It's Time to Be Scientific About Dyslexia

Julian G. Elliott

Durham University, UK

ABSTRACT

Tha author argues that despite the vast proliferation of scientific research, our understanding of dyslexia is marked by serious weaknesses of conceptualization, definition, and operationalization that are not only unscientific but also result in impoverished practice in schools, social inequity in both understanding and provision for many struggling readers, and ultimately, reduced life chances for millions of students worldwide. Key to this problem is the inconsistency of the use of the term *dyslexia* in both scientific research and clinical and educational practice. Four different, common conceptions of dyslexia are outlined, and the implications that each of these have for work with struggling readers are discussed. Whereas it is often claimed that scientific understandings, derived from genetics, neuroscience, and cognitive science, enable clinicians to validly identify, from within a larger group of poor readers, those individuals with dyslexia, the author shows this to be not only misleading but also potentially deleterious to broader inclusive practice. The author argues that the seemingly scientifically based construction of the dyslexic individual, often buoyed by vested interests, typically favors more socially privileged students and often undermines attempts to identify and help all of those who struggle to learn to read. Common responses by proponents to challenges to the dyslexia construct are outlined and discussed. In conclusion, the author argues that scientists, researchers, clinicians, and educators have a responsibility to address and confront the real-world consequences of much science but little wisdom in the field of reading disability.

For many observers, the title of this article might seem oddly out of place. In recent years, dyslexia research in cognitive science, genetics, neuroscience, and education (including the teaching of reading) has flourished, leaving us with profound and significant insights about the development of reading and reading difficulty. However, I argue in this article that despite a proliferation of scientific findings, our understanding of dyslexia is marked by serious weaknesses of conceptualization, definition, and operationalization that not only are unscientific but also lead to impoverished practice in schools, social inequity in understanding and provision for many struggling readers, and reduced life chances for millions of students worldwide.

The aim of this special issue of *Reading Research Quarterly* is to move beyond the various binary adversarial positions that have so often plagued progress in the teaching of reading. In so doing, it is intended that theory and practice will be enhanced. In line with this goal, my purpose in this article is to clarify and take forward the dyslexia debate in a way that will enable the field to reach a common understanding, consistent operationalization, and equitable practice for all struggling readers.

How Is the Term *Dyslexia* Understood?

In this article, I highlight four differing understandings and uses of the term *dyslexia*: as a synonym for *reading disability*, as a condition manifested by a clinically derived subgroup of poor decoders, as persistent intractability to high-quality reading intervention, and as a neurodiverse condition that goes significantly beyond literacy.

Dyslexia *as a Synonym for* Reading Disability

Most researchers operating across all relevant disciplines have treated dyslexia as synonymous with the concept of reading disability (Fletcher, Lyon, Fuchs, & Barnes, 2019; Pennington, McGrath, & Peterson, 2019), a term generally used to describe difficulty in word-level reading (decoding) difficulties.

> 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, p. 285)

For the purposes of this article, I label this conception as dyslexia 1 (a word-level reading difficulty). Identifying an individual with dyslexia on this basis is relatively straightforward and does not require a battery of psychological tests. Assessment would involve the use of one or more word-reading tests to identify those who have a consistent difficulty in decoding accurately and/or fluently (N.B. poor reading comprehension is seen as a common consequence, rather than as a component, of reading disability/dyslexia). Problems involving accuracy have historically predominated over fluency in both the scientific literature and clinical practice in the English-speaking world (Share, 2008). However, poor reading fluency, the more salient decoding problem in transparent, shallow orthographies such as Finnish or Italian, is now understood to be an important component of reading disability that reflects difficulties in the automaticity of word and text reading (Fletcher et al., 2019).

One challenging component of a dyslexia 1 conception, in terms of being scientific about dyslexia, is that reading skills are distributed normally in the population with no clear boundary between normal and disabled reading performance. Thus, the location of any cutoff point that could be employed for diagnostic purposes is largely arbitrary (Brady, 2019; Snowling, 2019). Perhaps, as is the case for hypertension, there could be general agreement about boundaries with moderate and severe dyslexia determined by performance 1.0 and 1.5 standard deviations below the test mean, respectively. Reaching such an agreement would enable the field to avoid reporting widely fluctuating prevalence figures that range from as low as 4–8% (Butterworth & Kovas, 2013; Hulme & Snowling, 2009) to as high as 17–21% (Ferrer et al., 2015; Shaywitz, 1996, 2005).

> 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 & Parrila, 2018, p. 3)

However, in establishing cutoffs, we would need to operate with some flexibility, as firm thresholds fail to take into account the measurement error of tests that cannot reliably assess individual student scoring at the boundaries.

Dyslexia as a Clinically Derived Subgroup of Poor Decoders

The challenge to science, educational practice, and social equity is that a significant proportion of academics, clinicians, teachers, lawyers, and parents consider dyslexia to be a diagnosable, but often unrecognized or even hidden, condition that is encountered only by some individuals who present with severe decoding problems. "Despite the prevalence of dyslexia, many Americans remain undiagnosed, untreated, and silently struggle at school or work" (Rep. Lamar Smith, as cited in Richardson, 2016, para. 12). A diagnosis on these lines is typically obtained on the basis of a clinician's judgment following detailed psychological examination using a range of educational, cognitive, and neuropsychological measures. For the purposes of this article, I label this conception as dyslexia 2 (a clinically derived subgroup of poor decoders).

The primary difficulty with dyslexia 2 is that there is currently no scientifically and educationally meaningful way of identifying a dyslexic subgroup within the larger pool of those who struggle with decoding text (J.G. Elliott & Grigorenko, 2014), there are no specialized forms of intervention that are differentially appropriate for these two groups (J.G. Elliott & Grigorenko, 2014; Miciak & Fletcher, 2020), and it is difficult to conceive of moral or ethical grounds for differential levels of resourcing for these groups. The following definition, originating in the United States, is widely employed by both researchers and practitioners (Miciak & Fletcher, 2020). As an account of the problems typically experienced by struggling readers, it offers a readily recognizable picture:

> 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, p. 2)

However, for that proportion of clinicians and practitioners who hold a dyslexia 2 (a clinically derived subgroup of poor decoders) perspective, the definition is also considered to be a means to differentiate between students with true dyslexia and other (sometimes known as garden-variety) poor readers. When used in this way, the definition becomes highly problematic, as analysis of each of its key components will now seek to demonstrate.

Neurobiology

Clearly, reading disability has a neurobiological component, as does proficiency across all domains of human performance (Protopapas & Parrila, 2018). Reference to a neurobiological origin, therefore, neither offers explanatory power nor serves a diagnostic function (Sand & Bolger, 2019). Given the reciprocal interaction between environmental and biological components in human development (Petrill et al., 2010), it is impossible to differentiate clinically (i.e., for a particular individual) between dyslexia and other decoding difficulties on the basis of nature versus nurture (Fletcher et al., 2019; Olson, Keenan, Byrne, & Samuelsson, 2019; Protopapas & Parrila, 2019). "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, p. 7).

Phonological Deficits

Phonological deficits are now recognized as important underlying factors in reading disability (i.e., dyslexia 1), particularly in opaque orthographies such as English (Perfetti, Pugh, & Verhoeven, 2019). However, given the multifactoriality of reading disability/dyslexia (Ring & Black, 2018), that "not every person with dyslexia has a phonological deficit" (Snowling, 2019, p. 55), that not everyone with a phonological deficit experiences reading disability (Catts, McIlraith, Bridges, & Nielsen, 2017), and that training in phonemic awareness has been shown to be an effective component of broader educational intervention (Pennington et al., 2019), it would be inappropriate to seek to differentiate between dyslexic and other poor decoders on this basis (Brady, 2019).

Unexpectedness

Unexpectedness, a uniquely North American conception that reflects the earlier work of Kirk (1963) in the field of specific learning disability (Miciak & Fletcher, 2020), is an equally problematic criterion because it is unclear exactly how this should be operationalized (Wagner, 2008). Despite the historical popularity of psychometric approaches, it is now widely accepted that 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 the broader category of learning disability (Fletcher et al., 2019; Fletcher & Miciak, 2017; McGill, Dombrowski, & Canivez, 2018). Some have suggested that unexpectedness might be signaled by economic or environmental factors (Hammill & Allen, 2020). There are serious risks for equity here, of course, as the subjectivity involved in any decision making that is conditioned by perceptions of students' home and neighborhood environments will work against the interests of those who are socially and economically disadvantaged or from minority backgrounds (Chapman & Tunmer, 2019; Odegard, Farris, Middleton, Oslund, & Rimrodt-Frierson, 2020; Rutter, 1978).

Effective Instruction

Reading performance will often be impacted by the quality of the instruction provided, but poor teaching is highly unlikely to be the only precipitating factor where severe and complex difficulties are found. Taken to its extreme, of course, a child who has never received formal reading instruction is unlikely to achieve any significant standard of literacy. However, for everyday purposes, the notion that a clinician would be able to determine that a student's literacy difficulties were purely a result of poor instruction is both impractical and unpersuasive. Although aspects of whole language approaches (as discussed in this special issue) can be unhelpful for some students (Tunmer, Greaney, & Prochnow, 2015), most students will learn to read regardless of whichever approach is employed. It is the student at risk of developing reading difficulties who is most likely to be affected by the absence of evidence-based structured and systematic approaches. Although the quality of instruction cannot be proven to be a cause of an individual's reading disability, this does not mean that specialists cannot assist in assessing instructional response, the fidelity of instruction, and the content of instructional programs.

Secondary Consequences

It is true that reading disability often leads to problems involving reading comprehension, vocabulary, and background knowledge. However, the presence of such problems cannot enable clinicians to differentiate between dyslexic and other poor decoders; such difficulties are typically found, in differing ways and combinations, in poor readers generally. One need only probe a little further to see that trying to diagnose on this basis would make little sense. For example, if a struggling reader were to

demonstrate reading comprehension or vocabulary skills that were superior to his or her decoding performance, it is highly unlikely that the individual would be adjudged to be a nondyslexic poor reader.

Dyslexia as Persistent Intractability to High-Quality Intervention

Sadly, there remains a proportion of struggling readers for whom all of our current educational approaches appear to be ineffective (Fuchs, McMaster, Fuchs, & Al Otaiba, 2013). The term *dyslexia* could be reserved solely to describe the core problem of this group, that is, as a reading disability that is seemingly resistant to the best forms of intervention currently operating. For the purposes of this article, I describe this conception as dyslexia 3 (persistent intractability to high-quality intervention). As for dyslexia 2 (a clinically derived subgroup of poor decoders), this variant implies that it is possible to differentiate between dyslexic and other poor readers, but here, crucially, we can only make such a determination post hoc on the basis of response to instruction over time, rather than on the basis of initial performance on a range of cognitive tests. The value of such a diagnosis is that it identifies a need to cater somewhat differently for a small proportion of treatment-resistant poor readers for whom evidence-based educational approaches have demonstrated limited effectiveness. Such individuals may gain little from more of the same educational diet and are likely to require assistive technology to help them navigate the literacy demands of daily life (de Beer, Engels, Heerkens, & van der Klink, 2014).

A dyslexia 3 (persistent intractability to high-quality intervention) conception brings its own problems of measurement and operationalization (Odegard et al., 2020). Having identified such students, it is unclear how extensive a period of failure to improve one's reading skills would be necessary before a diagnosis could be made. A period of six weeks might be deemed sufficient for determining an individual's responsiveness to structured intervention, even in the early phases of schooling (Gersten et al., 2009). However, feedback after a few months, particularly during preadolescence, would be insufficient to justify a conclusion that further progress will be limited, thus necessitating reprioritization toward alternative forms of support and accommodation. A diagnosis of this kind could only be made following a lengthy period of high-quality intervention involving intense, comprehensive, and individualized support (Fuchs & Fuchs, 2015). Within a multitier Response to Intervention model, the individual would most likely have reached the highest tier available (typically Tier 3) and still be encountering significant literacy difficulties.

The suggestion that we might restrict a dyslexia diagnosis solely to that small proportion of struggling readers who demonstrate persistent intractability to educational intervention (J.G. Elliott & Gibbs, 2008)) has not met with widespread approval. This may be partly because of the technical and operational difficulties involved in reaching such a conclusion together with an understandable reluctance on the part of educators to accept that significant future progress in reading skill is unlikely. A further, powerful factor is that with this conception, the great majority of struggling readers would no longer be diagnosed as dyslexic, an outcome that would not accord with the strong desire of many struggling readers and their families to obtain this label. Finally, postponing diagnosis until later, and then basing a determination on the individual's response to educational intervention, poses a significant existential threat to a vast, growing, and often problematic dyslexia assessment, diagnosis industry.

Dyslexia as a Neurodiverse Profile

The fourth conception understands dyslexia as a pervasive neurodiverse disorder that, in its reach, goes far beyond reading difficulties (Cooke, 2001). Indeed, proponents argue that one can struggle with dyslexia even when not experiencing reading difficulties (Ryder & Norwich, 2018). Such reasoning, currently less prevalent in the United States than the United Kingdom and some other countries, is based on observations that those with severe reading difficulties are more likely than normal readers to present with various cognitive difficulties, thus leading to the conclusion that they are markers of dyslexia. Commonly sought cognitive indicators include difficulties with memory (particularly working memory), processing speed, attention, concentration, time management, self-organization, and the capacity to express oneself orally (Asghar et al., 2018; Asghar, Williams, Denney, & Siriwardena, 2019).

According to some proponents, dyslexia's neurodiverse profile brings with it associated gifts (both cognitive and conative) that can help those so affected to thrive (Davis, 1997; Eide & Eide, 2011), such that it can even be perceived as a desirable difficulty (Gladwell, 2013). Consonant with dyslexia 2 (a clinically derived subgroup of poor decoders) usage, specialist clinical expertise, involving a variety of cognitive and neuropsychological tests, is required for a diagnosis, yet unlike dyslexia 2, the current presence of a severe reading problem is not an essential criterion, or necessarily the prime focus for specialist attention. Within this category can be found many high-achieving college students and professionals diagnosed as dyslexic despite their possession of strong reading skills. For the purposes of this article, I label this as dyslexia 4 (a neurodiverse profile).

Dyslexia 4 throws up a host of conceptual, operational, and ethical difficulties. Often applied to adults and diagnosed relatively late in their lives (Holmqvist, 2020; Locke, Alexander, Mann, Kibble, & Scallan, 2017), the

diagnosis can be used to obtain various educational accommodations and resources (Asghar et al., 2018, 2019; J.G. Elliott, 2014). Promulgated by an eager dyslexia industry, this conception represents a major area of growth that permits a radical decoupling from literacy concerns. If a determined assessor draws on enough cognitive measures, it is relatively easy to find strengths, weaknesses, and discrepancies and subsequently build a case for the diagnosis. For receiving institutions, there are limited means of challenging the judgments of assessors who, in the main, are employed by the individual who will be the beneficiary of any subsequent accommodations and additional resources that are recommended. It is hardly surprising, therefore, that a high level of heterogeneity exists in assessor practices, with significant inconsistency and reliability in the way that dyslexia is diagnosed (Ryder & Norwich, 2018).

The case for using various cognitive processes to diagnose dyslexia, particularly in the absence of reading difficulty, is hard to make. Certainly, cognitive processing difficulties tend to be more prevalent in poor readers, but this is equally the case for students with other learning and attentional difficulties. Indeed, it has been shown that an individual's observed cognitive profile may bear little relation to the reason for their referral to specialist services or to the diagnostic label that is obtained (Astle, Bathelt, CALM Team, & Holmes, 2019; Peters & Ansari, 2019). Furthermore, there is no evidence that cognitive interventions are effective, especially for working memory and executive functions. Neither do they generalize to improved reading skills (J.G. Elliott & Resing, 2015).

One may question the justifiability of prioritizing some processes (e.g., working memory) over others (e.g., long-term memory) for educational accommodations, dispensations, and additional support merely because these are more commonly found in poor readers. Similarly, it is unclear why a diagnosed dyslexic person presenting with poor working memory or problems of attention and concentration should receive educational assistance or accommodation that is unavailable to others. A wide range of cognitive strengths and weaknesses will be found within any college cohort, but if we were to try to identify and assist all students who demonstrate deficits in specific cognitive processes, the system would rapidly break down.

Why Is Scientific Knowledge Treated So Unscientifically?

My aim in this article is not to examine the science underpinning reading disability, as this has been tackled in detail elsewhere (e.g., J.G. Elliott & Grigorenko, 2014; Seidenberg, 2017). Rather, it is to highlight, and to seek to

explain, a puzzling conundrum: Somehow we have found ourselves in a position in which science has presided over the production of a vast volume of research studies in the field of reading difficulty, but the translation of this into a coherent body of scientific knowledge that appropriately informs legislation, and clinical and educational practice, continues to be absent. Dissonant understandings and practices that exclude huge numbers of struggling readers from the same benefits do not reflect an absence of scientific knowledge, but rather are a consequence of preferences, motivations, and desires that reflect personal and social agendas. To demonstrate this phenomenon, I will now identify common responses and rebuttals offered to criticisms of the dyslexia construct and seek to explain why many operating in this field appear to ignore or tolerate misrepresentations, circumventions, and refutations of current research.

J.G. Elliott and Grigorenko (2014) were certainly not the first to point to the inherent problems of the dyslexia construct (Department of Education and Science, 1975; Yule, 1976). Although marked by a certain lack of prescience, the detail behind Yule's (1976) prediction rings true some 45 years later:

> The era of applying the label "dyslexic" is rapidly drawing to a close. The label has served its function in drawing attention to children who have great difficulty in mastering the arts of reading, writing and spelling but its continued use invokes emotions which often prevent rational discussion and scientific investigation. (p. 166)

In their review of the field, J.G. Elliott and Grigorenko (2014) argued that although it would be possible for the term *dyslexia* to be used in a consensual and meaningful fashion, the difficulties that continue to result from the preponderance of understandings and misunderstandings are such that it would be more helpful to discontinue the use of the term and replace it with *reading disability*. Many reasons have been presented to counter this recommendation, none of which, I contend, have proven scientifically persuasive. In this section, I consider several of the most common reasons.

Common Arguments Against Replacing Dyslexia With Reading Disability

The Impact of Genetics, Neuroscience, and Cognitive Science

Proponents for maintaining a dyslexia/poor reader distinction have argued that this has been legitimized by multiple findings in genetics, neuroscience, and cognitive science. Certainly, these disciplines have provided, and will surely continue to provide, valuable insights into the nature of reading development and disability. It is important to note,

however, that studies in these fields have typically addressed reading difficulties (and reading development more generally) rather than the particular problems of an identifiable subgroup of poor decoders that some might choose to describe as dyslexic. Many outputs from these disciplines have made reference to dyslexia, although in such cases, the term is typically used as if it were synonymous with *reading disability*. This important point becomes particularly evident when the nature and characteristics of the participants involved in such studies are analyzed. Lopes, Gomes, Oliveira, and Elliott (2020) analyzed 800 studies of dyslexia, across all scientific disciplines, that had been undertaken over the past two decades and found that clear criteria for participant recruitment were rarely made explicit. In general, *dyslexia* was used as a catchall term to describe poor readers (and sometimes spellers) rather than a specific and clearly delineated subgroup. In the small number of cases where such a differentiation had been made, the key criterion appeared to be an IQ–reading discrepancy, a method that is no longer seen as appropriate (Siegel & Hurford, 2019).

It is important, therefore, to challenge the suggestion that findings from scientific studies of dyslexia relate to a meaningfully identified subgroup of poor readers (dyslexia 2). In actuality, the findings concern poor readers more generally (dyslexia 1, a word-level difficulty). Olson et al.'s (2019) renowned findings on the genetics of dyslexia, for example, involved participants selected on the basis that they scored below the 10th percentile on word recognition tests, not because they represented a clinically meaningful dyslexic subgroup of poor readers.

However, the particular characteristics of such dyslexic participants are often overlooked when study findings from genetics, neuroscience, cognitive science, and other disciplines are cited to support the notion that there is something different about the brains of dyslexic poor readers as compared with those of other struggling readers. Nicolson (2005), for example, made a category error of this kind when seeking to argue that this distinction is meaningful: "The fact that 50 per cent of the variance in dyslexia is genetic means that dyslexia does have a clear and distinct basis" (p. 658). There is little doubt that reading ability is an inherited trait, ranging from moderate to high, and problems with reading (dyslexia 1) often run across family generations (Fletcher et al., 2019). We have genetic organizations that make it easier and harder for our brains to reorganize when exposed to reading. This phenomenon renders the early provision of high-quality instruction all the more important for all struggling readers. However, scientific knowledge cannot support Nicolson's rationale for accepting a dyslexic/nondyslexic poor reader distinction (effectively, dyslexia 2).

Similar errors are also commonly found in applications from neuroscience where, as noted earlier, study participants are also typically selected on the basis of their performance on reading tests. Confusion seems particularly evident in this discipline, where beguiling references to brain scans (Weisberg, Taylor, & Hopkins, 2015) and the brightly colored pictures of brain activation seem to reduce the critical faculties of many (Bowers, 2016a, 2016b; Howard-Jones, 2014; Satel & Lilienfeld, 2013). Many fail to understand that the contribution of neuroscience to the practical task of assessment and intervention of reading disability is still rudimentary (Sand & Bolger, 2019), and scientific understandings continue to be undermined by methodological difficulties and the selective use of evidence (M.L. Elliott et al., 2020; Protopapas & Parrila, 2018; Ramus, Altarelli, Jednoróg, Zhao, & Scotto di Covella, 2018).

Misunderstandings have been fueled by the internet, where neuroscientific research on dyslexia is frequently characterized by "distortions, simplifications, and misrepresentations" (Worthy, Godfrey, Tily, Daly-Lesch, & Salmerón, 2019, p. 314). An absence of criticality reflects a form of neuroseduction, whereby neuroscientific accounts increase the likelihood that one will be persuaded by explanations or conclusions that are not justified by the facts (Fernandez-Duque, Evans, Christian, & Hodges, 2015; Schwartz, Lilienfeld, Meca, & Sauvigné, 2016; Weisberg et al., 2015). Principal among these for dyslexia, perhaps, is the erroneous belief that brain imaging can be employed for the purpose of differential assessment and intervention (Bowers, 2016a, 2016b; M.L. Elliott et al., 2020) rather than this being an aspiration for the future (Norton, Beach & Gabrieli, 2015; Ozernov-Palchik & Gaab, 2016) that may ultimately "be proven to be unfeasible" (Ozernov-Palchik, Yu, Wang, & Gaab, 2016, p. 52).

The issue of participant selection applies equally to research in cognitive science. In practitioner contexts, diagnostic checklists typically offer a profile of cognitive difficulties that are commonly found in individuals with dyslexia. The presence of some of these may be portrayed by assessors as revealing the condition (i.e., dyslexia 2, a clinically derived subgroup of poor decoders). Most widely cited are weaknesses in phonological awareness, rapid naming, working memory, and processing speed. However, although these and various other cognitive difficulties are often experienced by those with complex reading difficulties, there are no scientific grounds for using the presence of these, in any combination, as criteria for differentiating between dyslexic and nondyslexic poor readers (J.G. Elliott & Resing, 2015; Pennington et al., 2019).

Despite the popularity of cognitive or neuropsychological assessments (Maki, Floyd & Roberson, 2015), there is little empirical support for the oft-repeated suggestion that they can be employed to assist in screening for, or diagnosing, dyslexia and the formulation of subsequent literacy intervention (Burns et al., 2016; J.G. Elliott & Resing, 2015; McGrath, Peterson, & Pennington, 2020)

or to help predict who will best profit from additional reading assistance (Stuebing et al., 2015). In the light of a growing body of research findings, there continues to be insufficient support for claims that using expensive resources to undertake assessments for these purposes is justifiable (Miciak, Fletcher, Stuebing, Vaughn, & Tolar, 2014; Siegel & Hurford, 2019). Rather, psychologists and other practitioners should

> 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 labeling in favor of assessment that would eventuate in educational and remedial activities tailored to the child's individual needs. (Vellutino, Fletcher, Snowling, & Scanlon, 2004, p. 31)

Identifying the particular literacy strengths and weaknesses of a given struggling reader appears to be the most effective means to determine forms of instruction appropriate to his or her needs (Connor, 2011; Connor, Morrison, Fishman, Schatschneider, & Underwood, 2007; Ring & Black, 2018). Assessment should include evaluation of phonological processing (for pre- and early readers), sound–letter associations, decoding, blending and synthesizing, and word (and pseudoword) reading, plus examination of associated strengths in spelling and reading comprehension (Siegel & Hurford, 2019).

One can perhaps understand why misunderstandings might persist for the lay public, or even by schoolteachers (Elbeheri & Everatt, 2009) and university professors (Ryder & Norwich, 2019), but it is puzzling that the use of cognitive measures to diagnose dyslexia continues to be widespread among clinicians (Machek & Nelson, 2007; O'Donnell & Miller, 2011; Stanovich, 2005). This may reflect assertions occasionally found in the scientific literature that such a procedure is meaningful (cf. Hammill & Allen, 2020; Yuzaidey et al., 2018), and, for some practitioners, an explicit rejection of the academic literature in favor of a personal perspective (Ryder & Norwich, 2018). In part, resistance to scientific knowledge may be a feature of professional defensiveness. A focus on the assessment and teaching of literacy skills may create significant problems for those with psychometric, rather than reading instruction, expertise. In contrast, persisting with the use of cognitive discrepancies as a central means to determine students' eligibility for intervention services (Hammill & Allen, 2020) retains psychometricians' place at the heart of the assessment, intervention, and resource allocation process. Professionals, particularly those in private practice, may also feel pressured by families or education administrators to diagnose (and confirm) dyslexia by this route.

Dyslexia 2 conceptions are likely to prove attractive to practitioners in professional fields outside of education. Youman and Mather (2015), for example, referred to a proposal for the state of Kansas that would have required schools to accept a dyslexia diagnosis from a licensed psychologist, physician, or psychiatrist and provide services accordingly. Audiologists, physical therapists, optometrists, and pharmacists may also seek a role despite the fact that these professions have no measures that can be employed to diagnose or treat dyslexia (or, indeed, other specific learning disabilities; Grigorenko et al., 2020). Sanfilippo et al. (2019) advocated that pediatricians should seek to identify an early risk of dyslexia, and recommended that the medical community should become involved in national conversations about this condition. Perhaps medical interest will thrive in contexts where health insurance is increasingly used to fund clinical practice, although this does not sit easily with growing recognition that, as far as practice is concerned, reading disability is essentially an educational problem requiring an educational solution. To divert from this route runs the risk of misusing finite resources while maintaining or increasing an already existing inequity of provision. In this respect, Holmqvist (2020) spoke critically of a process of consecrating medicalization that aids the already more privileged to obtain a dyslexic label and all the benefits that accrue from this, while effectively excluding others with less social and cultural capital.

Although not relevant for a dyslexia diagnosis, intellectual assessment can occasionally have a valuable role in providing teachers with a broader picture of a struggling reader (J.G. Elliott & Grigorenko, 2014; J.G. Elliott & Resing, 2015). Although performance on such measures is largely irrelevant in determining the nature or content of specialist decoding instruction, this can help ensure appropriate challenge in relation to decisions about broader curricular materials and tasks. Sometimes, severe literacy difficulties, and their long-term effects on personal motivation and agency (Kiuru et al., 2011), may mask a student's intellectual abilities and lead to low teacher expectations and insufficient challenge across school subjects.

Personal Empowerment and Exculpation

It has frequently been argued that a diagnosis of dyslexia can help struggling learners feel better about themselves and gain a greater sense of competence and agency. In particular, children and their families may be reassured that the diagnosis seemingly confirms that the children are not stupid or lazy—that this problem is not their fault (Snowling, 2019). "Knowing that his dyslexia is a respectable neurological diagnosis, and not another word for laziness or stupidity can transform a child's self-image" (Stein, 2012, p. 189).

It is incontrovertible that those who struggle with reading and writing often experience great hardship in school. Personal testimonies (Riddick, 2010) have illustrated how common it is for such individuals to question

their intelligence and lose belief in their ability to achieve scholastically, and in life more widely. A sense of helplessness can lead to academic withdrawal and the adoption of a range of maladaptive compensatory behaviors (Covington, 1992). Closely associated with negative views of one's abilities are the apparent perceptions of teachers, peers, and others that the poor reader is stupid and/or lazy, with all the attendant negative experiences that can follow (Gwernan-Jones & Burden, 2010). Given such an unfortunate and misleading scenario, one can understand the immense power of a dyslexia diagnosis, not only as a means to refute negative perceptions and attributions but also as a label suggestive of above-average intelligence. Echoing this in the media, one regularly sees references to the gift of dyslexia, which provides above-average abilities and dispositions, leading to high levels of success in life (Eide & Eide, 2011; Gerber & Raskind, 2013). Such accounts have a popularity and resonance that are often undimmed by the absence of scientific support (Seidenberg, 2017).

It is important to tackle misconceptions that decoding difficulties are an indicator of low intelligence or laziness, yet there are unintended consequences when dyslexia diagnoses are used as the principal means to effect this outcome. The folly of using these to reassure some students that it is not their fault is thrown into relief when we consider the much higher proportion of struggling readers who are not so labeled. Are these students any more to blame for their difficulties? Are they more likely to be stupid or lazy? Hopefully, most professionals would not believe this to be the case, but in what is effectively a zero-sum game, such unfortunate messages are often conveyed subliminally, if not more directly.

Dyslexia's Conceptual Problems Are Not Unique

Some advocates for the continued use of the term *dyslexia* (e.g., Cutting, 2014; Snowling, 2015) recognize the conceptual and diagnostic challenges that pertain, but argue that such difficulties are equally true for many other developmental and psychiatric disorders. Rather than dispensing with the term, they contend that we should continue to use the dyslexia label while working toward improved definition and operationalization. Cutting (2014) noted that

> science needs to evolve so that we can make distinctions between various types of reading difficulties, and the dyslexia label, along with the broader reading disability term, pushes us to keep propelling science forward. This issue of fuzzy boundaries occurs in multiple developmental disorders—and many other medical disorders for that matter. (p. 1252)

A diagnosis of dyslexia is rather different from those for psychiatric categories such as attention deficit hyperactivity disorder, obsessive compulsive disorder, or clinical depression, for which explicit, agreed criteria are specified

in psychiatric manuals, such as the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM–V*; American Psychiatric Association, 2013). Despite heterogeneity within diagnostic categories (Sonuga-Barke, 2016) overlap between them (Rutter & Pickles, 2016), and an element of subjectivity in their interpretation by clinicians (Regier et al., 2013), explicit criteria guide the decision making of any clinician using that tool. For dyslexia, there are no clear and consistent criteria (only various features commonly found for all poor readers), thus leading to inconsistent usage and interpretation. It was for these reasons that the term *dyslexia* was initially dropped in earlier drafts of the *DSM–V*, although following fierce lobbying by dyslexia advocacy groups, it was subsequently reinstated as a specifier. Notably, this particular formulation offers no criteria other than the literacy problems that it is connected to, and thus its usage in the *DSM–V* would seemingly reflect a dyslexia 1 understanding.

Ramus (2014) argued for the continuation of the dyslexia construct on the grounds that the current "absence of evidence will not last forever" (p. 3374). Such a view of ongoing conceptual refinement and precision neatly reflects the scientific model. However, such a stance becomes problematic when an ill-defined scientific construct crosses into the domain of professional/clinical activity, and unclear conceptualization and operationalization result in educational inequalities and inequities that negatively impact students' life chances.

Fallacies of Relevance

Sternberg (2004) spoke of fallacies of relevance whereby the conclusions of an argument are not based on a sound or relevant line of reasoning. Several forms of fallacious argument—straw man, ad hominem, ad verecundiam, ad populum, and arguments from ignorance—apply to current exchanges about dyslexia, affecting the quality of public understanding and argument.

The Straw Man and Ad Hominem Fallacies

A common rhetorical device for adversarial debate is to provide a misleading account of the position of an adversary and then to demolish this by showing its inherent weaknesses. In the process, the apparent advocate of this proposition is held up to be foolish or mendacious. In relation to dyslexia, a common ploy is to reframe challenges to the use of the construct as arguments that dyslexia does not exist. Refuting this proposition is easy; one need only to point to the many students who struggle with reading and other comorbid problems, highlight the very real distress that is experienced, signal the failure of some students to progress despite high-quality education, and conclude that it is obvious that this cannot all be the fault of poor teaching or a lack of motivation. This reductio ad absurdum construction (admittedly, a view sometimes

presented by ill-informed commentators in the media) lays the ground for a vigorous rebuttal of any challenge to the scientific validity of the construct as it is currently employed. However, as J.G. Elliott and Grigorenko (2014) noted,

> the primary issue is not whether biologically based reading difficulties exist (the answer is an unequivocal "yes"), but rather how we should best understand and address literacy problems across clinical, educational, occupational, and social policy contexts. Essentially, the dyslexia debate centers on the extent to which the dyslexia construct operates as a rigorous scientific construct that adds to our capacity to help those who struggle to learn to read. (p. 4)

Other misrepresentations, frequently found in social media, allege that challenges to the the label reflect a demonization of middle-class parents supposedly seeking to excuse the performance of their lazy, or less than bright, children. Such accounts reflect a gross distortion of the complex issues concerning the disconnect between decoding and intelligence, and recognition of the legitimate concerns of parents (J.G. Elliott & Grigorenko, 2014). However, as a rhetorical device, portraying critics as insensitive to the concerns of children and their families can prove successful in disparaging those who challenge dyslexia orthodoxies and distract scientific and public debate away from the core issues.

Ad Verecundiam Arguments

These involve appeals to higher authorities that lead us to accept (or reject) assertions because they are associated with those with status, prestige, or respect. Such a stance is commonly used by dyslexia lobbies, which regularly draw on the biographies of historical figures and the personal testimonies of well-known celebrities as a means of legitimizing their stance, while also implicitly suggesting a version of dyslexia that can benefit society as a whole (Gabriel, 2020). Famous dyslexic high achievers, often diagnosed later in their lives having seemingly not had their difficulties recognized at school, are used to legitimate, sustain, and promote dyslexia 2 (a clinically derived subgroup of poor decoders) and dyslexia 4 (a neurodiverse profile) understandings. As Sternberg (2004) noted, however, the problem with ad verecundiam arguments is that the appeal is to an authority that typically lacks sufficient scientific expertise or credibility.

Ad Populum Arguments

These take the form that if everyone thinks something is correct, then it must surely be so. This applies to dyslexia advocacy where the supposed wisdom of crowds has resulted in an ever-expanding construct that incorporates widely divergent, and potentially dissonant, perspectives. Here, everyone knows what dyslexia is, and clinicians should be trusted to provide expert diagnoses on the basis of clinical judgment, despite the field's inability to offer scientifically based criteria that underpin such determinations.

Arguments From Ignorance

These suggest that a phenomenon should be considered to be true because it has not been shown to be false. Ramus (2014), for example, adopted this position when taking issue with the assertion that a dyslexia 2 (a clinically derived subgroup of poor decoders) diagnosis has little utility for guiding educational practice. While agreeing that the field has not identified differing forms of intervention for dyslexic versus nondyslexic poor readers (Miciak & Fletcher, 2020), Ramus contended that we should continue to differentiate between these two groups because future approaches might prove more effective for one or the other of these groups.

Reading disability is multifactorial and heterogeneous in nature (Peters & Ansari, 2019), and perhaps a meaningful dyslexic/nondyslexic poor reader differentiation will ultimately be found. Seeking to identify potential aptitude–treatment interactions that can guide alternative forms of intervention for different kinds of struggling learners is a worthy aim of scientific research, and Ramus's (2014) call for further work is justified. However, those who hold out hope for a more precise dyslexia construct that, crucially, will inform a different form of educational practice confuse the potential value of further exploratory research with the imperative that ongoing clinical and educational practice must operate on the basis of current evidence.

The Power of the Dyslexia Construct to Influence and Persuade

A persuasive argument for continuing with the term *dyslexia* is that despite the flaws noted in this article, this construct has the power to influence government policy, educational practice, and lay perceptions in ways that can lead to increased legislation and resourcing on a scale that would otherwise be difficult to achieve. Although one would rarely find this position explicitly expressed in the scientific literature (for a critique, see Gabriel, 2020), dyslexia associations have been exceedingly successful in gaining political and legislative support across the world (Mather, White, & Youman, 2020), particularly in the United States, where skillful lobbying by advocacy groups has seen dyslexia legislation spread rapidly to almost all of the states (National Center on Improving Literacy, 2020).

The power of the label to increase the provision of services has not been lost on many teachers and families who have been instrumental in influencing policymakers, often through personal anecdotes of personal hardship. In her study of policy narratives and testimonials, Gabriel (2020) cited multiple parental accounts of how diagnosis proved to be a turning point in their lives, one that marked

the beginning of the end of many years of struggle. She described a powerful conversion narrative in which the perceived failure of public schools to cater for the individual needs of students with dyslexia is contrasted to a privatized dyslexia assessment and intervention industry that seemingly offers greater understanding and instructional solutions. Often in such accounts, a distinction is drawn between reading difficulty, portrayed largely as a societal problem, and dyslexia, framed "as a personal tragedy exacerbated by schools that neither identify nor specifically address it" (p. 311).

Gabriel (2020) recognized that too many poor readers continue to struggle without access to proper support and instruction, and one can understand the background to the parental perspectives and motivations that she reported. However, given the vast number of students who struggle with reading, the needs of the majority are unlikely to be resolved by maintaining dyslexia as a distinct and diagnosable problem separate from reading disability. Indeed, it is something of a paradox that successful appeals to legislators for dyslexia testing and specialist dyslexia teaching may ultimately undermine arguments and reduce political pressure for greater recognition of the needs of all poor readers.

> The use of conversion narratives, rather than scientific or economic arguments, signals a move away from accountability era ideas about evidence-based practices or standard protocols for identifying and remediating reading difficulties among all school children. Brand-name programs sold by for-profit companies are discursively constructed as religions unto themselves, with educators and families publicly declaring allegiance, attributing miraculous turnarounds to their methods, and describing the moment of diagnosis/training in the same terms as a moment of conversion or enlightenment. (p. 332)

Discussion

In this article, I have identified four broadly different conceptions of the dyslexia construct that are currently in use. Dyslexia 1 (a word-level difficulty) relates to an understanding that most researchers, and many practitioners, appear to be slowly gravitating toward (Protopapas, 2019). Here, a diagnosis identified on the basis of cognitive testing is not required, merely the presence of a severe and persistent decoding difficulty (albeit excluding those with significant intellectual and sensory disabilities or some who are non-native language speakers). The term *dyslexia* has the potential to retain much of its power with funding and lobby groups, although the costs of catering to the huge numbers of students to whom the label would then apply might cause concern to policymakers. Widespread acceptance of this conception would enable educators to focus on scientifically based means of meeting the needs of all struggling readers, rather than remain confused by

what dyslexia is, who does and does not require help, and how intervention can be best undertaken (White, Mather, & Kirkpatrick, 2020).

Hammill and Allen (2020) argued from a dyslexia 2 (a clinically derived subgroup of poor decoders) perspective that professionals and parents should welcome the rising interest in dyslexia by U.S. politicians, as this "will allow clinicians and assessment professionals to accurately separate individuals with dyslexia from other poor readers" (p. 40). Such a position not only lacks a strong scientific foundation but also privileges those who can gain access to the label. Once diagnosed as dyslexic, there are many advantages conferred upon the recipient, but this comes at a price paid by the great proportion of other struggling readers who lose out in what is essentially a zero-sum game involving positive and negative attributions, test accommodations, and access to finite resources.

Applying the dyslexia label solely to those struggling readers who have failed to respond sufficiently to high-quality and increasingly individualized educational inputs over a lengthy period of time, dyslexia 3 (intractability to high-quality intervention) has some merit (Fletcher & Miciak, 2017). Where sound education programs are in place, ideally operating within a Response to Intervention/multitier systems of support framework, using this perspective would help highlight and cater to the needs of a small group of individuals. In identifying those who are unlikely to make sufficient progress from further educational programming, and demonstrating their concomitant need for assistive technology, the label serves a clear, practical, and valuable function. However, this conception is unlikely to prove popular, as it can only be applied after a lengthy period of intervention and effectively excludes most struggling readers from this much sought-after label. Neither is it likely to meet with the approval of a rapidly expanding dyslexia assessment and treatment industry (see FMI Research, 2019, 2020).

Although there appears to be no clear scientific basis or rationale for dyslexia 4 (a neurodiverse profile), this conception is becoming increasingly popular in the United Kingdom. Largely promoted by psychometricians and diagnosticians, and attractive to a growing neurodiversity movement, its departure from primary concerns about literacy has taken the construct a long way from its origins and from the concerns of the dyslexia-related scientific literature.

Time for a Scientific Approach

As I have sought to demonstrate in this article, there is a lot of science in dyslexia, but in many respects, such proliferation has not resulted in scientific wisdom. Of course, it is often difficult to interpret and apply complex scientific understandings, but the distinctions, contradictions, and tensions among the four conceptions of dyslexia that

I outlined can surely be recognized, debated, and resolved. At present, professional practice and educational resourcing are claimed to be underpinned by science, but often they are not. Although there appears to be no suggestion from researchers or practitioners that the population that scientific research has worked with is, or should be, different from those who are being prescribed treatment based on the science, it is a sad fact that in many educational systems, misunderstandings, misinterpretations, and a lack of clarity have resulted in wide disparities of practice, with clear losers and winners.

Differences in dyslexia conceptualization and operationalization, fueled by the term's varied use both as a psychological/medical diagnosis and as a social construct (Kirby, 2018), have led to a burgeoning dyslexia assessment industry that disproportionally caters to more advantaged social, racial, and economic groups (Holmqvist, 2020) while distracting attention from the needs of high numbers of other struggling readers. Criteria for the diagnosis remain unclear and inconsistently applied by assessors, who are often directly employed by customers who are actively seeking the label. In some settings, diagnoses can be accompanied by recommendations for expensive private schooling that school districts/local authorities are subsequently required to fund, thus consuming finite resources that are required by other struggling learners. Inequity goes beyond educational resourcing, however, as the label can also confer a range of other, less tangible benefits. For example, a dyslexia diagnosis is recognized as having the potential to help those so labeled to gain a more positive picture of themselves, while also encouraging teachers and others to be more understanding, sympathetic, and supportive. However, for struggling readers who lack the label, the suggestion of a greater degree of personal and familial culpability may be an unfortunate consequence.

Dyslexia diagnoses are mushrooming in some higher education settings, yet these diagnoses are often derived from observation of supposedly discrepant cognitive processes that are deemed to be impacting the students' learning, even where no literacy difficulties are apparent (J.G. Elliott, 2014). In schools, universities, and professional examinations, the diagnosis can offer a range of accommodations and forms of support that are unavailable to others. It is currently far from clear which cognitive processes and profiles, and at what levels of severity, should be included in determining such a disability.

Educators from kindergarten to college are confused by the widely differing usage of the term *dyslexia* and are unclear as to whether debates about the science of reading instruction (cf. this special issue) apply differently to individuals diagnosed with dyslexia than to others presenting with decoding difficulties. Such uncertainty, sometimes exacerbated by the vaunted recondite expertise of dyslexia specialists (Gabriel, 2020), reduces mainstream educators' confidence and ability to identify problems and intervene appropriately (Worthy et al., 2016; Worthy, Svrcek, Daly-Lesch, & Tily, 2018). This problem is exacerbated by time-consuming wait-to-fail referral processes that delay educational interventions that are usually far more effective in grades 1 and 2 than in later grades (Lovett et al., 2017).

Dyslexia advocacy groups seem unsure about how to reconcile a dyslexia 1 (a word-level reading difficulty) understanding, as generally represented in the scientific literature, with the personal and professional interests of those members and supporters who will gain more from the continued adoption of dyslexia 2 (a clinically derived subgroup of poor decoders) and dyslexia 4 (a neurodiverse profile) perspectives. How can we reconcile these problems? J.G. Elliott and Grigorenko (2014) suggested dropping the *dyslexia* term altogether and replacing it with *reading disability*, a term which offers the perceived benefit of focusing attention early and systematically on all who are struggling with decoding text. However, as Bishop (2014) predicted, many practitioners have proven reluctant to accept this suggestion, and it appears that the attractiveness and power of dyslexia are such that the label may be here to stay. If so, it is surely important that science, rather than emotion or the powerful voices of vested interests, forms the basis for a meaningful, rigorous, and consistent use of a term that ensures that all who struggle to learn to read are identified and provided with appropriate forms and levels of intervention. In highlighting the current confusions and tensions in the use of *dyslexia*, I hope that this article will serve as a stimulus to the achievement of a shared understanding that will operate across both research and practitioner settings.

Isaac Asimov's (as cited in Leslie, 2020) observation that one of the saddest aspects of life is that science gathers knowledge faster than society gathers wisdom raises the question of scientists' responsibility to society. Some leading voices in the field may not fully grasp how dyslexia is playing out in practitioner settings and how confused our educators and policymakers are by a multitude of differing accounts and recommendations, or appreciate the extent to which the failure to challenge inappropriate and noninclusive practices has resulted in prejudicial implications for social equity and justice. Some scientists, whether researchers or clinicians, might argue that this is not their responsibility. I would respectfully disagree.

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JULIAN G. ELLIOTT is a professor in the School of Education, and the principal of Collingwood College, at Durham University, UK; email joe.elliott@durham.ac.uk.