can often be remedied by persevering and persistent training. The sooner the true nature of the defect is realised, the better are the chances of the child's improvement. (Hinshelwood, 1902, cited in Shaywitz & Shaywitz, 2020b: 22)

In their historical account of learning disabilities, a term that includes a number of specific areas of problematic functioning, including reading disability, Hallahan and Mercer (2001) observed that groundbreaking work largely shifted from Europe to the USA during the 1920s. With the increasing trend towards mass education and the issues that resulted in conjunction with the dissemination of the idea of universal literacy (Grigorenko, 2011), many researchers found themselves with the responsibility not only of understanding and explaining children's academic and behavioral difficulties, but also of taking a lead in assessment and remediation techniques, particularly in relation to reading disabilities (Hallahan & Mock, 2003).

Leading clinical researchers at this time were Samuel Orton and Grace Fernald. Fernald was a psychologist who employed a multisensory approach for those with reading difficulties and sought to evaluate the success or otherwise of her techniques by maintaining detailed case records of her clients' progress. Despite the rather anecdotal mode of evaluation, still largely the case for multisensory approaches today (see Chapter 4), such techniques have an intuitive appeal and continue to be popular among specialist dyslexia teachers. Such professionals are typically qualified by accrediting bodies to conduct informal curriculum-based assessments and deliver specialist teaching programs to those with dyslexia.

Orton, Fernald's contemporary, was a neurologist who became best known for his work on educational intervention, in particular multisensory approaches and an emphasis upon phonics. Orton attempted to understand the origins of reading difficulties, introducing a number of ideas that added to contemporary understandings. Like his intellectual predecessor, Hinshelwood, he was interested in areas of the brain that might be influential but believed those other than the angular gyrus were involved. He suggested that reading difficulties were primarily the result of poor cerebral dominance in which the nondominant hemisphere stored

a different representation from that of the dominant one. This explained the common tendency for cases to exhibit letter and word reversals, and the use of mirror reading and writing. To reflect a shift from an emphasis upon purely visual deficits, Orton recommended that the term "word-blindness" should be replaced by "strephosymbolia" which in Greek means twisted. His work proved highly influential and promoted much theorizing on various visual mechanisms held to be responsible for reading difficulties (see Kirby & Snowling, 2022, for further detail).

These early pioneers sought to understand a condition that continues to pose significant problems for many individuals, and challenges to those who seek to help them. Their puzzlement over the particular problems encountered by a small number of children would appear sufficient to refute any suggestion that dyslexia or reading disability is merely the consequence of poor teaching. Since then, more than a century of research activity has provided incontrovertible evidence that some children experience particular difficulties that render the reading process highly problematic. The original belief of these early clinicians that the difficulty was caused by a visual pathology has now been largely rejected in favor of language-based origins (see Chirkina & Grigorenko, 2014, for details of similar conclusions that were reached rather earlier in the Soviet Union). Nevertheless, a conception of dyslexia as essentially a visual problem is still widely held by the general public (Johnston & Scanlon, 2021) and the role of visual factors in reading difficulty has attracted greater researcher attention, particularly as the primary focus has moved from visual processing to visual attention (see Chapter 2).

Given all of the above, it may seem incomprehensible that some have claimed that dyslexia does not actually exist (Hitchens, 2014; Schwartz, 2019); that it is a concocted invention that serves to exculpate those who are responsible for the delivery of inadequate education. As discussed throughout the present text, it is clear that there are many children who struggle to learn to read for reasons other than poor-quality schooling.

Other critics contend that the term is little more than a confected prop that largely meets the needs of the middle classes, particularly the "worried mothers" of struggling learners (see Kirby, 2019, 2020b). Such arguments have tended to be promoted by political or social commentators with an insufficient understanding of the science involved.

In many ways, the question "Does dyslexia exist?" is both unhelpful and misleading. It typically leads to the answer that, of course "it" exists because the severity of problems that some children encounter with reading are surely all too real. However, the primary issue here is not whether

biologically based reading difficulties exist (the answer is an unequivocal "yes," although these are intertwined with environmental factors) but rather, how we should best understand and address literacy problems across clinical, educational, occupational, and social policy contexts. Essentially, what is sometimes known as "the dyslexia debate" has centered upon the extent to which this construct operates as a rigorous scientific construct that adds to, rather than reduces, our capacity to identify and help those who struggle to learn to read. Allied to this is disagreement as to whether dyslexia should be employed to describe difficulties that range far beyond literacy. To achieve any meaningful resolution of the debate we need a consensual understanding of how to define and operationalize the term, and it is here that fundamental problems first arise.

Definitions of Dyslexia

> Without an agreed-on definition that can be implemented reliably and validly, understanding the nature, causes, and best treatments for reading disability is unlikely. Similarly, an agreed-on definition is essential for practice.
>
> (Brown Waesche et al., 2011: 296)

Somewhat paradoxically, defining dyslexia is seemingly both very easy and very difficult. It is easy, largely because most parties are agreed that the definition should principally concern the inherent and particular difficulties that are encountered by those who struggle to learn how to read. It is difficult because the field has been unable to produce a universally accepted definition (Helland, 2022). As noted in the above extract, without a universally agreed operational definition, we cannot be sure that assessments are measuring the same thing, and as a result, there are likely to be serious doubts about any resultant diagnosis or classification.

One of the particular difficulties concerning definitions of dyslexia is that the term has variously been seen as different from, or synonymous to, several other labels that involve problems with literacy. These include specific reading retardation, reading difficulties, specific reading difficulties, reading disability, learning disability, unexpected reading difficulty, and specific learning difficulties. These terms overlap substantially and vary according to causal assumptions (Rice & Brooks, 2004), thus compounding the confusions that abound.

Irrespective of the specifics of the definition, it is generally agreed that the core problem of dyslexia is difficulty in accurately and fluently reading

text; this is why it is sometimes also known as a word-level reading disorder (Miciak & Fletcher, 2023). Single word reading is seen as important for studying word recognition skill as, presented in isolation, words are unable to offer any semantic or syntactic cues that could assist word identification.

Many writers use the term "decoding" as synonymous with "word recognition" (e.g., Hoover & Gough, 1990). Here the former term reflects the notion that print effectively operates as a code that needs to be deciphered in order to convert printed text into language. On the grounds that words like "yacht" and "does" cannot be decoded using knowledge of letter–sound relationships, others tend to use "decoding" in a narrower manner. While reading irregular words places significant emphasis upon sight-word recognition, and the distinction between these two terms is important for instructional purposes, it should be noted that there is a strong relationship between phonological decoding and sight-word reading (Aaron et al., 1999). In order to avoid potential misunderstandings resulting from different usage in the literature, the terms "word recognition" and "decoding" are largely used interchangeably throughout this book.

Word recognition and decoding can be contrasted with the ultimate goal of reading – taking meaning from the written word (Nation & Snowling, 1998). While decoding skill and reading comprehension are highly related (Fletcher et al., 2019; Georgiou et al., 2022), the overlap should not be overestimated. Some people can understand considerably more of a passage of text than one would expect on the basis of their reading skills; others may read the words without apparent difficulty but derive little meaning from them. Unsurprisingly, however, those who experience severe difficulties with word recognition will usually experience associated problems of reading comprehension, in part because the effort that must be expended upon decoding is likely to result in heavy cognitive load demands that detract from their capacity to focus upon deriving meaning.

The issue as to whether spelling difficulty should be seen as a core component of dyslexia has been subject to varying opinion. Although most definitions of dyslexia focus upon reading difficulty, problems with spelling are often identified as key symptoms. While word reading and spelling skills are closely related processes (in their meta-analysis, Kim, Wolters, and Lee (2023) reports a high correlation of r = 0.82), they are far from identical skills. In order to understand and address literacy problems, it is important to differentiate clearly between them (see Kim & Petscher, 2023, for a detailed discussion).

In reconciling debate about the use and value of the term "dyslexia," it is first helpful to have a clear understanding of the different ways that this term

has been conceptualized, understood, and operationalized. In an attempt to highlight some key distinctions, Elliott (2020) identified four broad categories:

- Dyslexia 1: a synonym for reading disability (i.e., a significant problem with the accuracy and/or fluency of single-word decoding which affects word reading in isolation or in text);
- Dyslexia 2: a condition manifested by a clinically derived subgroup of poor decoders;
- Dyslexia 3: a condition manifested by persistent intractability to high-quality reading intervention;
- Dyslexia 4: a neurodiverse condition that involves a range of cognitive problems, one of which may be a difficulty in decoding.

Each of these is now considered in turn.

Dyslexia 1: A Synonym for Reading Disability

There is an important distinction between defining dyslexia as an end state represented by word reading deficits and basing the definition upon the supposed causes of such deficits (Catts & Petscher, 2022). The former represents the approach that is typically employed by researchers (Elliott, 2020; Odegard, Farris, & Washington, 2022) who largely use the terms reading disability and dyslexia as synonyms to describe a single-word-level reading difficulty that may involve either or both reading accuracy and reading fluency (Fletcher et al., 2019; Lopes et al., 2020; Pennington, McGrath, & Peterson, 2019). Reading fluency concerns the ability to read text both accurately and speedily. It is often considered to demonstrate the extent to which word reading has achieved a level of automaticity such that it has become instantaneous and effortless (LaBerge & Samuels, 1974).

Underpinning a Dyslexia 1 conception is a recognition that reading is a skill that is normally distributed in the population with no clear boundary existing between so-called "normal" and "disabled" performance.

> Dyslexia is mainly defined as the low end of a normal distribution of word reading ability (Rodgers, 1983; Shaywitz et al., 1992). Thus, in order to diagnose the disorder, a somewhat arbitrary cutoff must be set on a continuous variable. (Peterson & Pennington, 2015: 285)
>
> Dyslexics are children (and later adults) whose reading is at the low end of a normal distribution. Reading skill results from a combination of dimensional factors (that is, ones that vary in degree), yielding a bell-shaped curve. The reading difficulties of the children in the lower tail are severe and require special attention. Dyslexia refers to these children. Viewed this way,

> dyslexia is on a continuum with normal reading. All children face the same challenges in learning to read but dyslexics have more difficulty with the essential components. (Seidenberg, 2017: 156–157)
>
> There is no doubt that dyslexia exists as the lower part of a continuous distribution of basic reading skills. (Miciak & Fletcher, 2020: 346)

Such difficulties would typically be present from an early age and prove difficult to remedy even by high-quality teaching (Snowling, Hulme, & Nation, 2020).

Lopes et al. (2020) analysed 800 dyslexia studies across a range of scientific disciplines (genetics, neuroscience, psychology, education) that had been undertaken over the previous two decades. While clear criteria for participant recruitment were rarely made explicit, the use of the term dyslexia was typically employed to describe poor readers in general (and sometimes spellers). An attempt to identify dyslexic groups, as distinct from other poor readers, was found in only about six percent of the studies.

Dyslexia 2: A Condition Manifested by a Clinically Derived Subgroup of Poor Decoders

Much of the fuel for the dyslexia debate lies in the fact that the use of the terms "dyslexic" or "with dyslexia" to describe all those operating at the lower extreme of reading ability is far less common in educational, clinical, and occupational professional practice. Deeming a Dyslexia 1 conception to be overly inclusive, a significant proportion of psychologists, educators, medical practitioners, and members of the lay public reserve its use to describe a subgroup existing within a larger pool of poor decoders. Here, not all of those with word-level reading difficulties are considered to be dyslexic, and the relative influence of nature (their biological features) and nurture (their home environments and instructional histories) is generally perceived to be an important discriminating factor.

In recent years, dyslexia has become a high profile issue in the United States where extensive lobbying from support groups has resulted in the introduction of federal and state legislation for dyslexia identification and intervention that is largely independent of the existing framework for children with learning difficulties (Gabriel, 2020a; Miciak & Fletcher, 2020). Such developments are prompted by a belief that the needs of the dyslexic child often go unrecognized:

> Despite the prevalence of dyslexia, many Americans remain undiagnosed, untreated and silently struggle at school or work. (Lamar Smith,

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> Chairman of the US Science, Space, and Technology Committee, quoted in Richardson, 2016)

It is a matter for debate whether Smith's observation should be interpreted as suggesting that US schools are failing to identify and cater for large numbers of struggling readers (i.e., Dyslexia 1) or, alternatively, that there is a large unrecognized pool of dyslexic people, with very particular needs, who are failing to be differentiated from other poor readers (Dyslexia 2). Reflecting the confusions that result from the use of these contrasting understandings, Rice and Brooks (2004) offer clarification:

> The critical question in dyslexia research is not whether dyslexic people in particular differ from normal readers. It is *whether dyslexic people differ from other poor readers*. (Rice & Brooks, 2004: 33, emphasis as in original)

One of the key difficulties for those who have tried to produce a definition of dyslexia in which dyslexia is differentiated from others with poor word recognition skills is that providing a scientifically acceptable version that can reflect this distinction has proven elusive. Popular definitions tend not to permit clear differentiation of this kind. For example, the British Psychological Society's, Division of Educational and Child Psychology's operational definition (1999) states that:

> Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty. This focuses on literacy learning at the word level and implies that the problem is severe and persistent despite appropriate learning opportunities. (1999: 64)

Based largely upon the severity of the reading difficulty, this appears to reflect a Dyslexia 1 understanding. However, somewhat puzzlingly, some diagnosticians appear not to find any dissonance in citing this definition as justification for their use of a Dyslexia 2 approach.

A Dyslexia 2 definition would seem to need to be framed in a fashion that embodies either symptoms, causality or prognosis (Tønnessen, 1995). Symptoms refer to, "… observable and/or measurable signs of underlying conditions and processes. When we describe reading behavior or reading achievement without reference to their underlying causes, then we are at the symptom level" (Tønnessen, 1997: 80). Symptom-based definitions of dyslexia may be inclusionary or exclusionary; the condition may be signaled by the absence of certain factors or symptoms, or by the presence of others.

An early example of a definition that utilizes exclusionary factors is that offered by the World Federation of Neurology in 1968. This states that dyslexia is:

> … a disorder manifested by difficulties in learning to read despite conventional instruction, adequate intelligence, and socioeconomic opportunity. It is dependent upon fundamental cognitive disabilities that are frequently of constitutional origin. (cited in Critchley, 1970: 11)

Here can be found two of the most commonly employed exclusionary factors – intelligence and socioeconomic disadvantage.

Within the field of psychiatric classification, there was much debate about the use of the term dyslexia prior to the final production of the American Psychiatric Association's *Diagnostic and Statistical Manual – Fifth Edition* (DSM-5) (APA, 2013). An earlier draft version had removed reference to dyslexia on the grounds that the differing conceptions and understandings of this term rendered the construct scientifically problematic; however, following vigorous and sustained lobbying, it later appeared in the final version.

The overarching term *Specific Learning Disorder* was introduced to describe a type of neurodevelopmental condition that impedes the ability to learn or employ academic skills. Clinicians are required to specify for a given individual any particular domains of academic difficulty, together with their subskills, that might be impaired. One specific learning disorder category concerns *impairment in reading*, with the particular skills identified as word reading accuracy, fluency, and reading comprehension. *Dyslexia* can be employed here as a "specifier," "… an alternative term used to reflect a pattern of learning difficulties characterized by problems with accurate or fluent word recognition, poor decoding, and poor spelling abilities" (APA, 2013: DSM-5, Diagnostic Code 315). While its inclusion into DSM-5 largely satisfied dyslexia advocacy groups, the term appears not to offer any additional diagnostic information.

A second literacy-related category, entitled *written expression*, includes spelling, grammar and punctuation, and clarity or organization of written expression. Learning problems should be "unexpected" when considered in relation to other areas of development and, "… must have persisted for at least six months despite the provision of interventions that target those difficulties" (APA, 2013: 66).

The other major psychiatric classification system, the International Classification of Diseases (ICD)-11 (World Health Organization, 2023), locates dyslexia within the overarching category of "Developmental Learning Disorder." This refers to a group of neurologically-based developmental disorders characterized by significant and persistent difficulties

in learning academic skills such as reading, written expression, and arithmetic. In respect of reading, ICD-11 states:

> Developmental learning disorder with impairment in reading is characterised by significant and persistent difficulties in learning academic skills related to reading, such as word reading accuracy, reading fluency, and reading comprehension. The individual's performance in reading is markedly below what would be expected for chronological age and level of intellectual functioning and results in significant impairment in the individual's academic or occupational functioning. Developmental learning disorder with impairment in reading is not due to a disorder of intellectual development, sensory impairment (vision or hearing), neurological disorder, lack of availability of education, lack of proficiency in the language of academic instruction, or psychosocial adversity. (World Health Organization, 2023: Section Code 6A03.0)

ICD-11 shares many of the same characteristics of DSM-5 including the notion of unexpectedness. However, in ICD-11, unlike for DSM-5, unexpectedness may be based upon a discrepancy between reading and intellectual ability, a notion that is now widely discredited (Fletcher et al., 2019). Unlike DSM-5, it does not employ the criterion of an insufficient response to appropriate forms of intervention.

Arguably, the most widely cited current definition is that developed by a research group convened by the International Dyslexia Association (IDA) and subsequently adopted by its Board in 2002:

> Dyslexia is a specific learning disability that is neurobiological 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. (Lyon, Shaywitz, & Shaywitz, 2003: 2)

This definition has been endorsed by many leading international researchers Dickman (2017) although more recently has been subject to criticism (Brady, 2019; Elliott, 2020). Intensive lobbying by dyslexia advocacy groups over the past decade has seen it adopted widely in US legislation and taken up in many other countries. While the definition works adequately where the term dyslexia is used to describe reading disability in line with a Dyslexia 1 conception, it quickly unravels when employed to differentiate dyslexic from non-dyslexic poor readers (Dyslexia 2).

Similar to the World Federation of Neurology's definition, there is a reference to a biological component although the descriptor "neurobiological" is preferred to "constitutional," perhaps reflecting increasing emphasis upon advances in neuroscience (see Chapter 3). Neurobiological factors apply across all domains of human performance (Protopapas & Parrila, 2018), however, and with reference to reading, the term "neurobiological" neither offers explanatory power nor serves a meaningful diagnostic function (Sand & Bolger, 2019). Reference to phonological ability in the definition reflects its important role in reading development although its portrayal as a unitary causal explanation is likely to decline with increased recognition of multifactorial accounts of reading disability in which no single process is necessary or sufficient to cause reading disability (Compton, 2021; Fletcher et al., 2019; Pennington, McGrath & Peterson, 2019). While secondary consequences of dyslexia are listed in the definition, such outcomes are typically found for the great majority of struggling readers and thus these hardly offer additional diagnostic power. Cognitive functioning and a lack of access to appropriate schooling both appear to be exclusionary, but here they are couched within an inclusionary notion of unexpectedness.

What Might Be Indicators of Unexpected Performance?

The notion of dyslexia as *unexpected* poor performance in reading, writing, or spelling is a uniquely North American conception that reflects the earlier work of Kirk (1963) in the field of specific learning disability (Miciak & Fletcher, 2020). In 2018, the notion of unexpected underachievement was codified in US federal law (First Step Act of 2018: 115–391). It is widely employed as a key criterion in the diagnosis of broader learning disability but is also used to differentiate between dyslexic and other struggling readers (Wagner & Lonigan, 2022). Indeed, in the opinion of S. Shaywitz and J. Shaywitz (2020: 456), unexpected underachievement has been shown by research to be the "… most consistent and enduring core" of the definition of dyslexia for more than one hundred years. More recently, this term has begun to gain some traction in the UK. Nevertheless, used in this way, the term is highly problematic (Elliott, 2020).

> Developmental dyslexia or reading disability refers to unexpected poor performance in reading. Poor performance in reading typically is defined as performance markedly below that of one's peers or expectations based on some form of standards. What constitutes an unexpected level of poor performance in reading has been more difficult to define. (Wagner, 2008: 174)

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At one level, a failure on the part of an individual to make age-related progress in reading, given a standard educational diet, could be deemed to be unexpected (Lachmann & Bergström, 2023). Such a judgement would not require a psychometrically based differentiation between dyslexic and other poor readers derived in clinical assessment contexts. Unsurprisingly, perhaps, dyslexia advocates, assessors, and lobbyists have tended to look elsewhere for the unexpected components.

DSM-5 lists a number of factors that could reduce the likelihood of a diagnosis of Specific Learning Disorder, a category which, as noted above, includes the terms word-reading accuracy and reading fluency as types of learning disability. Not only should the individual's performance in culturally and linguistically appropriate tests of the requisite academic skill (reading, writing, mathematics) be well below the average range, but their difficulties should not be better explained by developmental, neurological, sensory (vision or hearing), or motor disorders (APA, 2013).

A child who is severely visually, hearing, or neurologically impaired, or for whom the text is not in their first language, might understandably struggle to learn to read. It is not in these areas of challenge, however, that the dyslexia debate is meaningfully situated, although the needs of second language learners who also have a reading disability can often be particularly complex and difficult to resolve (Vaughn, Martinez, et al., 2019). Rather, argumentation concerning the expected versus unexpected nature of reading difficulties is more commonly centered elsewhere. It is often argued that a reading difficulty would not be unexpected in cases where the individual demonstrates one or more of the following:

- low intelligence (involving a discrepancy between measured intelligence and reading performance and/or a mixed profile of cognitive strengths and weaknesses)
- socioeconomic disadvantage
- a history of inadequate schooling
- emotional and behavioral factors that might affect attention, concentration, and responsiveness to teacher direction.

i. Intelligence

In considering the role of intelligence in understanding why someone might be struggling to learn, it is often thought important to differentiate between children with or without an intellectual disability. In the USA, the presence of an intellectual disability is generally considered to be an exclusionary criterion for determining a learning or reading disability.

A diagnosis of intellectual disability (or its equivalent term in the UK, learning disability) was historically marked by an IQ score below the second percentile. However, this is an overly narrow conception of intelligence and diagnosing this condition on the basis of a single test score is no longer considered advisable. It is generally considered that, for a diagnosis of intellectual disability, consideration should go beyond IQ and include a range of adaptive, functional behaviors (Elliott & Resing, 2019).

In contrast with intellectual disability, learning disability in the USA has historically been signaled by the presence of a discrepancy between a person's IQ score and an area of academic performance; such a discrepancy, therefore, can be considered to operate as an inclusionary criterion (Grigorenko et al., 2019). In diagnosing dyslexia, the "two-group" hypothesis approach contends that poor readers with high IQs (so-called "dyslexics") can be differentiated from non-dyslexics ("garden-variety" poor readers) whose difficulties are considered more likely to result from a more global cognitive weakness (Stanovich, 1991).

It is not difficult to allocate a poor reader to one of these two groups although there are significant problems of reliability (Fletcher et al., 2019: 38–89). However, even if methodological problems were overcome, for such a distinction to have any direct utility for tackling reading difficulties, derived IQ-discrepant groups and non-discrepant groups would need to show meaningful differences in one or more of the following:

a. differences on the basis of academic and/or cognitive factors that underlie reading performance;
b. differences in response to reading instruction;
c. differences in the nature and content of effective forms of intervention;
d. differences in prognosis.

IQ has proven to be unable to make meaningful differentiations on any of these bases. Meta-analyses and scorecard reviews (Fletcher et al., 2007; Hoskyn & Swanson, 2000; Stuebing et al., 2002, 2009) have yielded little evidence to support the suggestion that IQ-achievement discrepancy is an important predictor of decoding-related differences between the two groups. In summarizing the current state of knowledge, Fletcher et al. (2019) note that studies have clearly shown that IQ discrepant and non-discrepant low achiever groups, "… do not differ practically in behavior, achievement, cognitive skills, response to instruction, and neurobiological correlates once definitional variability is controlled …. The classification lacks validity" (Fletcher et al., 2019: 52).

Studies have repeatedly shown that IQ scores are poor predictors of those who can be successfully remediated compared with those who are likely to be more resistant to intervention (Gresham & Vellutino, 2010). On the basis of a meta-analysis of twenty-two studies, Stuebing and colleagues (2009) concluded that IQ predicted only one to three percent of the variance in children's response to reading intervention. Noting that a small effect might still be relevant, particularly where any costs involved are minor, they pointed out that in comparison with relatively expensive IQ procedures, baseline assessment of word reading skills had proven to be a much stronger predictor. For this reason, the authors queried why anyone would choose to use IQ rather than "… a shorter task with a much stronger relation with outcome" (Stuebing et al., 2009: 45).

There is no evidence that IQ discrepancy categories can be used to determine differing forms of intervention (i.e., an aptitude–treatment interaction) for word decoding difficulties (Elliott & Resing, 2015; Kearns & Fuchs, 2013).

Finally, studies undertaken in which students were repeatedly tested over many years (Francis et al., 1996; Flowers et al., 2001; Vellutino, Scanlon, & Lyon, 2000) have shown that IQ discrepancy offers little prognostic information about future reading performance. Peng et al. (2019) assessed the performance of children at risk of reading difficulties over a four-year period from grade one to grade four. Nonverbal reasoning failed to predict word reading growth over this period although it did predict reading comprehension growth.

To date, there is no significant neurophysiological evidence of different etiologies for discrepant and nondiscrepant groups (Fletcher et al., 2007; Tanaka et al., 2011; Simos et al., 2014). However, there is some evidence for a stronger genetic contribution to reading difficulty for those with high IQ (Wadsworth, Olson, & DeFries, 2010) perhaps because of an association between higher IQ and a more supportive educational environment for reading (Olson et al., 2019).

Stanovich and Stanovich (1997) argue that if there is no empirical evidence to support the suggestion that we should make separate classifications and treatments for discrepant and nondiscrepant groups, such a step would need to be based upon a social policy decision arising from notions of social justice in relation to the fulfillment of the child's educational potential. The argument that children with high IQs have a greater severity of need (Ashton, 1996, 1997) because the realization of their supposedly higher potential is undermined by their reading difficulties does not stand up to scrutiny (Siegel & Hurford, 2019; Siegel et al., 2022).

The notion that IQ tests provide a picture of fixed potential that places a limit on academic achievement has a long tradition. As Sir Cyril Burt, England's first school psychologist, noted, "Capacity must obviously limit content. It is impossible for a pint jug to hold more than a pint of milk and it is equally impossible for a child's educational attainment to rise higher than his educable capacity" (1937: 477). Given that IQ was designed originally to predict subsequent educational achievement, a task in which it is relatively successful (Sternberg & Grigorenko, 2002a), it seems plausible to argue that poor readers with high IQs are particularly likely to benefit from additional assistance. If this were true, providing greater help to such children might seem to be a logical way of gaining most benefit from the distribution of limited resources. However, in addition to the ethical issues this raises, the proposition can also be challenged on scientific grounds; IQ was always meant to function as a general predictor across the curriculum, not as a means to make focused predictions in specific curricular areas. Furthermore, reliance on such measures is problematic because the use of the IQ test as a proxy for cognitive potential is itself highly contested (Lidz & Elliott, 2000; Sternberg & Grigorenko, 2002a; Sternberg, 2021).

Reading and IQ test performance have a reciprocal influence. Reading less (and less well) not only affects reading development but also undermines performance on IQ tests (Ferrer et al., 2010). Good readers not only become more competent in reading by applying and practicing their reading skills, but these also help them to develop their cognitive skills and subsequently perform more highly on IQ tests. The opposite outcome applies to poor readers (Fletcher et al., 2019). This phenomenon is an exemplar of the "Matthew effect" (Stanovich, 1986) that can lead to an underestimation of the potential of those with reading difficulties. However, despite this reciprocity, there is some evidence that reading ability has greater influence upon the time spent on reading activity than vice versa (Van Bergen et al., 2018).

A related argument with important implications for policy concerns the use of the discrepancy model to identify those children whose reading is poorer than their cognitive ability, but whose literacy difficulties are not sufficiently low to be normally deemed eligible for additional educational support (such students are sometimes known as "twice exceptional"). In a longitudinal study undertaken in Connecticut (Shaywitz, Morris, & Shaywitz, 2008), it was found that seventy-five percent of children identified by discrepancy criteria also met low achievement reading criteria. These researchers suggest that the remaining twenty-five percent may still be struggling with their reading but not to a level that is recognized on the basis of comparisons with peers using norm referenced measures.

For some (B. Shaywitz & S. Shaywitz, 2020; S. Shaywitz & J. Shaywitz, 2020; Thomson, 2009), such children merit additional assistance; others disagree on the grounds that finite resources should be targeted towards those whose absolute levels of literacy performance are weakest.

In the light of the wealth of research on the limited role of IQ in relation to dyslexia, Vellutino and colleagues concluded that "… intelligence tests have little utility for diagnosing specific reading disability" (Vellutino et al., 2004: 29). Practitioners were advised to:

> … shift the focus of their clinical activities away from emphasis on psychometric assessment to detect cognitive and biological causes of a child's reading difficulties for purposes of categorical labelling in favour of assessment that would eventuate in educational and remedial activities tailored to the child's individual needs. (Vellutino et al., 2004: 31)

The demise of the IQ discrepancy model has done much to undermine the clinical utility of the dyslexia construct. From an original position where it was believed that IQ testing could identify a dyslexic subgroup with genuinely different abilities and needs, the finding that such measures had little to offer diagnosis or intervention in respect of problems of accurate and fluent reading was a massive challenge to existing practice. As noted below, some have merely ignored or discounted this finding even though a positive practical consequence of the demise of the discrepancy approach is that the needs of many more struggling readers could potentially be identified and addressed (Di Folco et al., 2022; Snowling et al., 2020)

a. Profiles of Cognitive Strengths and Weaknesses Some have argued that while global IQ and other cognitive test scores may lack diagnostic or clinical utility for dyslexia, various combinations of subtests from such measures may yield more helpful information. Although sometimes perceived as a modern approach, cognitive profiling of this kind has had a long history (Fletcher et al., 2019).

One approach, particularly popular during the 1980s and 1990s, was to focus upon particular clusters of IQ subtests. For example, low scores on the so-called ACID profile, derived from the Arithmetic, Coding, Information and Digit Span subtests in the Wechsler Intelligence Scales for Children, were considered to be indicative of dyslexia (Vargo, Grossner, & Spafford, 1995). A popular procedure was to compare the child's scores on the ACID profile with their performance on the other subtests that together make up the full IQ score. If each of the four ACID subtest scores

proved to be equal to, or lower than, the lowest score on the other subtests, the individual was considered to have a positive ACID profile.[2]

While children with reading difficulties often score poorly on these subtests, the incidence of the overall ACID profile is typically low, generally between four and five percent in samples of learning disabled children (Prifitera & Dersch, 1993; Ward et al., 1995; Watkins, Kush, & Glutting, 1997). Ward et al., 1995 examined a subset of children with marked IQ-reading discrepancies but found the incidence even lower at 3.9 percent. Such incidence levels do not result in useful clinical information for diagnosis and intervention. Somewhat puzzlingly, Thomson (2003), an advocate of psychometric testing for poor readers, found a much higher rate of forty percent in a sample of children at a special school for dyslexic children where he was employed. It is possible that this finding, remarkably different to other major studies, may merely reflect local education authority diagnostic practices and referral patterns. In Thomson's (2003) study, particular weaknesses were found on Digit Span, Coding, and Symbol Search; poor performance on Arithmetic and Information subtests was also noted. Subsequently, using a later version of the Wechsler Scales (WISC-IV), arithmetic was substituted by a new subtest, letter-number sequencing (Thomson, 2009). The subtests in both studies generally tap those cognitive processes (working memory, rapid naming) that are widely agreed to be problematic for poor readers (see Chapter 2), and weaknesses in these areas are unsurprising.[3]

Analyses of this kind have long been criticized on the grounds that subtest scores from IQ tests such as the Wechsler Scales (the most recent being the WISC-V) have questionable reliability and validity (de Jong, 2023; Dombrowski, McGill, Watkins et al., 2022; Watkins et al., 2022). For this reason, leading professional bodies have stated that the potential of subtests "… for accurate prediction of criteria, for beneficial examinee diagnosis, and for wise decision-making is limited" (American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME), 2014: 35).

An alternative approach seeks to identify an individual's unexpected difficulty in academic areas on the basis of an uneven pattern of strengths

[2] Kaufman (1994) suggested a rather different subtest cluster (SCAD) in which the Information measure was replaced by the Symbol Search subtest.

[3] The Information subtest seemingly taps a different set of skills. Low scores on this subtest, a measure of general knowledge, most likely will reflect, in part, reduced opportunity to gain information from reading.

and weaknesses (PSW) in their cognitive functioning. While this can be seen as an extension of the traditional IQ-aptitude discrepancy approach, the key difference here is that a combination of both intellectual strengths and weaknesses is required.

In addition to the use of the commonly employed Wechsler Scales (see Watkins & Canivez, 2021, for a critique of profiling with the WISC-IV) several more specialized measures have proven popular for diagnosing learning disability. These include the Dual/Discrepancy Consistency Model (D/DC; Flanagan et al., 2018), formerly known as the XBA cross-battery assessment method, the Concordance/Discordance Model (C/DM; Hale & Fiorello, 2004) and the Discrepancy/Consistency Model (D/CM; Naglieri, 2011; Naglieri & Feifer, 2018). For proponents of cognitive test profiling, these tools can be used not only to identify a learning disability, but also to provide valuable information for the individualization of tailored interventions. However, a number of problems have been identified in the literature concerning accurate identification, an (in)ability to inform intervention, and poor prognostic prediction.

Problems of accurate identification. PSW approaches have been heavily criticized on psychometric grounds, particularly in relation to their reliability (Beaujean et al., 2018; Fletcher et al., 2019; Miciak, Taylor et al., 2018). This problem appears to be little improved by the use of supplementary assessment data or the application of clinical judgement (Maki, Kranzler, & Moody, 2022). Pennington, McGrath, and Peterson (2019) note that PSW is an intuitively appealing notion but caution against its use. In so doing, they reference the significant difficulties that emerge when employing a single cut-off point on a continuous distribution of an academic or cognitive skill. The PSW approach massively increases this problem because it involves the setting of cut-off points on multiple continuous measures. As a result:

> … the majority of students with clinically impairing literacy problems do not meet PSW criteria, and even a relatively small change in diagnostic criteria results in a large shift in which specific children are identified (Miciak, Fletcher, Stuebing, Vaughn, & Tolar, 2014; Stuebing et al., 2012). These problems make using the PSW for individual diagnosis impractical and potentially harmful. (Pennington, McGrath, & Peterson, 2019: 75)

Others have emphasized the tendency of PSW to produce an undesirable number of false positives (Kranzler et al., 2016a; 2019). This outcome is hardly surprising because, at the level of the individual, significant variability across cognitive processes is commonplace. Thus, in an examination of a large simulated dataset, McGill and Busse (2017) found that employment of one of the PSW models resulted in more than half of 9–13 year

olds presenting with at least one cognitive weakness, with a quarter of the sample presenting with two or more weaknesses.

A further threat to reliability and validity results from the finding that comparison of different PSW methods results in little agreement about who should be identified as learning disabled (Taylor et al., 2017). In a study of fourth-graders, Miciak et al. (2016) found agreement levels derived from the XBA and C/DM were little better than chance (see also, Miciak et al., 2014). Where models fail to identify the same students as learning disabled, their joint validity is necessarily low.

Problems in informing intervention. Proponents of the PSW approach argue that it is helpful for drawing up bespoke forms of individualized intervention:

> One of the major purposes of a comprehensive assessment is to derive hypotheses emerging from a student's cognitive profile that would allow the derivation of different and more effective instruction. By eliminating an evaluation of cognitive abilities and psychological processes, we revert to a one-size-fits-all mentality where it is naively assumed that all children fail for the same reason …. At the current stage of scientific knowledge, it is only through a comprehensive evaluation of a student's cognitive and psychological abilities that we can gain insights into the underlying proximal and varied root causes of reading difficulties and then provide specific interventions that are targeted to each student's individual needs. (Reynolds & Shaywitz, 2009a: 46–47)

These confident assertions were challenged on the grounds that supportive evidence was lacking. Thus, Fletcher (2009) argued:

> Despite claims to the contrary (Hale et al., 2008) there is little evidence of Aptitude × Treatment interactions for cognitive/neuropsychological skills at the level of treatment or aptitude (Reschly & Tilley, 1999: 28–29). The strongest evidence of Aptitude × Treatment interactions is when strengths and weaknesses in academic skills are used to provide differential instruction (Connor et al., 2007). (Fletcher, 2009: 6)

Along similar lines, Gresham (2009) expressed concern that no data-based studies (other than individual case studies) had been cited to support the claims of PSW proponents, while hundreds of studies in a variety of different areas of learning had failed to show such a phenomenon (Cronbach, 1975; Cronbach & Snow, 1977; Pashler et al., 2008). According to critics (Fletcher & Vaughn, 2009; Gresham, 2009), those advocating the value of cognitive and neuropsychological data for formulating differentiated interventions have a responsibility to provide empirical evidence to support such claims.

In response to such criticisms a White Paper by fifty-eight leading scholars in the USA (Hale et al., 2010), many closely associated with the psychometric tradition, contended that evidence indicating the value of cognitive and neuropsychological assessment for determining potential responsiveness to academic and behavioral intervention was only just beginning to emerge, and further research was needed. However, such optimism appears to have been misplaced as the ability of cognitive profiles of this kind to determine effective interventions has not been supported by scientific investigations (McGill, Dombrowski, & Canivez, 2018; Kranzler et al., 2016b). Burns et al. (2016) conducted a meta-analysis of studies that have sought to use neuropsychological data to inform interventions in reading and mathematics. The data included measures of cognitive functioning involving intelligence, rapid naming, verbal memory, executive function, and attention. Also included in the analysis were studies involving phonological or phonemic awareness and reading fluency. Effect sizes varied considerably from g = 0.17 for measures of cognitive functioning to g = 0.43 for reading fluency and g = 0.50 for phonological/phonemic awareness. In reflecting on these results, the authors concluded that measures of cognitive abilities have little to no utility in screening or planning reading interventions. It is important to note that the authors challenged the application of the descriptor "neuropsychological" to phonological/phonemic assessment as this relates to skills that are proximal, can be directly instructed, and appear to have a moderate effect on learning (see Chapter 4).

Some leading proponents of PSW approaches have come to accept that the basis for claims concerning the aptitude × treatment efficacy of the approach is flawed. Schneider and Kaufman (2017), for example, acknowledged that:

> After rereading dozens of papers defending such assertions, including our own, we can say that this position is mostly backed by rhetoric in which assertions are backed by citations of other scholars making assertions backed by citations of still other scholars making assertions. (Schneider & Kaufman, 2017: 8)

Nevertheless, they tempered this seeming volte-face by noting that such assertions are often backed by "… deep ethical intuitions, fine-tuned professional insights, vivid personal experiences, and a large body of indirect scientific evidence" (Schneider & Kaufman, 2017: 8). However, similar justifications could equally be applied to many other popular educational approaches that have been subjected to systematic scientific research and subsequently found to be ineffective.

Problems in informing prediction of who will make progress. A further argument for cognitive profiling is that it may be able to point to a struggling learner's likely progress when provided with appropriate intervention. Fletcher and colleagues (2011), for example, found that cognitive processes were able to differentiate subgroups defined on the basis of poor response and low achievement after a small group work intervention. However, they noted that this seemed to reflect the severity of impairment in reading skills rather than qualitatively distinct differences in the cognitive profiles of these groups. As a result, they concluded that the assessment of cognitive processes failed to provide sufficient value-added benefit to justify their use. Miciak et al. (2016) similarly sought to measure the extent to which PSW approaches could predict who would or would not respond to an intervention. Crucially, what was of interest here was the additional predictive capacity over and above that based upon baseline measures of reading. The authors' data simulations indicated that, in the most positive scenarios, an improvement in predictive accuracy was found in approximately five–ten students for every 1,000 students assessed. Most of the comparisons undertaken resulted in no statistically significant or educationally meaningful improvement in prediction.

Two meta-analytic studies (Stuebing et al., 2009, 2015) indicated that cognitive skills (e.g., attention, nonverbal reasoning, and working memory) were weak predictors of response to intervention. Similarly, Peng et al. (2020) demonstrated that following a program of reading instruction with first-grade at-risk readers, neither initial working memory nor nonverbal reasoning scores predicted their responsiveness immediately afterwards, nor in the following year in second grade. In contrast, domain specific reading skills, particularly letter knowledge, proved to be valuable predictors.

In summarizing their revised perspective on the PSW approach, Schneider and Kaufman (2017) acknowledged that:

> The existing evidence base that demonstrates the value of comprehensive cognitive assessments for this purpose is not nearly as strong as it needs to be. Proponents of comprehensive cognitive assessments for learning disability identification must do more to rigorously evaluate their beliefs or else concede the argument to those with better evidence. (Schneider & Kaufman, 2017: 8)

Siegel and Hurford (2019) argue that the use of the PSW approach in dyslexia assessment is:

> Expensive and time-consuming, does not have predictive validity, does not specifically or necessarily highlight the difficulties that the student is

> encountering, provides no insight as to remediation, is convoluted, esoteric and unnecessary …. There is little to no evidence that models of patterns of strengths and weaknesses will provide accurate identification of students in need of intervention, while simply assessing the areas in which the student is struggling is considerably more likely to result in academic benefits. Patterns of strengths and weaknesses models are not only unnecessary for the identification and remediation of dyslexia, but should be avoided. (Siegel & Hurford, 2019: 27)

On the basis of overwhelming scientific evidence, unexpectedness on the basis of IQ and cognitive measures, whether involving total scores, or profiles of cognitive strengths and weaknesses, should no longer be used for diagnosing dyslexia or a broader category of (specific) learning disability (Fletcher et al., 2019; Fletcher & Miciak, 2017; McGill, Dombrowski, & Canivez, 2018). Even if more informative forms of profiling could be developed, it would still be necessary to demonstrate that any additional benefits could justify the high costs involved (Fletcher & Miciak, 2017).

At the turn of the century, Watkins (2000) described cognitive profiling as a shared professional myth, yet its continuing popularity led Fletcher and colleagues to comment that: "It is ironic that methods of this sort continue to be proposed when the basic psychometric issues are well understood and have been documented for many years" (Fletcher, Stuebing, Morris & Lyon, 2013: 40). More than a decade later, it remains a puzzle why IQ testing and cognitive profiling approaches are still widely employed by school psychologists for diagnosing learning disability in general and dyslexia more specifically (Al Dahhan et al., 2021; Benson et al., 2019, 2020; Farmer et al., 2021; Kranzler et al., 2020; Lockwood & Farmer, 2020; Lockwood, Benson, et al., 2022; Maki & Adams, 2019; Sadusky, Berger, Reupert, & Freeman, 2022).

b. The Continuing Popularity of Intelligence for Diagnosing Dyslexia The dissociation between reading disability and intelligence is now recognized by many dyslexia associations. The website of the International Dyslexia Association, for example, states:

> Research indicates that dyslexia has no relationship to intelligence. Individuals with dyslexia are neither more nor less intelligent than the general population.[4]

[4] https://dyslexiaida.org/dyslexia-at-a-glance; accessed November 17, 2023.

Despite this, many members of these associations appear to disregard this statement in their assessment practices. Reasons for this include the following:

a. Average or above intelligence has long been a defining feature of dyslexia; this association, steeped in everyday understandings, has proven difficult to break.
b. There is a longstanding tendency for popular clinical practices to be passed down across generations, "… through clinical lore and become almost immune to self-correction" (Farmer et al., 2021: 108).
c. Psychologists can often downplay scientific knowledge where this runs counter to practice habit and existing beliefs and instead prioritize personal intuition and observations (so-called "gut feelings") (Dombrowski, McGill, Farmer, et al., 2022 Dombrowski et al., 2021; Vanderheyden, 2018).
d. School psychologists' assessment practices in the USA are heavily influenced by the particular frameworks permitted by individual state regulations (Benson et al., 2020).
e. Such practices persist in the production and delivery of clinical instructional resources and school psychology training programs (Farmer et al., 2021; Lockwood & Farmer, 2020), despite some signs of a gradual decrease (Lockwood, Benson, et al., 2022). The continuing emphasis upon IQ-reading discrepancy undermines the take-up of emerging evidence-based, professional understandings (Dombrowski, McGill, Farmer, et al., 2022 Dombrowski et al., 2021; Farmer et al., 2021).
f. In many middle- and high-income countries across the world, IQ tests continue to have a role in determining eligibility for additional education services (Elbeheri & Siang, 2023). Policy and legislation are often slow to adapt to advances in scientific understanding and can be greatly influenced by lobby groups.
g. Some prominent researchers have given credence to discrepancy approaches by continuing to argue that developmental dyslexia concerns an unexpected difficulty in learning to read for those with average or above average intelligence (e.g., Nicolson & Fawcett, 2007). The location of the lower endpoint of the "average" range may vary or is not always made explicit.
h. Dyslexia as an unexpected condition is difficult to operationalize if IQ, or another measure of cognitive ability, is ruled out as a key indicator.
i. Practice can be influenced by suggestions that the weighting of genetic and environmental risk factors for dyslexia appears to vary

between children with high or low IQs (Wadsworth, Olson, & DeFries, 2010). However, this distinction currently has no practical relevance for differential assessment and intervention (Pennington, McGrath, & Peterson, 2019).

j. IQ is sometimes used as a criterion in the selection of participants for dyslexia research studies (Lopes et al., 2020; Rice & Brooks, 2004). This has been justified on the grounds that studying poor readers with normal range IQs, may help to shed greater light on key underlying cognitive mechanisms.

k. For some, the continued use of IQ in the assessment of dyslexia reflects the perceived absence of appropriate alternatives. In putting forward such a position, Elbeheri and Everatt (2009) argue that positive (inclusive) diagnostic indicators are still not sufficiently robust and until these "… are fully explored and reliably measured, the arguments for using IQ tests as a basis of indication will be difficult to refute" (2009: 30).

l. The IQ discrepancy model is retained in the 11th edition International Classification of Diseases (ICD-11) (World Health Organization, 2023).

m. IQ tests may help to identify intellectually able children whose reading levels, while depressed, are not so poor that they would typically be identified as requiring special services (Mather & Schneider, 2023; B. Shaywitz & S. Shaywitz, 2020; S. Shaywitz & J. Shaywitz, 2020). As a result, some highly able children may not receive additional literacy support. This argument runs counter to the notion that finite resources should be prioritized for those who experience the greatest literacy difficulties. There is an associated risk that the application of an IQ-achievement model could serve to exclude less intellectually able children from specialized literacy-related intervention (Huettig & Ferreira, 2022; Siegel & Hurford, 2019).

n. Some psychologists believe that cognitive discrepancy approaches, while currently flawed, may ultimately evolve to produce more meaningful results (Schneider & Kaufman, 2017; VanDerHeyden, 2018).

o. IQ may be seen as the most suitable alternative by psychologists in countries where systematic response to intervention, RTI models have not been implemented (Sadusky et al., 2022).

p. There is a relationship between IQ and higher order reading skills. Cognitive tests may help to shed light upon the specific nature of a child's higher-order reading comprehension difficulties involving

such processes as reasoning, inferencing, and logical deduction (Cain, Oakhill, & Bryant, 2004; Fletcher et al., 2019; Christopher et al., 2012; Peng et al., 2019; Vellutino et al., 2004).

q. The IQ test is an instrument whose usage is restricted to those with appropriate qualifications and thus it serves as a means of garnering, signaling, and maintaining professional influence and status. Thus, with some evident frustration, Stanovich (2005) cites a comment in the house journal of the American Psychological Association that provides an analogy with an iconic tool of medicine: "… the intelligence test is our stethoscope, like it or not" (Kersting, 2004: 54).

r. Resistance to change by practitioners does not merely reflect a lack of engagement with current scientific knowledge. It would be a mistake to consider professional practice as a purely scientific pursuit devoid of political, social, and personal concerns. To accept the admonitions of Vellutino and colleagues (2004) that practitioners should change the focus of assessment from cognitive testing to reading-related behaviors is to introduce a potential threat to those professionals schooled in the psychometric tradition who may lack high-level expertise in curricular and pedagogic practices in the field of literacy.

s. A populist emphasis upon identifying and celebrating the intellectual and creative strengths of those with "dyslexic brains" has been spurred by powerful media campaigns backed by the endorsement of respected high-profile individuals and public bodies. The conception offered in these accounts involves a substantial reframing of a dyslexia construct that bears little relationship to findings from scientific research.

t. For many poor readers, and their families, there is an understandable desire to ensure that their reading difficulties are not perceived by others as indicative of low intelligence.

ii. Socioeconomic Disadvantage and Psychosocial Adversity

The view that adverse economic and environmental disadvantage can rule out unexpectedness as an explanatory criterion for a given individual (Hammill & Allen, 2020) is highly problematic. This would likely reduce the possibility of a diagnosis of dyslexia in poor readers from impoverished backgrounds (Rutter, 1978) and constrain their access to any benefits that may accrue from the label. Such a phenomenon is exemplified in studies in the USA (Odegard et al., 2020) and the UK, where the results of a large cohort study indicated that teachers were more likely to label

as dyslexic those children with greater socioeconomic and cultural capital (Knight & Crick, 2021).

An educational achievement gap between advantaged and disadvantaged backgrounds has been found in most societies (Liu et al., 2022). Highly negative environmental circumstances, in particular, disruptive early life experiences resulting from extreme poverty, and low levels of parental education, are likely to have a significant effect upon the development of children's language and literacy (Hartas, 2011; Herbers et al., 2012; Lervåg et al., 2019). Lurie et al. (2021), for example, employed a longitudinal design that showed that cognitive stimulation, involving elements such as language exposure, access to learning materials, caregiver involvement in children's learning, and variety of enriching experiences, operates as an environmental mechanism linking socioeconomic status and academic achievement through children's receptive and expressive language.

Concern about social class differences in the home language experience of infants was fueled by a study of an impoverished Californian community (Hart & Risley, 2003). Here it was reported that, by the age of five, some of the children studied had heard 32 million fewer words spoken to them than the average middle-class child. While concerns have been expressed about the methodology employed in this study (Sperry, Sperry, & Miller, 2019), and Hart and Risley's "30 Million Word Gap," headline is now considered to represent a considerable overestimate, a recent meta-analysis of studies (Dailey & Bergelson, 2022) has shown that a significant, albeit far smaller, socioeconomic difference does exist, particularly in relation to levels of child-directed speech in the home.

Socially disadvantaged children are also less likely to have high levels of print exposure in the home. While important for all children, such experience appears to be particularly valuable for low ability readers (Mol & Bus, 2011). Outside the home, opportunity to learn, defined in terms of student curricular experience, has also been shown to be significantly poorer in schools serving disadvantaged communities (Schmidt et al., 2015). Accordingly, a student's reading achievement is predicted not only by their socioeconomic status (SES), but also, and more powerfully, by the average SES of their school. Indeed, in comparison with their peers, not only are socioeconomically disadvantaged children more likely to experience less developmentally favorable environments at home and at school, a "double dose of disadvantage" (Neuman, Kaefer, & Pinkham, 2018: 102), they are also likely to be more adversely affected by them (Buckingham, Wheldall, & Beaman-Wheldall, 2013). Nevertheless, where it is provided,

high-quality instruction can reduce the negative impact of socioeconomic disadvantage upon reading achievement (Romeo et al., 2018).

DSM-5 and ICD-11 both identify psychosocial adversity as an exclusionary factor for learning and reading disability. How to operationalize this construct is left unclear and understandings vary greatly. De Jong and van Bergen refer to "… educational disadvantages which, for example result in school absenteeism" (2017: 358). Here, they may be referring to the higher levels of truancy typically found in disadvantaged communities but avoidance of school can also be a consequence of reading disability leading to a variety of adverse schooling experiences (Elliott & Place, 2019). In a rare attempt to operationalize the construct, Di Folco et al. (2022) employed "children in care" as a proxy for the exclusionary criterion of psychosocial adversity in their large epidemiological study comparing the prevalence of dyslexia using DSM-5 and ICD-11. These researchers appeared to recognize the conceptual difficulty noting that there were no other available indicators. The obvious fact that this is inappropriate as a basis for a clinical judgement throws up the difficult question of what factors might be drawn upon and the concomitant need for close consideration as to how to avoid bias against certain social and minority groups (B. Shaywitz & S. Shaywitz, 2020).

Dyslexia lobby groups and education policymakers tend to avoid definitions that make direct reference to social or economic disadvantage. It would surely be incongruous and unfair if distinctions between dyslexic and non-dyslexic poor readers and the contrasting perceptions, expectations, and access to additional support that can result, were predicated on the basis of judgements about children's life experiences. All too easily a situation could emerge where inappropriate genetic or neurobiological (dyslexic) or environmental (non-dyslexic) explanations for a reading difficulty are ascribed to an individual on the basis of their socioeconomic circumstances. However, biology and environment cannot be disaggregated in such fashion (Becker al., 2017; Gotlieb et al., 2022; Mascheretti et al., 2017). To illustrate, parents with a family history of reading difficulties living in disadvantaged communities may be less able to provide high-quality language and literacy experiences for their children (van Bergen et al., 2017) with one influential factor being parental linguistic ability (Puglisi et al., 2017).

The quality of adult-child interaction has an important effect upon the developing brain. For example, studies indicate that the quality of the home language and literacy environment is associated with brain structure and later linguistic, cognitive, or behavioral measures (Hutton et al. 2020; Merz

et al., 2020). Controlling for socioeconomic status and age, early parent-child shared reading experience was shown to be associated with changes in brain structure, one area of which was found to mediate the relationship between shared reading time and subsequent reading outcomes (Davison et al., 2023). For such reasons, the home literacy environment cannot be considered to be a purely environmental measure (Snowling & Hulme, 2021). Multiple other environmental factors will also affect the infant's physical development. Hoeft and Bouhali (2022) list a range of environmental factors that can influence reading and math outcomes including high concentrations of heavy metals such as lead and methylmercury, and chemicals such as polybrominated diphenyl ethers. Factors that can affect pre- and postnatal development include maternal physical and mental health and substance use. Chronic exposure to high levels of infant stress, can lead to altered brain structure, function, and connectivity and affect academic performance (Burenkova, Naumova, & Grigorenko, 2021). Such factors are not unique to socioeconomically disadvantaged communities, of course.

How could a diagnostician working with a poor reader differentiate a genetic etiology from alternative environmental explanations? Might a family history of reading difficulty be seen as an indicator that the child's problem is gene-based and thus an indicator of "true" dyslexia? Could a home environment that is perceived to be less than optimal be considered to be an exclusionary factor that would rule out a diagnosis? Such questions are oversimplified to the point of meaninglessness and attempting to distinguish between children in this way for clinical purposes is both scientifically impossible and ethically unacceptable. Nevertheless, it is possible that such considerations may sometimes play a subliminal role in determining whether a child's reading difficulties are deemed to be unexpected.

As is typically the case for most aspects of human development (Petrill et al., 2010), a reciprocal interaction between multiple biological and environmental risk and protective factors operates in the development of reading disability (Theodoridou et al., 2021; Turesky et al., 2022) with genetic predispositions changing as a consequence of the particular environmental context environment (see Little & Hart, 2022, for further discussion of these issues).

Given the complexities involved, it is unsurprising that behavior-genetic studies have yet to enable any specification of the balance of genetic and environmental influences for a given individual with a reading disability. These:

> … only provide estimates for the average influence from genes and environment in the sampled population, and for the average influence of

> moderating variables such as SES on the balance of genetic and environmental influences across the dyslexic sample. (Olson et al., 2019: 404)

In summary, it is important that clinicians and assessors not only understand that it is not currently possible to offer a dyslexia diagnosis on the basis of genetic/neurobiological (versus environmental) explanations (Fletcher et al., 2019; Protopapas & Parrila, 2019), but also ensure that such ideas do not influence decision-making, even at a tacit or subliminal level.

> The idea that people are born with dyslexia because they have bad genes and bad brains is an outmoded notion that should be replaced with concepts of risk and malleability that are dependent on instruction and early intervention. (Miciak & Fletcher, 2020: 7)

iii. Inadequate Schooling and Educational Deprivation

Dickman's (2017) assertion that a definition of dyslexia that fails to exclude reading difficulties resulting from "educational deprivation" would be too broad might appear to have a certain logic but, on closer analysis, this soon becomes problematic.

One obvious explanation for poor reading is where the child has never attended school or received an appropriate alternative form of education. More challenging is where there is a history of school absenteeism. As noted earlier, school refusal may be an understandable consequence of the experience of learning difficulty (Elliott & Place, 2019). How this should affect a diagnosis of dyslexia is a concern that has caused considerable confusion and uncertainty amongst professionals (Nag, 2022; Sprick et al., 2020). For children who are attending school regularly, determining whether a reading difficulty is a consequence of inadequate schooling is also problematic. How might an assessor operationalize "inadequacy" in order to inform their clinical judgement? Should any determination about the adequacy of schooling be based upon the nature of the reading (or wider) curriculum? the approaches to teaching and learning employed? the perceived skills of the teaching staff? the quality of the classroom learning environment? or the extent to which parents actively support and reinforce the school's work? To what extent could responses to these questions ensure intra- and inter-assessor reliability in decision-making?

As is noted in Chapter 4, there has been an increasing tendency to explain many reading problems on the basis of a failure to apply scientific approaches to the teaching of reading (Hanford, 2018; Seidenberg, 2017). However, while the use of much criticized whole language approaches in isolation is likely to be suboptimal (Tunmer, Greaney, & Prochnow, 2015),

most children will become accomplished readers whatever the balance of instructional approaches employed. In contrast, it is the child who is at risk of developing reading difficulties who will most likely be adversely affected by the absence of structured, systematic approaches to instruction. Even in those schools where whole language approaches predominate, one cannot rule out the possibility that a given struggling reader would have experienced a significant reading disability even if an optimal approach to instruction had been employed.

Nevertheless, one might argue that significant reading improvement that follows on from the provision of high-quality intervention may indicate that the original problem was primarily a consequence of poor instruction. However, because of changing classroom, developmental, maturational, and motivational factors it would be difficult to move beyond reasonable speculation to a clear determination. Whether this distinction would still matter anyway in cases where sound progress was being made, is a moot question. To add to this complicated scenario, it is likely that some struggling readers and their families would be discomfited by suggestions that improvements in their reading ability to an adequate level indicated that they should be perceived as "instructional casualties" rather than "compensated dyslexics" (Cavalli et al., 2017).

In summary, differentiating between dyslexic and other poor readers on the grounds of educational deprivation or inadequate schooling is difficult to justify (de Jong & van Bergen, 2017).

iv. Emotional and Behavioral Factors

Experience of reading difficulty can be traumatic (Edwards, 1994), stigmatizing (Riddick, 2000; Livingston, Siegel, & Ribary, 2018; Haft, Greiner de Magalhães, & Hoeft, 2023) and impact negatively upon self-concept and self-esteem (McArthur et al., 2020; McNulty, 2003) (see Chapter 5 for further discussion). It is unsurprising, therefore, that resultant emotional problems can continue into adulthood (Alexander-Passe, 2015; Cederlöf et al., 2017). A relationship between emotional-behavioral problems and reading difficulties has been reported for both internalizing (e.g., anxiety and depression) and externalizing (conduct disorders) problems (Aro et al., 2022; Cederlöf et al., 2017; Donolato et al., 2022; Francis et al., 2019; Giovagnoli et al., 2020; Grills et al., 2022; Grills-Taquechel et al., 2012; Mugnaini et al., 2009; Ramirez et al., 2019; Visser et al., 2020; Xiao et al., 2023; Zuppardo et al., 2023). There is some evidence that comorbidity between dyslexia and emotional and behavioral problems is greatest at potentially stressful times, such as when children transfer from

kindergarten to elementary school, or from primary to secondary school (Horbach et al., 2020).

Ramirez et al. (2019) observed an association between reading anxiety and achievement in first and second-grade students, with a stronger relationship for boys. In contrast, the influence of reading anxiety and general anxiety upon reading accuracy was both found to be marginal in a cross-sectional study of fourth- and fifth-grade struggling readers, with this being rather greater upon reading fluency than untimed single word reading (Macdonald et al., 2021). In a study of early elementary schoolchildren, Grills et al. (2022) found that, contrary to expectation, struggling and typical readers failed to show differences in anxiety levels at the beginning of the school year, perhaps because they had not yet experienced significant difficulties with reading. However, by the end of the year, those who continued to struggle with reading showed greater levels of anxiety and depression than peers who had met reading benchmarks. Supporting Horbach et al.'s (2020) suggestion that the effect of reading difficulty upon anxiety may take some time to develop, McArthur et al. (2022) found that across four large longitudinal databases, emotional health (rated by parents) at age five was unrelated to reading at age seven. In contrast, reading at age seven was related to emotional health at age eleven. In the light of their findings, these researchers suggested that poor reading is likely to impact emotional health rather more than the other way around. This concurs with the finding of Ramirez et al. (2019) that, while reading anxiety appears to be both a cause and outcome of poor reading achievement, the effect of achievement upon anxiety was the greater.

It may be helpful to know if there are any particular cognitive factors that might lead to an increased risk of anxiety for those with reading disability. While evidence suggests a modest relationship between weaknesses in domain general cognitive abilities (such as processing speed and executive functions) and comorbid anxiety and word reading difficulties (Anderson et al., 2023), research in this area is still in its infancy.

There is a long history of studies showing that poor readers are more likely to present with higher levels of problematic externalizing behavior than typical readers. Lin et al. (2013) found that poor readers in third grade were more likely than their peers to demonstrate behavioral difficulties in fifth grade. Similarly, Morgan, Farkas, et al. (2008) found that reading problems in first grade increased the likelihood of problem behavior in third grade even after controlling for prior behavior and potential demographic-related confounds. Noting that early behavioral problems also predicted subsequent reading difficulties, the authors suggested a bidirectional causal

model in which initial difficulties create a negative feedback cycle that results in disengagement from academic activity and increasingly problematic behavior (see also McGee et al., 1986; McArthur et al., 2022).

Drawing upon a large data set from seven independent studies, van Dijk et al. (2023) reported that poor readers with significant behavioral problems in kindergarten through third grade, K-3, were less likely to profit from reading instruction and intervention. However, this finding contrasts with the results of a meta-analysis of intervention studies involving students with co-occurring reading and behavior difficulties across grades K-12 (Roberts et al., 2020). Here it was found that small group reading interventions could improve reading achievement; however, this was not associated with an improvement in behavior, neither did a behavioral intervention appear to lead to improved reading outcomes. This led Morgan and colleagues (2008) to question the validity of the argument that behavior and reading difficulties have a reciprocal relationship, although the strength of any interaction is likely to vary according to the child's age and development.

Reading difficulties have been associated with a greater risk of criminality (Cederlöf et al., 2017; Grigorenko et al., 2019) and a high proportion of struggling readers is commonly found in incarcerated settings (Cassidy et al., 2021; Grigorenko et al., 2015; Kirk & Reid, 2001; Lindgren et al., 2002; Morken, Jones, & Helland, 2021).

Attentional difficulties are commonly found in struggling readers, with strong evidence arising from studies employing both clinical (Aro et al., 2022; Cheung et al., 2012 Mayes & Calhoun, 2006) and epidemiological samples (Brimo et al., 2021; Gilger, Pennington, & DeFries, 1992). While comorbid reading disability and attention deficit hyperactivity disorder (ADHD) occurs in approximately 5 percent of the population, between 25 and 40 percent of children with one of these disorders also meet the criteria for the other (McGrath et al., 2011). There is a strong likelihood that the association is genetically mediated (Brimo et al., 2021; Mascheretti et al., 2017). It is estimated that approximately 20 percent of children with the inattentive type of ADHD struggle with reading difficulties (Wadsworth et al., 2015), a far stronger association than is the case for the hyperactive dimension (Pham, 2016). In the search for shared cognitive deficits, processing speed has emerged as an important factor in explaining comorbidity between reading disability and the inattentive component of ADHD (McGrath et al., 2011; Peterson et al., 2017).

It appears likely that the relationship between emotional and behavioral problems and reading difficulties is linked to the comorbid presence

of ADHD. (Horbach et al., 2020; Willcutt & Pennington, 2000; Carroll et al., 2005). Horbach et al. (2020) conducted a longitudinal study of children from kindergarten to fifth grade. Parents of children, either with or without reading and spelling difficulties, were asked to rate their child's behavior using the *Child Behavior Checklist*. On the children's entry to school, parental ratings did not differ between the two groups. However, in first grade externalizing and attention problems had become more evident in the struggling reader/speller group. Higher levels of internalizing difficulties emerged later for this group and by fourth grade these had become prominent (see a similar finding by Ackerman et al., 2007) before declining somewhat the following year. This rise and subsequent decline were considered to be most likely a consequence of additional stressors relating to the children's imminent transfer to secondary schooling.

The most significant aspect of this study is that the researchers found that the relationship between reading/spelling and behavior difficulties disappeared when ADHD was taken into account. This outcome largely replicated a similar finding by Willcutt and Pennington (2000) although in this earlier study, internalizing problems were found to be independently related to reading disabilities in girls. As a possible explanation, Horbach et al. (2020) suggested that the difference in the two sets of findings may result from the greater predominance of boys participating in their study.

Given that struggling readers tend to experience higher levels of anxiety, depression, attentional difficulty, and conduct disorder, it is hard to understand how such problems might be employed as exclusionary factors for a diagnosis of dyslexia. Rather than excluding children with emotional and behavioral problems from a label that can provide many benefits, early recognition of the complex nature of these difficulties is required (Livingston, Siegel, & Ribary, 2018), together with multi-component forms of intervention targeted to address both academic and health needs (Hendren et al., 2018; Vaughn et al., 2022).

Inclusionary Approaches: The Search for Marker Variables

Definitions of learning disabilities have tended to move away from the use of exclusionary criteria, indicating what dyslexia is not, towards identifying key marker variables (Fletcher et al., 2019; Helland, 2022). In clinical practice, a dyslexia diagnosis is often based upon the observed presence of various symptoms: high IQ, difficulties in phonological awareness, poor short-term (or working) verbal memory, poor ordering and sequencing, weak spelling, morphological awareness deficits, clumsiness, a poor sense of rhythm, difficulty with rapid information processing, weak executive

functioning, poor concentration, inconsistent hand preference, impaired verbal fluency (typically measured by the production of as many words as possible from a particular category in a given time), limited vocabulary, poor phonic skills, frequent letter reversals, poor capacity for mental calculation, difficulties with speech and language, low self-image, and, in one checklist, anxiety when asked to read aloud. Other potential indicators of reading disability, for example, poor sleep patterns (Joyce & Breadmore, 2022) can be found in the literature. Critics of such lists (Elliott & Gibbs, 2008; Rice & Brooks, 2004) note that none of these elements are necessary or sufficient for a dyslexia diagnosis. Commonly reported "signs of dyslexia" can be regularly found in poor readers who may not be considered to be dyslexic, and in others without reading difficulties. Some difficulties seen as indicative of dyslexia, for example, letter reversals, are also commonly found in younger typical readers (Cassar et al., 2005). Similarly, while dyslexic children appear to be more likely than typical readers to demonstrate morphological awareness deficits (i.e., reduced awareness of the smallest units of meaning within any given word), their performance is not significantly different to that of younger children reading at the same level. It appears that the growth rate of morphological awareness is a consequence of phonological awareness and letter knowledge Inoue, Georgiou, and Parrila (2023) and morphological difficulties are more likely to be a consequence than a cause of reading difficulties (Georgiou et al., 2023). Finally, symptoms commonly employed as indicators of dyslexia vary greatly amongst those so diagnosed, and many are commonly found across other diagnosed developmental disorders such as ADHD, dyscalculia and dyspraxia (Astle et al. 2019, 2022; Brimo et al., 2021; Elliott & Place, 2021). Indeed, it has been shown that the same child can often be diagnosed with a different disorder depending upon the disciplinary specialism of the assessor (Bishop et al., 2017). This, together with significant heterogeneity within categories, renders a particular diagnosis highly questionable (Astle et al., 2019; 2022; Mareva et al., 2023; Peters & Ansari, 2019). Accordingly, Astle et al. (2022: 411) consider that "… diagnostic taxonomies that classify individuals in terms of discrete categories are ill-suited" for identifying and catering for individual needs. Instead, when intervening for neurodevelopmental difficulties, it may be preferable to operate a flexible approach that relates to the child's individual needs rather than be guided by a particular primary diagnosis (Finlay-Jones et al., 2019; Mareva et al., 2023).

Protopapas (2019: 4) comments that drawing upon lists of symptoms to conceptualize dyslexia is a "feature of the past" that has largely been abandoned. While this is largely true in relation to research, it is

unfortunate that this is unlikely to be a wholly accurate account of current assessor practice.

One of the paradoxes of dyslexia assessment is that certain processes can be held to be indicators of the condition irrespective of whether these are found to be strengths or weaknesses on the part of the individual concerned. S. Shaywitz & J. Shaywitz, (2020), for example, suggest that unexpectedness is revealed by an uneven profile in which a decoding weakness is typically surrounded by a "sea of strengths" (2020b: 56) involving such elements as reasoning, problem solving, empathy, critical thinking, vocabulary, comprehension, and general knowledge. The authors' suggestion that vocabulary may be a particular strength of dyslexic children needs to be set against the finding that weaker vocabulary is a common characteristic of struggling readers and thus, a potential symptom of dyslexia. Snowling et al. (2020), for example, found that approximately a third of their sample of eight- and nine-year old dyslexic children demonstrated lower levels of vocabulary, particularly those who also experienced developmental language disorder. The idea that superior vocabulary may indicate dyslexia runs counter to the observation that weakness in this area is a likely secondary outcome resulting from the reduced reading experience of those who struggle with literacy (Fletcher et al., 2019).

In line with the notion of "set for variability" (Wegener et al., 2022), children will attempt to draw upon their existing vocabulary to guide them in identifying and correcting mispronouncements while reading aloud (Dyson et al., 2017). Poor vocabulary is also likely to impair the young child's capacity to read unknown words, particularly where these can be partially decoded or are irregularly spelled, so hampering the further development of the child's phonological recoding skills (Lawrence et al., 2018; Tunmer & Greaney, 2010). In line with mutualism theory (Kievit, 2020; Kievit et al., 2019; Peng & Kievit, 2020), reading and vocabulary appear to contribute reciprocally to each other's growth (Lervåg & Aukrust, 2010), although, in comparison with reading comprehension, the evidence for a reciprocal relationship between vocabulary and word reading is weaker (Verhoeven, van Leeuwe, & Vermeer, 2011). Georgiou, Inoue, and Parrila (2023), for example, found a unidirectional effect of word reading to vocabulary only in very young children.

There is considerable evidence that exposure to books in the home is important for vocabulary development (Georgiou, Inoue, & Parrila, 2021; Zhang et al., 2020) with greatest impact on those already at risk of reading disability (Caglar-Ryeng, Eklund, & Nergård-Nilssen, 2020). Accordingly, one might anticipate that citing a strong vocabulary as an

indicator of dyslexia is likely to be unhelpful for poor readers from disadvantaged backgrounds. A similar argument can also apply to the possible diagnostic value of sound general knowledge.

The co-occurrence of reading and mathematical difficulties (particularly arithmetical problems with higher verbal content) is consistently reported in the literature (Daucourt et al., 2020; De Clercq-Quaegebeur et al., 2018; Landerl & Moll, 2010; Moll et al., 2014, 2019; Joyner & Wagner, 2020; Raddatz et al., 2017) although estimates vary considerably. It has been found that problems co-occur in 30 to 70 percent of individuals with either reading or math disorder (Kovas, Haworth, Harlaar, et al., 2007; Landerl & Moll, 2010; Moll et al., 2014) and that individuals with a math disorder are more than twice as likely to also have a reading disability (Joyner & Wagner, 2020). In part, comorbidity levels are affected by decisions concerning cut-off points. Dirks et al. (2008), for example, found that comorbidity between arithmetic and reading difficulties declined sharply as selection criteria became more stringent. Indeed, for those scoring below the tenth percentile, comorbidity was a mere one percent, a level that might be expected by chance. A similar finding was found in a large population study (Landerl & Moll, 2010) when the cut-off was reduced from a standard deviation of –1 SD to –1.5 SD.

The reasons for comorbidity between reading disability and difficulties in math, and whether there is a common underlying deficit, remain unclear. Moll et al. (2019) suggest that higher comorbidity is found when using math tasks that place greater reliance upon language skills, with language difficulties appearing to be a shared risk factor for both conditions (Snowling, Moll, & Hulme, 2021). Suggestions of other possible deficits include phonological processing (Amland, Lervåg, & Melby-Lervåg, 2021) and working memory (De Weerdt, Desoete, & Roeyers, 2013).

Unsurprisingly, the presence of math difficulties is often listed as a symptom in dyslexia checklists. Somewhat paradoxically, competence in math could also be taken as an indicator of dyslexia as, in line with S. Shaywitz and J. Shaywitz's (2020) notion of a sea of strengths, one could argue that a comparative strength in this area demonstrated the unexpected nature of a child's reading problem. Thus, irrespective of a struggling reader's performance in math, it would still be possible to justify the outcome as an indicator of dyslexia on the grounds of either comorbidity (weak math performance) or unexpectedness (strong math performance).

The idea that seemingly "unexpected" high performance on one or more components listed in the sea of strengths could help to identify dyslexia markedly disadvantages struggling readers from socioeconomically

disadvantaged backgrounds. Such a profile is likely to be more commonly found in children assessed by privately funded assessors and dyslexia clinics as such services are more likely to be taken up by families enjoying higher levels of cultural, social, and linguistic capital. It also raises the related question of how we might best represent the needs of those children whose cognitive profiles are relatively flat (Fletcher et al., 2013). Excluding formal recognition of such children's learning disabilities and additional services on such grounds is quite rightly considered to be "absurd" (Fletcher, Morris, & Lyon, 2003: 52) (see also Peterson et al., 2021, for a similar conclusion).

Dyslexia and Language Disorders

Oral language deficits have a critical role in both word reading and reading comprehension difficulties (Catts, 2021; Snowling & Hulme, 2021) although relationships are complex and not easily disentangled. There is strong evidence that reading disability and developmental language disorder (DLD) (Bishop et al., 2017), a difficulty that concerns impaired receptive or expressive language, should best be considered as separate disorders (Adlof, 2020) although in both cases, problems are likely to have a basis in early language difficulties albeit with different developmental trajectories (Snowling et al., 2019; Snowling & Hulme, 2021).

Research suggests that language problems in young children can affect the development of a number of pre-literacy skills, such as letter knowledge and phonological awareness, which have been shown to be important for the acquisition of word reading (Caravolas et al., 2012; van Viersen et al., 2018) although studies have shown mixed results. Significant associations have been found in some studies (e.g., Lyytinen, Eklund, & Lyytinen, 2005; Preston et al., 2010; Price, Wigg, Misener et al., 2022) but absent in others (Rescorla, 2009; Duff et al., 2015). Such inconsistencies may be best explained by the differing degrees of language deficit or reading levels sampled and by the tendency of some young children with early language problems to catch up by the age of five to seven years (Price, Wigg, Misener et al., 2022).

For older children, research has consistently supported a relationship between reading disability and language impairment although the reported overlap varies greatly across studies. Using a clinical sample, Bishop et al. (2017) observed that 50 percent of children diagnosed with dyslexia also fulfilled criteria for DLD, and about 50 percent of children with DLD evidenced significant reading impairments. Findings from epidemiological studies, however, are suggestive of a smaller overlap. Catts et al. (2005), for

example, reported that approximately 30 percent of their sample met the criteria for both language impairment and dyslexia.

Children with reading disability and those with DLD typically share some similar features although the latter often experience a broader range of language problems (Snowling et al., 2019; Snowling & Hulme, 2021). While reading-disabled children can also experience a variety of language difficulties (Adlof & Hogan, 2018; Snowling & Melby-Lervåg, 2016), particular difficulty is experienced in the area of phonological processing and the consequent problems this causes for the acquisition of literacy skills (Snowling et al., 2019). Phonological difficulties are particularly severe in children with comorbid reading disability and DLD. Children with DLD but not reading disability may also experience phonological problems but these tend to decrease over time (Snowling et al., 2019). Studies comparing phonological processing in language-impaired and reading-disabled groups have not always yielded a consistent picture, however, and differentiating between the two groups on this basis is not recommended (Adlof, 2020).

The changing demands of the reading process over time help to explain why the composition of poor reader groups is often far from stable as children gravitate from elementary to high school (Adlof, Catts, & Lee, 2010), and offer pointers as to why some children with specific language impairment who demonstrate reading difficulties in the later school years may not be identified as poor readers at a younger age. In the early years of school, an ability to decode simple words may be sufficient for such children to cope with non-complex narratives of commonly used words. In later years, as texts become more syntactically and semantically complex, language-based weaknesses are likely to become more problematic for reading, particularly in relation to comprehension (Snowling & Hulme, 2021).

Some children with reading disability present with speech production deficits that can range from relatively mild problems of mispronunciation to the more serious clinically diagnosed speech sound disorder (SSD). A relationship between speech production problems in young children and subsequent reading difficulties has been consistently shown in the literature (Burgoyne et al., 2019; Hayiou-Thomas et al., 2017; Tambyraja, Farquharson, & Justice, 2020; Mues et al., 2021) and the more severe or persistent the speech production disorder, the more likely the child will experience difficulties in reading (Cabbage et al., 2018). Thus, it has been argued that young children with speech difficulties should be monitored for later language and reading difficulties (Mues et al., 2021; Snowling & Hulme, 2021).

In line with what has been termed the simple view of reading, which differentiates word recognition from language comprehension (LC) (Gough & Tunmer, 1986) it has been suggested that the individual with dyslexia typically struggles with word recognition but has little difficulty in understanding meaning when text is read aloud for them (Tunmer, 2008). From this perspective, reading comprehension (RC) difficulties may result from an inability to decode, an inability to comprehend language, or difficulties with both of these skills. This distinction has substantial evidential support (Sleeman et al., 2022a). It has also proven popular with dyslexia assessors, although Tunmer and colleagues (Chapman & Tunmer, 2019a) have changed their position and now caution against the use of dyslexia as a diagnostic label on the grounds of the social and educational inequities that often result.

Reading disability is associated with both RC and LC although the difference between struggling and typical readers is greater for RC (Georgiou et al., 2022). The suggestion that dyslexia may be marked by an observed discrepancy between LC and RC has risen in prominence recently although this is not a new idea (Odegard, Farris, & Washington, 2022). As long ago as 1991, Stanovich dismissed this and other discrepancy-based approaches, in part on technical grounds (see also Fletcher et al., 2019: 204), but, more importantly, for failing to provide an educationally meaningful distinction between so-called dyslexic and "garden-variety" poor readers. More recently, a higher LC versus lower RC discrepancy, forming part of a hybrid model of dyslexia that includes poor academic achievement and poor response to instruction, has been proposed by Wagner and colleagues (2019, 2020). Its primary purpose is not to help diagnose dyslexia in an individual but, rather, to serve as a proxy in estimating the prevalence of dyslexia in a given population. As part of this formulation, dyslexic individuals are considered to differ from other poor readers on the basis that any LC–RC discrepancy is seemingly unexpected. Simulations using their Listening Comprehension–Reading Comprehension discrepancy index have indicated that only a minority of cases of struggling readers demonstrated such a discrepancy. However, listening comprehension:

> … is a language-specific measure of a child's amassed vocabulary and background knowledge based on prior experiences and educational opportunities. As such, LC [listening comprehension] serves as a proxy measure of a child's exposure to social determinants of language development, promotive factors that foster language development, and vulnerability factors that hinder language development. (Odegard, Farris, & Washington, 2022: 304)

Such exposure is likely to be less favorable for children from disadvantaged communities (Catts & Petscher, 2022; Pace et al., 2017). Such children may also experience less frequent use of academic words by the teachers in their classrooms (Wanzek, Wood, & Schatschneider, 2022). Given the inherent difficulties, Catts (2021) cautions against the use of a word recognition–language comprehension distinction to characterize struggling readers for diagnostic purposes.

This approach runs similar risks to that of the IQ discrepancy model. It provides a seemingly straightforward means of operationalizing "unexpectedness" enabling a distinction to be drawn between dyslexic and non-dyslexic struggling readers, yet its relevance for educational intervention is unclear (Middleton et al., 2022) and any benefits that accrue from receipt of the dyslexia label will be disproportionately absent for children from minority and disadvantaged backgrounds (Odegard, Farris, & Washington, 2022). This does not mean that comparison of performance on LC and RC has no practical utility for, as noted by Wagner and Lonigan (2022), significantly poorer performance on the latter may be helpfully addressed by assistive technology. Additionally, Middleton et al. (2022) argue that the presence of strong oral skills may serve as a protective factor in reading development and, for this reason, the use of LC–RC discrepancy as an indicator may help predict a struggling reader's intervention response. However, any suggestion that strong LC offers a better prognosis, all else being equal, is not easy to align with Wagner et al.'s (2019, 2020) contention that strength in this area can serve as an indicator of dyslexia, a condition that, as is noted in the following section, is often considered to be signaled by a poor response to intervention.

Dyslexia 3: Intractability to High Quality Intervention

It is an unfortunate reality that some struggling readers fail to make sound progress even when provided with high-quality intervention. Accordingly, some contend that a particular characteristic of dyslexia is its persistence, despite appropriate intervention (Miciak & Fletcher, 2020; Snowling, Hulme, & Nation, 2020). However, the notion of intractability and how it should be operationalized is complex and fraught with difficulties (Odegard et al., 2020). Nor is it clear how extensive the period of intractability would need to be before such a diagnosis could be made. Nevertheless, a response to intervention (RTI) approach to diagnosis and intervention is increasingly being seen as preferable to the now discredited

discrepancy formulae approaches that have featured in traditional psychometric assessment practices. The service delivery model is now commonly viewed as operating within multi-tiered systems of support (MTSS) that are often broader than those used for earlier RTI conceptions and designed to address academic and behavioral needs and broader physical, emotional, and mental health (Charlton et al., 2020).

In the USA, the use of RTI, both to guide educational intervention in schools and as a means of identifying or diagnosing learning disability that may assist in determining eligibility for special education (Gartland & Strosnider, 2020), has gained considerable support since its incorporation in the Individuals with Disabilities Education Improvement Act of 2004 (US Department of Education, 2004). Discussion and debate about the operation of RTI and MTSS in the USA have largely played out in relation to the classification of specific learning disability (SLD) rather than reading disability/dyslexia, its most common component.

Although models of RTI and MTSS vary, they all share a similar basic structure in which widespread screening of relevant skills is undertaken, problems are identified, appropriate intervention is provided, and close monitoring and examination of the individual's ongoing progress is undertaken (Jimerson, Burns, & VanDerHayden, 2016). While this would not seem dissimilar to many traditional remedial approaches to children's learning difficulties, it is its highly structured and systematic nature that renders it rather different. The approach incorporates the use of (usually, three) tiers or levels (Berkeley et al., 2020) in which the level and nature of support provided is a function of the child's response to earlier intervention. Initially, at Tier 1, a universal process of screening in the relevant domains (e.g., reading or math) operates. A child deemed to be particularly at risk of academic failure would subsequently receive specialized intervention and regular monitoring (Tier 2). Should the child concerned continue to make insufficient progress, input would become gradually more intense and more individualized (Tier 3). Monitoring of academic progress largely involves the use of curriculum-based measures.

The terminology employed can be confusing as the use of the terms RTI and MTSS has been rendered more complex by the absence of consistent language and practices. Thus, in a national survey of practice in the USA, Berkeley et al. (2020) reported that while the majority of states explicitly contrasted RTI with MTSS, others subsumed RTI within MTSS, here used as an umbrella term, and yet others either treated the terms as synonymous or developed their own terminology. Interestingly, the different names employed by the states appeared not to reflect similarities or

differences between them in practice reliably. Nevertheless, in relation to dyslexia, it is argued that:

> … dyslexia identification and treatment processes should be built within well-implemented multitier systems of support (MTSS) that include universal screening, evidence-based Tier 1 instruction, preventive intervention, ongoing progress monitoring for high-risk students, and mechanisms to intensify interventions for students who demonstrate inadequate response to quality instruction similar to those that occur with other SLDs. (Miciak & Fletcher, 2020: 343)

Crucially, with this approach, the unexpected component is no longer related to variable levels of functioning in relation to an individual's current strengths and weaknesses, but instead, is determined on the basis of the child's failure to respond to standard and validated instruction (Fletcher et al., 2019). An "inadequate instructional response" therefore becomes an essential inclusionary criterion, unlike the presence of "inadequate instruction," which is identified as an exclusionary criterion by cognitive discrepancy approaches (Fletcher et al., 2019). In RTI, a discrepancy is similarly emphasized but the focus here is on within-individual discrepancies relative to age-based expectations and instruction. This conception is believed by its advocates to have more utility for determining the nature of appropriate intervention than that offered by cognitive discrepancy approaches (Fletcher & Miciak, 2017).

Despite the growing popularity of RTI (Berkeley et al., 2020), there remain a number of difficulties in both how it can best be designed and structured and how to ensure that it operates in practice as intended.

In relation to design and structure, problems result from there being several different RTI models with no single agreed method of determining how best to measure response to intervention, and these are not consistent in identifying poor responders (Fletcher et al., 2014). In general, approaches vary on whether they emphasize rate of growth or a cut-off score of some kind. Fletcher et al. (2019) suggest that growth may be important for informing instruction but is less necessary for identification of a learning disability. Another difficulty concerns the use of a bifurcated responder categorization (responders–non responders), which can be problematic as this fails to capture the range of response accurately (Peng et al., 2020). Finally, there is a risk that assessors may focus unduly upon personal achievement-related characteristics (e.g., effort, motivation) leading to less attention upon actual progress rates (Barrett et al., 2022). These problems are likely to have significant implications for children who require additional services, although differences between leading RTI

models tend to be smaller than when compared with the traditional discrepancy approach (Brown Waesche et al., 2011).

The RTI approach has been particularly criticized by those with an allegiance to traditional psychometric approaches. For critics, it cuts at the central component of the traditional conception of learning disability – an unexpected difficulty in relation to ability (based upon comparison of the individual's strengths and weaknesses). A further problem, it is argued, is that bright children, performing below their potential but at a level commensurate with less able peers might fail to be identified. This argument has been supported by a small-scale study reporting that, for a sample of high IQ, age-appropriate readers, reduced brain activity occurred in the same regions as for struggling readers (Hancock, Gabrieli, & Hoeft, 2016). It has been suggested (Tanaka & Hoeft, 2017) that such children may benefit from additional accommodations and interventions. Finally, the common focus of the approach upon specific academic domains may result in a failure to spot other underlying conditions such as autism, ADHD, or a psychiatric disorder until the child has progressed through several tiers (Pennington, McGrath, & Peterson, 2019). To address this last concern, Miciak and Fletcher (2020) suggest a hybrid model of dyslexia which includes three components:

a. low achievement in reading, particularly in relation to accurate and fluent word reading and spelling;
b. poor response to RTI tiers despite effective instruction;
c. consideration of a small number of influential exclusionary factors such as severe visual or hearing impairment or second-language acquisition.

As part of the RTI or MTSS process, they emphasize the need to ensure early identification and treatment of such other conditions.

As noted above, the design of a sound, rigorous RTI or MTSS model is of little value if its subsequent operation within education systems is suboptimal. For this reason, it is difficult to evaluate the value of RTI independently of the level of energy and funding that any society is prepared to provide to ensure its effective operation. Unfortunately, operationalization in school systems has proven problematic with evidence of a significant research to practice gap (D. Fuchs & Fuchs, 2017; Sanetti & Luh, 2019; Savitz, Allen & Brown, 2021).

Two critics of RTI, B. Shaywitz and S. Shaywitz, (2020), have claimed that their longstanding criticisms (Reynolds & Shaywitz, 2009a, 2009b) have been "validated" (B. Shaywitz & S. Shaywitz, 2020: 463) by findings

from a large-scale national study in the USA (Balu et al., 2015). This found that first-grade children placed on Tiers 2 or 3 subsequently performed more poorly on reading outcomes than comparison children, with non-significant impacts at Grades 2 and 3. B. Shaywitz and S. Shaywitz, (2020) state:

> Despite the evidence of its ineffectiveness, many schools and school districts seem to remain blithely unaware of this evidence and the majority of schools in the US continue to use RTI as the primary intervention method of educating children with dyslexia. (B. Shaywitz & S. Shaywitz, 2020: 463)

However, based solely upon the findings of Balu et al. (2015), dismissal of the potential of RTI appears unjustified. Methodological considerations (the focus here was upon comparison of students at the cusp of the cut-off point for selection), and problematic practices in the schools studied, may help to explain the results obtained (Gersten, Jayanthi, & Dimino, 2017; D. Fuchs & Fuchs, 2017). There is some competing evidence that where instructional intensity is implemented with consistency and fidelity, positive effects of supplemental small group instruction can result (Coyne et al., 2018; Smith et al., 2016).

Miciak and Fletcher (2020) acknowledge that effective operation of school-wide RTI or MTSS systems will require substantial technical assistance and professional development. In particular, classteachers at Tier 1 must have the requisite skills to deliver the explicit phonics tuition that is particularly needed for struggling readers in the early grades. Despite the challenges inherent in such a large-scale, comprehensive approach, these authors argue that, because of the underpinning principles, it is one worth pursuing:

> A dyslexia identification approach that relies on achievement and instructional data generated within MTSS is dynamic, treatment oriented, preventive, and less likely to result in diagnostic problems because of its recursive and sequential nature. (Miciak & Fletcher, 2020: 350)

The RTI or MTSS model is designed to operate as an organizational framework within which can be provided a high-quality, evidence-based intervention appropriate to the child's needs. To argue that an RTI program needs to be replaced by interventions more appropriately attuned to the needs of dyslexic children is to conflate educational architecture with pedagogic approaches (Gibbs & Elliott, 2020). If RTI is operating appropriately, an alternative, more effective form of instruction or different content should not be required – it should already be being delivered as part of the RTI program. Unfortunately, inappropriate forms of reading intervention, delivered by ill-prepared teachers will undermine progress and, in

some cases, this will inflate the number of children progressing to Tier 2 (Moats, 2017). As is discussed in Chapter 4, evidence-based interventions are required that can be increasingly individualized, explicit, comprehensive, and intense, should the child continue to make insufficient progress (Al Otaiba, Russell-Freudenthal, & Zaru, 2024; Grigorenko et al., 2019). If these are not being provided, one cannot conclude that RTI as a general approach is wrong; rather, the problem would be that it is not being implemented as intended.

Of course, this distinction is likely to be of little interest to parents who are anxiously seeking help and support. It is understandable that fears that their child's needs are being overlooked, or that their school is delivering ineffective instruction, may lead them, sometimes with teacher support, to seek a formal diagnosis of dyslexia in the hope that this will lead to a superior outcome (Odegard, Hutchings, Farris, & Oslund, 2021). Such concerns may accurately reflect the reality that, in some school systems, the existence of a high proportion of struggling readers, together with limited resources, cannot enable an RTI or MTSS model to operate effectively.

B. Shaywitz and S. Shaywitz (2020) note that effective interventions for those with dyslexia are expensive and are often unavailable in schools. While this observation may be accurate, their preferred approach, advocating formal diagnosis, and championing the role of both private and public special schools for dyslexia, means that only a very small proportion of struggling readers could receive the help they require (Elliott, 2020). Thus, an understandable tension exists between the use of a traditional diagnostic approach that, because of its nature, typically enables allocation of scarce resources to a "dyslexic" minority (resulting in a form of bottleneck), and an approach that has the potential to identify so many genuinely struggling readers that the quality and level of individual support available is likely to prove insufficient.

Unfortunately, resources available to public education systems are typically overstretched and, in relation to reading disability (and, indeed, learning difficulties more widely), hard decisions must often be taken about which children should have priority access to additional assistance. Whatever approach is taken, the basis for decision-making should be seen to be fair and equitable. It should not be derived from scientifically questionable practices that confer built-in advantage to those who already enjoy higher levels of social and cultural capital.

A further dilemma concerns how best to help those who continue to make minimal progress despite receipt of high-quality intervention in the highest tiers. In the USA, this may be used as evidence to determine

eligibility for special education (on the grounds of specific learning disability) thus freeing up additional resources, although such provision may still be provided within an existing RTI or MTSS program.

The use of the dyslexia label could perhaps be meaningfully employed where persistent intractability of this kind has been demonstrated. Elliott and Gibbs (2008) for example, suggested that a dyslexia diagnosis might be restricted to that small proportion of poor readers who, despite having received extensive high-level, high-quality intervention, appear unlikely ever to become functionally literate. For such individuals, the dyslexia label could be employed to determine a need for assistive technology that can help them navigate the literacy demands of adult life (de Beer et al., 2022; Wood et al., 2018). To date, this suggestion has not achieved any significant traction, perhaps because this would mean that dyslexia diagnoses would no longer be required or available at scale.

Dyslexia 4: A Neurodiverse Profile

This conception differs from the other three listed above because here, reading disability is typically considered to be but one possible component of a broader neurodiverse dyslexic condition. Such a perspective, very different to dominant conceptions in the scientific literature, has largely arisen from practitioner concern about comorbid cognitive difficulties often found in poor readers. Many of these are considered in Chapter 2 and include difficulties with working memory, processing speed, attention and concentration, planning, physical coordination, time management, self-organization, and the capacity to express oneself orally (Asghar et al., 2018, 2019). While the cognitive processes considered important for a Dyslexia 4 conception are similar to those used for Dyslexia 2, in the former case, the presence of a severe reading difficulty is neither an essential criterion (Ryder & Norwich, 2018) nor necessarily the primary focus for specialist intervention and assistance.

While neurodiverse perspectives can provide a number of important theoretical insights, with some valuable practical implications (see Chapter 5), these do not justify the reframing of dyslexia into a much expanded and more nebulous construct. The use of the dyslexia label as an umbrella term encompassing a wide range of difficulties cannot be justified simply on the basis that such problems are more commonly found in poor readers. This growing practice seemingly reflects the immense power and leverage of the dyslexia label, in particular, its ability to garner institutional support for a wide variety of cognitive and linguistic difficulties that might otherwise be neglected or discounted.

According to accounts widely promulgated in the media, and supported by dyslexia lobby groups, dyslexia's neurodiverse profile may also include associated gifts (both cognitive and conative) that can help those so affected to thrive (Davis, 1997; Eide & Eide, 2011; West, 2022), such that the condition might be perceived as a desirable difficulty (Gladwell, 2013). Characters from history such as Leonardo da Vinci and Albert Einsten, have been cited as dyslexic (despite an absence of supportive evidence). Celebrated contemporary public figures have outlined how their dyslexic strengths have helped them achieve success despite many challenges. This perspective appears to have some resonance with official bodies. For example, it has been stated by the UK Intelligence Analyst agency (GCHQ) that the enhanced abilities of dyslexic people make them ideal analysts. This organization's website boldly states that "Dyslexic thinking skills are mission critical for protecting the country." Particular strengths of dyslexics according to this organization include "pattern recognition when dealing with big data, seeing the bigger picture when considering complex future scenarios and finding solutions to novel and challenging problems"[5]

In similar vein, a widely publicized 2018 report produced by one of the world's leading management consultant companies (EY, formerly known as Ernst and Young), and produced in conjunction with *Made by Dyslexia*, a dyslexia advocacy group, argued that those with dyslexia often have talents that offer much to business:

> Our research shows that dyslexic strengths provide a significant opportunity for organizations to harness a different, and widely untapped, pool of talent. Dyslexia influences at least 1 in 10 people and is a genetic difference in an individual's ability to learn and process information. As a result, dyslexic individuals have differing abilities, with strengths in creative, problem solving and communication skills and challenges with spelling, reading and memorizing facts. Generally, a dyslexic cognitive profile will be uneven when compared to a neuro-typical cognitive profile. This means that dyslexic individuals really do think differently. What does this mean in work? These varied cognitive profiles give dyslexic individuals natural abilities to form alternative views and solve problems creatively. Heightened cognitive abilities in certain areas, such as visualisation and logical reasoning skills and natural entrepreneurial traits can bring a fresh, often intuitive perspective. (EY, formerly known as Ernst and Young: 5)

As is demonstrated throughout this book, such claims have little or no support in the scientific literature. Nevertheless, *Made by Dyslexia*, backed

[5] www.gchq.gov.uk/news/dyslexic-thinking-skills; accessed November 17, 2023.

by high profile figures interviewed in the UK national media, offer what is described as a "twenty-first century definition of dyslexia":

> Dyslexia influences as many as 1 in 5 people and is a genetic difference in an individual's ability to learn and process information. As a result, dyslexic individuals have differing abilities, with strengths in creative, problem-solving and communication skills and challenges with spelling, reading and memorising facts.
>
> Generally, a dyslexic cognitive profile will be uneven when compared to a neurotypical cognitive profile. This means that dyslexic individuals really do think differently.
>
> Traditional benchmarking disadvantages dyslexics, measuring them against the very things they find challenging. (www.madebydyslexia.org)[6]

Dyslexia 4 conceptions have tended to be most popular in adult settings where it is easier to decouple this wide-ranging, multifaceted conception from its original use to describe severe and persistent reading difficulty. Its popularity in the adult sector rests in part upon its potential to provide various educational accommodations and resources (Asghar et al., 2018, 2019) and to offer employers greater insight into various cognitive difficulties that can prove professionally challenging for those so labeled (e.g., Locke et al., 2017). Commercially, this conception offers a number of attractions. By employing a wide range of tests, assessors are likely to encounter little difficulty in finding strengths, weaknesses and discrepancies which can then form the basis for their diagnosis. Unsurprisingly, however, the high level of heterogeneity in assessor practices adds to the inconsistency and questionable reliability of this approach (Ryder & Norwich, 2018). Further discussion of the inherent difficulties of this conception are outlined in Chapter 5.

The Prevalence of Dyslexia

Given the lack of current consensus about what exactly is meant by the term dyslexia, it is hardly surprising that estimates of its prevalence vary substantially. This problem is by no means new; almost a century ago Hinshelwood (1917) disparagingly commented that some educationalists considered congenital word-blindness to be very common, involving as many as one in a thousand. He noted that such estimates often included cases where there were "… slight degrees of defect in the visual word

[6] Accessed May 4, 2023.

centre, while the early writers had reserved it for only those grave cases which could be regarded as pathological" (1917: 82). Two decades later, Orton (1939) suggested that just over ten percent of the school-aged population had reading disabilities. He also introduced the notion of a continuum of disabilities, rather than clear pathological categories, arguing that experience of work with hundreds of cases indicated that clear divisions did not reflect the gradations of difficulty that he had encountered.

As noted above, reading ability is a continuous variable, and dyslexia/reading disability is typically defined by researchers on the basis of an individual's performance at the low end of a normal distribution of reading test scores. Where exactly any diagnostic cut-off should be located is essentially an arbitrary decision (Brady, 2019; Snowling, 2019) although it is widely considered that the reading difficulties should be sufficiently severe as to have clinical implications (Pennington, McGrath, & Peterson, 2019) and not be primarily explained by severe intellectual or sensory disability. However, there is no clear scientific basis to the argument that individuals with intellectual disability would not also have a reading disability, so excluding this group is questionable (Wagner & Lonigan, 2022). In the case of second-language speakers it is important to consider whether any observed reading difficulties also occur in their native language (Fletcher et al., 2019).

Prevalence estimates are affected by whether dyslexia is treated as a synonym for reading disability (Dyslexia 1) or is used to refer to a smaller subgroup consisting of only some individuals with a word reading difficulty (Dyslexia 2). Either way, it is important to be cautious of published estimates which can sometimes provide an inappropriately confident picture:

> Prevalence estimates are often mentioned in the dyslexia literature, giving the false impression that there are absolute criteria on the basis of which dyslexia is defined, further giving rise to the expectation that such criteria might be linked to specific, potentially identifiable causal factors, whereas in fact there is nothing but a continuous distribution of reading skill, with an enormous range of individual differences. (Protopapas & Parilla, 2018: n.p.)

Estimates have tended to range from approximately 5 percent to 20 percent. The lower figure is usually derived from the deployment of a cut-off point of approximately one and a half standard deviations below the mean. Similarly, leading researchers at the influential Florida Center for Reading Research (Catts et al., 2024) argue that the term dyslexia should describe a severe reading difficulty, and suggest a prevalence rate of 5–10%. Snowling (2013) suggests the deployment of two cut-off points, one at 1.5 standard deviations (SDs), and another at two SDs, below the mean, representing moderate and severe reading difficulty respectively.

Research studies have tended to cluster around the 1.5 SD cut-off figure. Yang et al. (2022) undertook a comprehensive systematic review and meta-analysis that sought to estimate the worldwide prevalence of developmental dyslexia in primary school children. This involved the final inclusion of fifty-six studies undertaken between the 1950s and 2021. The results indicated an overall prevalence rate of 7.10 percent. Somewhat surprisingly, they found no significant difference between logographic (6.97%), and alphabetic writing systems (7.26%), or between alphabetic scripts with different orthographic depths (shallow = 7.13%; deep = 7.55%).[7]

Yang et al. (2022) noted that there was no consensus as to diagnostic criteria and this resulted in definitional confusion. In their opinion, a clear operational definition is urgently needed.

Others have suggested a much higher prevalence rate, even as large as 25 percent (Pennington et al., 2019). The Yale Center for Dyslexia and Creativity suggests a dyslexia rate of 20 percent.[8] This likely reflects Shaywitz's influential longitudinal study in Connecticut (Shaywitz, 2005) which identified approximately 17.5 percent of the sample as having a reading disability, defined on the basis of reading performance that was below age, grade, or level of intellectual ability. In citing this figure, it would appear that the term "reading-disabled" was seen as synonymous with "dyslexic" as, in Shaywitz's text, the terms are employed interchangeably:

> The apparent large-scale underidentification of reading-disabled children is particularly worrisome because even when school identification takes place, it occurs relatively late – often past the optimal age for intervention. Dyslexic children are generally in the third grade or above when they are first identified by their schools; reading disabilities diagnosed after third grade are much more difficult to remediate. (Shaywitz, 2005: 30)

Interestingly, in the second edition of this text (S. Shaywitz & J. Shaywitz, 2020: 30) the term "reading-disabled" was replaced by "dyslexic," although the meaning of the passage remains unchanged.

In an earlier, highly influential article, Shaywitz claimed that "… dyslexia affects a full 20 percent of schoolchildren" (Shaywitz, 1996: 100). This estimate was also provided in the revision of her earlier 2005 text (S. Shaywitz & J. Shaywitz, 2020) in which it was stated that dyslexia affected ten million children in America alone.

[7] Orthographies are described as shallow or transparent when the degree of grapheme–phoneme mapping of the language is highly consistent. Where consistency is low, the orthography is described as deep or opaque (Frost et al., 1987; Seymour et al., 2003).

[8] https://dyslexia.yale.edu; accessed November 17, 2023.

Shaywitz and Shaywitz's position reflects the understanding that reading difficulties are dimensional – they lie along a continuum with no clearcut distinction between good and poor readers. Citing the words of Kendell (1975), "Classification is the art of carving nature at the joints; it should indeed imply that there is indeed a joint there, that one is not sawing through bone" (Kendell, 1975: 65), S. Shaywitz & J. Shaywitz (2020) argue that although there is no natural joint separating dyslexic and good readers, "… a gap of nature" (S. Shaywitz & J. Shaywitz, 2020: 27), the provision of educational services has often been based upon just such a belief and, as a result, many struggling readers have failed to receive adequate support.

The prevalence rates for dyslexia provided by national support groups can vary widely. The British Dyslexia Association states that it "… is the voice for the 10% of the population that are dyslexic."[9] The Dyslexia Foundation of New Zealand (2008) similarly claims that 10 percent of children in that country are dyslexic. The International Dyslexia Association avoids specifying a precise figure, but its factsheet suggests that as many as 15–20 percent of the population as a whole may have some of the symptoms of dyslexia.[10]

Females have been shown to score more highly in reading skill across multiple countries, education systems, and orthographies (OECD, 2015). Males are more likely to be identified as having a reading disability with the ratio of males to females so identified ranging from a low of 1.2:1 to a high of 6.8:1 (Quinn, 2018). This variation reflects the use of differing definitions and measures, and differences between clinical and epidemiological samples. A view that males have been disproportionally identified as reading-disabled was spurred by findings from Shaywitz's longitudinal Connecticut study. This reported that school identification procedures resulted in three to four times as many boys as girls being identified as reading-disabled, whereas her research team's own testing programme indicated comparable figures for males and females (B. Shaywitz & S. Shaywitz, 2020). S. Shaywitz's primary explanation for the "myth" of male vulnerability to reading disability (Shaywitz, 1996: 98) was that girls, who tend to be less obtrusive and attention seeking, are more likely to be overlooked for further clinical evaluation. Boys with reading difficulties are more likely to present with comorbid externalizing disorders and the hyperactive-impulsive form of ADHD (Barkley, 2015), whereas girls are more likely to present with internalizing problems (Pennington, 2009). As schools tend to refer to clinical services children with conduct rather than internalizing disorders (Bramlett et al.,

[9] www.bdadyslexia.org.uk; accessed July 3, 2022.
[10] www.dyslexiaida.org; accessed July 3, 2022.

2002), disproportionate referral rates of boys and girls for reading related problems are an inevitable outcome. While biased referral rates are likely to be a contributory factor, epidemiological studies indicate that the male incidence of reading disability nevertheless remains higher with studies suggesting a ratio of approximately 1.5:1 (Brimo et al., 2021; Flannery et al., 2000; Flynn & Rahbar, 1994).

In a large international meta-analytic review of dyslexia prevalence, Yang et al. (2022) reported a 2:1 male to female ratio (boys = 9.22%; girls = 4.66%). Quinn's (2018) meta-analysis found a relatively similar figure; males were 1.83 times more likely than females to be identified as having a reading problem regardless of method of identification, reading measure, publication year, and age of the participant. Additionally, it was found that the more severe the level of the reading difficulty, the more likely it would be that males would be identified relative to females. This accords with Arnett et al. (2017) who found a gender discrepancy at the low tail of the distribution, and Quinn and Wagner (2015) who reported male to female ratios of 1.3:1 and 2.0:1 at the thirtieth and third percentiles respectively.

The reasons for meaningful male–female differences remain unclear although there is evidence of greater male difficulty with phonological awareness Lundberg, Larsman and Strid (2012) and also the apparent mediating effects of poorer processing speed and inhibitory control (Arnett et al., 2017).

The Difficulty of Bridging Science and Practice: The Rose Report

Many of the difficulties involved in attempting to provide a sound approach to the understanding and assessment of dyslexia, while attending to political and other external pressures, can be illustrated by reference to the UK Government sponsored Rose Report (2009). While the Report's scientific basis and desire to increase support for struggling readers are generally laudable, its recommendations appear to maintain diagnostic practices that are questionable and fail to work to the advantage of many children.

The Report stated that, as a developmental disorder, the difficulties experienced by the dyslexic child would likely change as he or she passes through school and progresses through adulthood. According to the Report, at the preschool stage, signs of dyslexia are most likely to be delayed or problematic speech, poor expressive language, poor rhyming skills and little interest in or difficulty with learning letters. In the early school years, problems are most likely to include poor letter–sound knowledge, poor

phoneme awareness, poor word attack skills, idiosyncratic spelling, and difficulties in copying. In the middle school years, typical difficulties will include slow reading speed, poor decoding skills when confronted by new words, and difficulties with spelling. In adolescence and adulthood, principal difficulties will most likely be poor reading fluency, slow speed of writing, and poor organization and expression in work. While the Report refers to dyslexia, it should be noted that such difficulties are common features of all struggling readers.

The Rose Report identified three characteristic features of dyslexia: weaknesses in: phonological awareness, verbal memory and verbal processing speed. Each of these is examined in greater detail in Chapter 2. Of central importance was the statement that none of these markers was considered to be necessary for a diagnosis. Similarly, problems of language, mental calculation, motor coordination, concentration, and personal organization, while often comorbid, could not, by themselves, be recognized as markers of dyslexia.

In respect of diagnosis, the Rose Report was somewhat confusing. Recognizing that reading disability/dyslexia reflects a dimension, rather than a categorical diagnosis (Pennington & Bishop, 2009; Snowling, 2008), it stated that

> … dyslexia is best thought of as a continuum, not a distinct category, and there are no clear cut-off points …. Until recently, a child was deemed to either have or not have dyslexia. It is now recognised that there is no sharp dividing line between having a learning difficulty such as dyslexia and not having it. (Rose, 2009: 33)

Despite this claim, the Report suggested that an accurate diagnosis could be made by specialists. To many diagnosticians, such a perspective seemed to signal a belief that the use of a categorical label – dyslexia – was more helpful than a dimensional account for communicating the nature of reading difficulty, a position that has been criticized for glossing over the practical realities of identification and resourcing of children with special educational needs (Norwich, 2010). To be in any way effective, such an approach requires consensual understandings as to the meaning of the categorical term concerned. A particular problem for dyslexia is that this is evidently not the case.

The Rose Report appeared to conflate these differing understandings. It endorsed the construct of dyslexia, argued that it was at the more severe end of a reading performance continuum, and appeared to support a medical model in which experts retain a role in determining who is, and who is not, dyslexic. The Report set out a three-level model for assessment and

diagnosis. At Level 1, class teachers "… will be aware of the possibility that some children may have dyslexia. However, they will not declare that a particular child has dyslexia" (Rose, 2009: 53). By Level 3, appropriately qualified specialists "… would make a decision on whether or not the child has dyslexia, and with what severity" (Rose, 2009: 53). How exactly such a determination might be arrived at was rendered rather less clear. Such phrasing seems inconsistent with the claims of a member of the Rose Expert Advisory Group that: "… it was not a question of dyslexia, yes or no" (Reason & Stothard, 2013: 12), and seems to strike a dissonant chord with the Report's other remarks about dividing lines. This apparent tension reinforces a perception that influential professional and other lobby groups had exercised pressure to ensure the continuation of what has been sometimes described as the dyslexia industry (Gabriel, 2020a: Holmqvist, 2020).[11]

The Rose Report illustrates the confusions and compromises that can result when sound research is translated into educational policy and practice. Its scientific basis lies in the groundbreaking work of Snowling and others who, as noted above, largely employ the term dyslexia as a synonym for a severe reading (decoding) difficulty that is generally resistant to evidence-based forms of intervention (i.e., approximating to Elliott's (2020) notions of Dyslexia 1 and Dyslexia 3). However, poor response to "well-founded intervention" appears not to be an essential criterion in the Rose Report as it merely describes this element as "… a good indication of the severity and persistence of dyslexic difficulties." By couching the definition of dyslexia in this way, it remains possible for a diagnosis to be provided following a one-off clinical assessment.

In outlining in detail many of the difficulties experienced by those who struggle with reading, and recommending a key role for expert diagnosis, a symptom-driven version of Dyslexia 2 is likely to become dominant. (There is also the potential for a Dyslexia 4 conception although, as noted above, Rose de-emphasizes the diagnostic role of most comorbid features). Through this approach, assessors can undertake a clinical interview, identify a number of particular literacy and cognitive difficulties, and then conclude that their poor reader client is dyslexic. That it is highly unlikely that any child with a serious reading disability would fail to present with some of these difficulties is generally not explicitly recognized.

The inherent confusions in such an approach were highlighted by a UK Government investigation into dyslexia in 2009. In interviews with expert

[11] See also the House of Commons, Science and Technology Committee (2009) for criticism of the influence of dyslexia lobby groups on the UK Government.

witnesses and dyslexia lobbyists, members of the House of Commons, Science and Technology Select Committee (House of Commons, 2009) repeatedly sought guidance on how the contents of the Rose Report might help assessors to differentiate between dyslexic and non-dyslexic poor readers, and how this distinction could be used to inform practical educational guidance that would differ for members of these two groups. Scrutiny of the discussion (see, in particular, Q96–Q102) demonstrates a degree of frustration on the part of Committee members that these questions were being insufficiently answered. The resultant Select Committee Report concluded that:

> The Rose Report's definition of dyslexia is … so broad and blurred at the edges that it is difficult to see how it could be useful in any diagnostic sense. (House of Commons, 2009: 26, para. 71)

And added that it:

> … is not useful from an educational point of view… (House of Commons, 2009: 28, para. 77)

Understandings and Definitions of Dyslexia: A Summary

It is incontrovertible that there is a significant number of individuals who struggle to learn to read despite receiving instruction in formal education settings. While word recognition difficulty is widely known as dyslexia, others hold alternative views, and gaining a clear, scientific, and consensual understanding of this term has proven elusive. Table 1.1 outlines some of the many different, often overlapping, understandings that continue to be promoted.

Table 1.1 *Differing understandings of who may be considered to experience dyslexia*

- anyone who struggles with accurate single word decoding;
- anyone who struggles with accurate and/or fluent decoding;
- those who score at the lower end of the normal distribution on an appropriate test of reading accuracy or fluency. Cut-off points vary but are typically either 1, 1.5, or 2 standard deviations below the test's population mean;
- those whose decoding difficulties cannot be explained in alternative ways (e.g., because of severe intellectual or sensory impairment, socioeconomic disadvantage, poor schooling, or emotional/behavioral difficulty);
- those poor decoders who present with a range of symptoms commonly found in those with dyslexia (e.g., poor motor, arithmetical, or language skills, visual difficulties, attentional and organizational problems and low self-esteem);
- those for whom there is a significant discrepancy between decoding performance and IQ;
- those whose decoding difficulty is deemed to be unexpected;

Table 1.1 *(cont.)*

- those whose poor decoding skills contrast with strengths in other intellectual and academic domains;
- those whose decoding problems are deemed to be biologically determined;
- those whose decoding problems are marked by certain associated cognitive difficulties (in particular, phonological, rapid naming, and verbal short-term or working memory deficits);
- those with a history of very poor spelling;
- those who demonstrate a discrepancy between decoding/reading comprehension and listening comprehension;
- those who fail to make meaningful progress in decoding even when provided with high-quality, evidence-based forms of intervention.
- those for whom decoding is merely one element of a more pervasive dyslexic condition marked by a variety of cognitive strengths and weaknesses. This may include "compensated dyslexics" who no longer present with a reading difficulty.

Reading Disability as a Multifactorial, Heterogeneous Syndrome

One of the factors that has complicated our understanding of reading difficulties in general, and dyslexia in particular, is that researchers tend to operate at differing levels of analysis, depending upon their particular perspectives, disciplines, and specialisms. Frith (1997), for example, contends that the examination of reading difficulties can take place at the level of the biological, the cognitive, and the behavioral.

Perusal of media or professional accounts might lead one to assume that a diagnosis could draw upon data obtained from the direct assessment of an individual's genetic, neuropsychological, or cognitive profiles. However:

> … there is currently no consistent basis – biological, cognitive, behavioral, or academic – for distinguishing those who might be identified as dyslexic from others experiencing difficulty learning to decode words. In the end, determining whether or not someone is dyslexic amounts to deciding where on the normal distribution to draw a line …. There is no agreement about where to draw the line(s), and there is no evidence that instructional response should be different for those above or below the line(s). (Johnston & Scanlon, 2021: 70–71)

Research has demonstrated that single deficit understandings of dyslexia/reading disability, cannot explain the significant variability in underlying causal factors (O'Brien & Yeatman, 2021; Pennington et al., 2019; Rakhlin et al., 2022; van Bergen, van der Leij, & de Jong, 2014). The belief that single cognitive deficits could explain dyslexia (or, indeed, other

neurodevelopmental disorders) failed for both theoretical and empirical reasons (McGrath, Peterson, & Pennington, 2020). It failed theoretically because the suggestion that there were innate, localized cognitive modules located in the brain, each of which could be linked to a specific disorder, was ultimately shown to be erroneous. Specialized processing areas emerge developmentally and interactively and their brain substrates change accordingly. It failed empirically, because, as is subsequently detailed in Chapter 2, no specific deficit can be found in all children with a particular neurodevelopmental disorder, and some children without the disorder can present with the deficit.

Surprisingly, perhaps, such understanding, often unreflected by current dyslexia assessment procedures, is not a recent phenomenon. Indeed, almost two decades ago, a seminal publication put the case for a multiple deficit model (Pennington, 2006) operating at a number of levels. In a subsequent text, Pennington (2009) stated:

> (1) The etiology of complex behavioral disorders is multifactorial and involves the interaction of multiple risk and protective factors which can be either genetic or environmental; (2) these risk and protective factors alter the development of the neural systems that mediate cognitive functions necessary for normal development, thus producing the behavioral symptoms that define these disorders; (3) no single etiological factor is sufficient for a disorder and few may be necessary; (4) consequently, comorbidity among complex behavioral disorders is expected because of shared etiological and cognitive risk factors; and (5) the liability distribution for a given disease is often continuous and quantitative rather than discrete and categorical. (Pennington, 2009: 6)

The multifactorial nature of reading disability which sees risk factors as acting probabilistically rather than deterministically with different developmental pathways to reading disability is now widely accepted by leading researchers. However, the development of specific models is still in its infancy and most research activity is currently focusing upon the neuropsychological level of analysis (McGrath, Peterson, & Pennington, 2020).

Understanding of the nature and impact of resilience, a term that concerns better than expected outcomes despite the presence of risk (Luthar et al., 2000; Masten, 2001), is also still relatively rudimentary. The operationalization of resilience is inconsistent across studies but is generally seen to involve relationships between individual, environmental, and sociocultural factors (Lavin Venegas et al., 2019). Resilience typically benefits from the presence of promotive and protective factors (Slomowitz et al., 2021). Promotive factors are associated with positive outcomes irrespective of the presence of risk; however, they are only associated with resilience when they

occur in a high-risk context. A high-quality diet and sound sleep patterns, for example, will be valuable for all children, regardless of their risk status. In contrast, protective factors reduce risk and are particularly important for high-risk groups. Examples might be possession of social skills that can help to reduce the likelihood of peer admonishment about one's poor reading, lower personal sensitivity to reading-related stigmatization (Daley & Rappolt-Schlichtmann, 2018), and regular access to teachers highly skilled in the teaching of language and reading. Unlike promotive factors, protective factors can reduce the gaps between differing risk groups because they are likely to offer greater benefit to high-risk groups. High-quality parenting is likely to be a promotive factor for all individuals but this may have the greatest protective role for those most at risk (Catts & Petscher, 2022; Masten & Barnes, 2018).

Recognition has been slow on the part of many assessors and diagnosticians that there is no single cognitive deficit (or group of deficits) that is sufficient to warrant a diagnosis of dyslexia (Catts & Petscher, 2022). The persistent attraction of unitary understandings in diagnostic settings may be partly a consequence of the fact that multifactorial models largely rule out the use of a binary dyslexic/non-dyslexic poor reader distinction (at least, at the current time). Until greater understanding of the relationships and connections between different levels of analysis can be developed (Compton, 2021), attempts to provide differential diagnosis within the population of struggling readers (beyond ascertaining the level of severity and response to intervention) offer little for the purposes of intervention. In line with Vellutino et al. (2004), we should therefore dispense with the search for categorical labels for reading difficulties and, instead, focus assessment upon language and component reading skills together with consideration of relevant behavioral issues (Fletcher & Miciak, 2017).

In relation to the advancement of theory, we would wish to restate a recommendation offered in *The Dyslexia Debate*, and note the relatively slow progress that has been made since that time:

> … in order to derive sophisticated understandings of reading disability/dyslexia, there is a clear need to derive complex multifactorial models operating at biological, cognitive, and behavioral levels that interact with one another and with the environment …. Such an enterprise will, perhaps, be the key task for the next decade. (Elliott & Grigorenko, 2014: 379–380)

A Note on the Terminology Employed in This Book

As this chapter has demonstrated, the use of the terms *dyslexia*, *reading disability*, *reading difficulty* and other closely related constructs varies greatly, with these often being employed interchangeably. This discrepancy renders problematic the use of such terms in this book where a key aim is to achieve greater conceptual clarity. Our solution to this conundrum is, wherever possible, to use the particular constructs that are employed in the publications that are cited. In the case of more general discussion and reflection, the terms *dyslexia* and *reading disability* are used interchangeably to refer to a difficulty concerning the accurate and fluent reading of words and connected text. Where appropriate, however, the distinction between reading accuracy and fluency is highlighted and examined.

Where a categorical distinction between dyslexic and other poor readers is suggested or explored, we have employed the acronyms *DSR* (Dyslexic Struggling Reader) and *NDSR* (Non-Dyslexic Struggling Reader) as a shorthand form to aid the reader.

The distinction between dyslexia/reading disability and the closely related process of reading comprehension is recognized in the text. Throughout, the broader term *reading difficulties* is employed where reference is made to a group of reading problems that will typically include accurate and fluent decoding and reading comprehension.