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A Review of the Evidence on Tier 1 Instruction for Readers With Dyslexia

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ABSTRACT

In this article, I provide an examination of research evidence concerning the effects of classroom instruction (Tier 1) for students with dyslexia and other reading problems. I discuss the suitability and limitations of different types of research evidence that may be used to determine how best to support the learning of these students in the classroom (e.g., studies of the effects of classroom instruction on average reading achievement, studies of special interventions for students with reading problems). I then examine research on the impact on learning of amount of classroom instruction, the curriculum or content of classroom instruction, and the quality of classroom instruction. Because the preponderance of research has focused on what needs to be taught to students to improve their reading achievement, in that portion of the review, I focus on the results of 32 meta-analyses rather than individual studies. These meta-analyses addressed a wide range of topics, including phonemic awareness, decoding, oral reading fluency, reading comprehension strategies, writing, and various aspects of language and text structure. Finally, I provide a best estimate of beneficial approaches to classroom instruction for students with dyslexia and identify gaps and limitations in this evidentiary base.

Multi-tiered support systems, or Response to Intervention, is an approach to the identification and instruction of students with special learning needs. The approach depends on high-quality classroom instruction and universal screening. This foundation of instruction and assessment is provided to all students, whether or not they have learning problems. Those students who fail to make adequate progress from the core classroom instruction can then avail themselves of additional tiers of support in the form of interventions or special education beyond the classroom.

The purpose of this article is to explore the application of research on struggling readers to classroom practices for students with dyslexia. Tier 1 instruction includes both quality teaching and ongoing progress monitoring. In this article, I focus solely on the instructional part of that equation, to identify how to offer students with dyslexia the greatest opportunity for success. Unfortunately, determining the best classroom instructional options for students with dyslexia turns out to be neither simple nor straightforward; it is not clear which research is the most appropriate basis for such determinations. Accordingly, in this review, I first explore these evidentiary considerations and then review the relevant research base for determining how best to address the needs of students with dyslexia in the classroom.

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Conceptual and Technical Problems in Tier I Research for Students With Dyslexia

Multi-tiered support systems aim to increase the likelihood of academic success for students who struggle with reading. A basic premise is that high-quality classroom teaching should be beneficial for all. Yet, because the learning challenges that students with dyslexia face are so great, even high-quality Tier 1 instruction may be insufficient. How can we best determine how these students should be taught? To answer such questions, we use research to identify courses of action with the greatest likelihood of success. Empirical data can reveal whether particular approaches have conferred learning benefits in the past and for whom. However, as will be explained, applying research to the classroom instructional needs of students with dyslexia poses certain complications that must be considered. Currently, the best research evidence available requires the adoption of major assumptions or inferences in the application of that research to the needs of students with dyslexia.

Table 1 lists some of the types of research evidence to be discussed here and the associated assumptions required to apply that research evidence to instructional practice or policy. In this section, I consider the challenges of generalizing from evidence on struggling readers to students with dyslexia and from Tier 2 instructional evidence to classroom instruction, the need for disaggregation of classroom data, differences between elementary and secondary reading instruction, common confounds to Tier 1 data, the need for replication, and the distinctions between experimental and correlational evidence. The purpose here is not to discourage the application of research to the needs of readers with dyslexia in the classroom but to provide a clear-eyed estimation of the degree of confidence we can have in such evidence.

The closer the match between the instructional conditions considered in the research studies and the conditions in the classrooms where those research results are to be applied, the greater the confidence that can be invested in that evidence is. When there is little or no direct evidence, it is necessary to generalize from more discrepant research; research on the application of which is dependent on particular assumptions or inferences. For example, if an instructional approach has evidence showing it to be effective in improving average classroom achievement, then applying this research to the needs of students with dyslexia requires the assumption that what works for the average students will be beneficial for the students with disabilities. This may or may not be correct, so certainty of success cannot be as high as it would if the research had identified the impact of the teaching on the learning of those students with dyslexia. Likewise, when there is no direct evidence, we should prefer to depend on bodies of research requiring fewer assumptions but leading to similar conclusions. A Tier 1 approach proven to be beneficial with general classroom populations that is also effective with struggling readers in pull-out interventions should be considered a better choice for students with dyslexia in the classroom than approaches supported by only one of those types of evidence. This analysis should be useful to both policymakers/practitioners seeking research support for their decision making and for researchers whose aim is to increase what we know about how best to serve students with dyslexia.

TABLE 1
Assumptions Inherent in Various Sources of Evidence

Sources of evidence	Major assumption
Studies of the impact of Tier 1 classroom teaching on the learning of students with dyslexia who are not enrolled in Tier 2 instruction	None
Studies of the impact of Tier 1 classroom teaching on the learning of students with dyslexia who are receiving Tier 2 interventions	The impact of the teaching is entirely or mainly due to the classroom instruction.
Studies of Tier 1 classroom teaching on the reading performance of all students (including those who do not have dyslexia)	The readers with dyslexia benefit to the same extent as the average readers.
Studies of Tier 1 classroom teaching that disaggregates effects for low readers	These results are not affected by Tier 2 supports, and all low readers would respond to instruction in the same way.
Studies of Tier 2 instruction	The classroom conditions will not affect effectiveness.
Meta-analyses showing an approach to be effective with lower achieving readers	This correlation would hold up to direct experimental tests, and all low readers would respond to the instruction in the same way.

Note. The greater the degree of inference required to apply research to instruction, the lower the degree of certainty is that the action will accomplish the results reported in the research.

Students With Dyslexia Versus Struggling Readers

One challenge is that there are multiple definitions of *dyslexia* (Elliott, 2020), and sometimes there are categorical subtypes within those definitions (Fletcher, Lyon, Fuchs, & Barnes, 2019). Some authorities, to avoid controversy and confusion, eschew the term *dyslexia* altogether, preferring *learning disability*, *reading disability*, *specific learning disorder*, and so on. The various definitions and terms appear to be in agreement on a few basic points: The students in question find learning to read exceptionally difficult; the source of their problem is developmental, genetic, and neurobiological in nature; and the phonological components of language that impact word reading and spelling tend to be particularly implicated (American Psychiatric Association, 2013; Dyslexia, n.d.; International Dyslexia Association, 2002).

It is not hard to determine who is struggling to learn to read, but the etiological nature of the definitions of *dyslexia* make it a challenge even for skilled diagnosticians to distinguish the source of learning problems. It would not be common practice for educators and psychologists to run brain scans or genetic screens to attribute the source of a reading problem, or to distinguish among competing etiologies (e.g., socioeconomic factors, comorbid neurological factors). Accordingly, instructional research has focused mainly on the needs of "low readers," "poor readers," or "struggling readers" without much consideration of the source of the problem. In accordance with that practice, in this review, I focus on studies of readers who are having difficulty in learning to read, whether or not the researchers used the term *dyslexia*, and I use that term interchangeably with the synonyms noted above. Also, although phonological processing problems appear to be central to most current conceptions of dyslexia, this review is not limited to considerations of decoding instruction. Reading is complex, and it is possible that instruction in components such as vocabulary may influence phonological processing (Laing & Hulme, 1999). It is also true that students with learning disabilities may eventually attain average levels of decoding ability and may continue to lag considerably in vocabulary or reading comprehension (e.g., Spencer & Wagner, 2018).

This approach to the research is operationally workable and is consistent with much of the extant literature. However, it begs an important question: Do all students with reading problems benefit from the same instructional routines to the same extent, no matter the source of the learning interference? Much of the existing research has proceeded as if this were the case, so it is necessarily the approach taken here. Nevertheless, research has not yet convincingly compared the effectiveness of instructional regimens across reading disability etiologies. The most ambitious attempts at this (e.g., Vellutino et al., 1996) reported that young readers—whether their problems be constitutional or environmental—tend to benefit from explicit phonological instruction, although those students suspected of having dyslexia are more difficult to remediate in this regard. Etiology may be irrelevant when determining what to teach—all students need to gain the same skills to become readers—whereas the amount and intensity of this instruction might need to vary depending on the source of the problem. If that is the case, then the research results summarized here should be informative to the teaching of struggling students whether their reading problems be due to dyslexia, poverty, or poor education. However, it is important for the research community to recognize that this assumption is just that and not a research finding. Future research could profitably address this question more directly.

The Importance of Disaggregation

Our goal is to determine the best choices for classroom reading instruction for students with inherent problems in learning to read. One widely accepted criterion concerns the overall effectiveness of an instructional approach, that is, how well, on average, it improves reading achievement. "On average" in this case means that the experimental group accomplished a higher average reading score than the comparison group, a result that could be obtained even if the approach conferred no particular benefit to the lowest performing readers. Many, perhaps most, treatments of multi-tiered support systems promote this idea that Tier 1 instruction should be focused on approaches proven to improve reading achievement—without necessarily any reference to their specific impact on the lowest achieving readers (e.g., Fletcher et al., 2019; Foorman, Smith, & Kosanovich, 2017; Hughes & Dexter, n.d.). This is not an unreasonable approach; it would guarantee that all students would receive Tier 1instruction found to have some potency. However, it would be a mistake to assume that just because an approach can be effective overall would be the surest bet for the lowest readers or for the students with dyslexia.

Disaggregation of data is key here. Classroom teaching that is both effective overall and relatively beneficial for the lower performing readers should be considered when choosing instructional approaches. Classroom instruction is not likely to result in the lowest readers making the same progress as the average or higher performing students, but instruction should provide the lower performing students with some evident advantage (e.g., when these students are compared with similar students in other classrooms). Even good reader/poor reader disaggregations will not necessarily distinguish among types of low readers. Perhaps what works with the average low reader would not be equally effective with those suffering from dyslexia (Vellutino et al., 1996).

Classroom studies sometimes focus on young students who are at risk of reading problems or those, somewhat

older students, who have already demonstrated difficulty in learning to read. In this review, I consider both categories of struggle. However, I do not focus on at-risk designations that were drawn solely on demographic factors such as poverty or second-language status; I include the results of studies in which risk status is determined by low performance on screening measures such as reading readiness tests or batteries of prereading or early reading skills (e.g., alphabet knowledge, phonological awareness).

Elementary Versus Secondary Teaching

Another complication in evaluating the effectiveness of classroom teaching for students with dyslexia is the chasm between elementary and secondary school. Unlike in elementary school, it would be unusual for students to receive much explicit classroom reading instruction in high school; nor is it clear which teachers would be responsible for delivering such lessons. In the elementary grades, all students receive reading instruction as part of their English language arts curriculum, so ensuring that students receive both Tier 1 and Tier 2 reading instruction is pretty straightforward. Yet, in secondary school, students still in need of daily explicit reading instruction tend to be assigned to special classes.

That does not mean that there is no reading instruction at all in the secondary grades. Most states have adopted disciplinary literacy standards, but these do not focus on learning to read as much as on how to negotiate the specific reading and writing demands inherent in particular subject matters (e.g., mastering the organizational structure of a science experiment, learning how to use dates to evaluate the dependability of a primary document in history). Also, it is common in various subject matter classrooms that students are expected to read; teachers may support this reading to support comprehension and learning, and vocabulary and writing may be emphasized as well. This means that for those older students, it is important to not only know what kinds of Tier 1 instruction would be most beneficial but also where and by whom such instruction should be provided.

Tier 1 Confounds

The purpose of applying research to instructional decision making is to reduce uncertainty (Shanahan, 2020). In this case, students with dyslexia struggle to learn to read, so the idea is to choose instructional routines that will have the greatest possibility of success. There are many choices of how to do this, and research is useful for increasing the possibility of making sound selections among these alternatives. In some cases, such as deciding how to raise average reading achievement, the application of research can be pretty straightforward. One would look for instructional approaches that research had found to be effective, and then by considering effect sizes, consistency of results, and similarity of populations and conditions, reasonable decisions could be made. However, determining the best Tier 1 approaches for students with dyslexia is a bit more complicated.

Most schools provide Tier 2 interventions for struggling readers. When students receive intervention support in addition to their classroom instruction, this support may obscure the effects due to Tier 1 teaching unless all of the low-performing students receive similar Tier 2 interventions. When that is not the case, then additional analyses are needed to determine the degree of progress that resulted from the classroom portion of the equation. In those rare instances when researchers have provided such analyses, the impact of the Tier 1 teaching has been found to be limited (e.g., Kent, Wanzek, & Al Otaiba, 2017). Problems of data aggregation and confounding require that multiple categories of evidence be considered when evaluating classroom teaching for students with dyslexia. Not all research is equally applicable to the determinations that we hope to make, so considering multiple sources of evidence is requisite. For example, studies of classroom teaching that fail to disaggregate the performance of the lowest readers require a rather large and unlikely assumption that the effects of the instructional approach will be uniform across different levels of readers. It is possible that an approach that is effective on average would not work particularly well with the most challenged readers. Studies of Tier 2 interventions may do a better job of focusing on struggling readers, but applying this evidence to classroom instruction requires a baseless assumption that instructional conditions do not matter. That an approach works well with small-group instruction and a specially trained teacher would not ensure its success when delivered under typical classroom conditions.

The approach taken here is to rely on the most direct evidence possible, seeking studies that required the fewest unproven assumptions, or a convergence of evidence from studies dependent on different assumptions. Thus, the best evidence—that which would give us the most dependable foundation for decision making—would be classroom experiments that compared the impact of various instructional approaches on students with dyslexia who were either not enrolled in a Tier 2 intervention or were receiving the same Tier 2 support. Unfortunately, there are no such studies. There are classroom studies that have found instructional routines to be generally effective and that confer benefits to at least some of the lower performing readers. That is not perfect, of course, but it reduces some uncertainty. In some cases, there has been additional research showing that these instructional routines can also be effective in Tier 2 settings. The combination of these categories of research leaves some degree of uncertainty but provides greater confidence that such classroom instruction could be made to benefit students with dyslexia.

Experimental and Correlational Evidence and Replication

Correlation does not imply causation. Two phenomena may be correlated without one leading to the other. Studies that correlate student learning with various classroom practices may provide important clues as to what might be made to work. However, these correlational clues do less to reduce uncertainty than would data derived from well-designed, rigorously implemented experiments that divulge causal connections. It is one thing to say that an approach *may be* effective, but it is quite another to say that it *has been found* to be effective under some circumstances. Replication provides greater assurance of validity and reliability, as well as more precise estimates of effects through the benefits of averaging across studies.

Given the value of causal information and the importance of replication, it is no wonder that various public institutions have promoted the use of experimental data as the basis for educational decision making, emphasizing experimental evidence and meta-analysis of such evidence to determine whether instruction works (e.g., National Reading Panel [NRP], National Early Literacy Panel, What Works Clearinghouse, Institute of Education Sciences). In this review, I follow suit, providing an exploration of relevant meta-analyses of experimental and quasi-experimental studies that have considered learning outcomes.

A meta-analysis typically has two parts. The first is the identification of the size of actual effects exerted by the instruction under study. These initial statistics provide an average of the overall impact of the different versions of instruction. These effect sizes describe true effects, the amount of additional learning conferred to the students who received the experimental teaching over the comparison students who did not. In that sense, the initial effect size is a summation or weighted average of causal data (i.e., the independent variable was manipulated). As such, the meta-analyst's Cohen's *d* is not necessarily the final word on a subject, although it should be evident that it would likely provide a more precise estimate of an outcome than one would expect to derive from any single study. Nevertheless, in medicine, it has been found that meta-analytic results fail to predict the outcomes of later large randomized, controlled trials 35% of the time (LeLorier, Grégoire, Benhaddad, Lapierre, & Derderian, 1997). This means that the most precise expression of the best data currently available should be considered as provisional at best and open to revision as new data become available.

In the second part of a meta-analysis, there is usually an attempt to parcel the heterogeneity of effects on the basis of other variables: demographics, research design, experimental treatment variations, and so on. Those results can be informative, pointing the way to potentially useful future research. Yet, it must be remembered that these later results are usually no more than correlations; these statistics are not the effects of causal manipulations. Conclusions drawn from such correlations are less trustworthy than the actual effects of the experimental manipulations. Correlations are useful for identifying incidence and relations, not causation. When it comes to making instructional decisions (i.e., what to teach, which program to use), causal evidence is the gold standard.

Just as there are disagreements over what constitutes dyslexia, it follows that there would be differences in estimates of its incidence as well. Certainly not everyone who struggles to learn to read is dyslexic—there is wide acknowledgment in the scientific community that there are other causes for reading problems—so students with dyslexia are a subset of those who struggle to read, and whether one should start from a base of students below the 20th or 35th percentile seems to be more a matter of policy than science. There are substantial data indicating that reading performance is highly correlated with socioeconomic status (e.g., Kuhfeld, Soland, Pitts, & Burchinal, 2020; Yamasaki & Luk, 2018), indicating that a large percentage of those struggling with reading do so as a result of sociological and/or pedagogical factors, rather than disabilities. Although it is true that reading disabilities are the most commonly identified disability category in K–12 education, it is also true that the inferential nature of how these diagnoses are conducted (e.g., discrepancy scores, response to instruction) would mean that not everyone so identified is actually dyslexic. In any event, given the base of reading difficulty that one starts with and the fact that those with dyslexia are only a subset of that group, it would mean that dyslexia is necessarily a relatively low-incidence disability relative to a typical school's total population.

This level of incidence matters because few classroom studies can be powered sufficiently to properly evaluate the impact of experimental manipulations of instruction on the learning of students with dyslexia. Instead, an instructional innovation is likely to be evaluated across the whole population in a series of classroom experiments, which may later be meta-analyzed. If the results of the innovation are positive, the meta-analyst will check whether any of the demographic or contextual variations correlate with the variations in outcomes. For instance, a meta-analysis of 52 studies of phonemic awareness instruction on early reading achievement (NRP, 2000) resulted in a statistically significant difference in favor of those who received phonemic awareness instruction with an average effect size. Then, the NRP examined the correlations and found that readers in the normal range made somewhat larger gains than the at-risk or struggling readers. That phonemic awareness instruction was generally beneficial is a solid experimental finding, replicated many times; that such instruction was more effective with average

readers than struggling readers is a correlational finding not yet directly evaluated through experiments aimed at making such distinctions. This is important because quite often in meta-analytic studies, the impacts of interventions on struggling readers are teased out through such homogeneity analyses or by accumulating results across studies with quite different operational definitions of what it means to be a poor reader (e.g., Swanson et al., 2017).

I note one final point concerning the reliance here on meta-analyses. In this review, I include meta-analyses conducted over a wide time span, some as recent as a year or two old and others from more than 20 years ago (e.g., NRP, 2000). During that period of time, meta-analytic methods have grown more sophisticated, and educational research has generally gotten more rigorous (Schatschneider, Edwards, & van Dijk, 2020). Nevertheless, the research findings in this case have been quite consistent, something to be expected according to research methodologists (Fletcher, Savage, & Vaughn, 2020; Schatschneider et al., 2020); these examinations of reading instruction have been robust with regard to methodology and degree of rigor.

The Most Effective Tier 1 Teaching for Students With Dyslexia

In the remainder of this analysis, I focus on summarizing research—given the important limitations just discussed—with regard to what it has revealed about effective classroom reading instruction for students with dyslexia. This analysis is organized around three key issues: the amount of teaching provided, the content focus of that instruction (what is taught), and the quality of the instruction.

Amount of Instruction

Research has long found connections between the amounts of teaching and practice and the amount of learning (Farbman, 2015). Amount of instruction is an important correlate in statistical models of learning productivity (Fraser, Walberg, Welch, & Hattie, 1987; Walberg, Pascarella, Haertel, Junker, & Boulanger, 1982) and in meta-analyses of the impact of "time on task" on learning (Hattie, 2009; Kyriakides, Christoforou, & Charalambous, 2013; Sonnenschein, Stapleton, & Benson, 2010). More knowledgeable teachers manage to provide the greatest amounts of instruction and to keep students on task to a greater extent (Schachter, Spear, Piasta, Justice, & Logan, 2016). Various schemes for increasing amounts of teaching, including full-day kindergarten, after-school programs, summer school, and intervention classes (Tier 2), have all led to statistically significant increases in teaching and learning, at least under some circumstances (Cooper, Allen, Patall, & Dent, 2010; Fielding, Kerr, & Rosier, 2007; Lauer et al., 2006; Lester, Chow, & Melton, 2020; Wanzek et al., 2016).

Not all studies have found time increases to be statistically significant, however. For example, meta-analyses of the effectiveness of Tier 2 interventions have found those programs effective in improving reading achievement but have not found dosage variation to be a statistically significant moderator. Amount of instruction will not be expected to matter when the instruction itself is inappropriate (e.g., teaches skills already mastered) or of low quality. This also may be due to poor reporting of dosage information in the original studies than to actual unproductiveness of dosage (Wanzek et al., 2013, 2016, 2017).

Amount of instruction can be important, and this may be especially so for students with dyslexia. Research has shown that struggling learners may require more instruction than average students do to attain equivalent proficiency (Gettinger, 1991). Despite this need, researchers have reported that students with learning disabilities often receive less teaching than their more able peers receive (Friedman, Cancelli, & Yoshida, 1988; O'Sullivan, Ysseldyke, Christenson, & Thurlow, 1990; Vaughn, Levy, Coleman, & Bos, 2002; Wilson & Wesson, 1986). For instance, end-of-year kindergarten achievement was found to vary on the basis of the amount of text reading in which individual students were engaged (Kent, Wanzek, & Al Otaiba, 2012; Wanzek, Roberts, & Al Otaiba, 2014). The average amount of daily reading in this study was only 1 minute 40 seconds, with a great deal of variance across individual students—some hardly reading at all, with the less successful students mainly involved in choral reading. Possibly, the teachers afforded less opportunity to lower performing students to avoid embarrassment, although there was no relation between beginning-of-year student reading levels and the amount of reading required. Of course, kindergartens typically devote much less time to literacy development than is common in grades 1–5; accordingly, small time differences in reading instruction may be more potent at that early point.

Unfortunately, over the past two decades, there have been no experimental studies of the benefits of increases in amount of in-class teaching for students with dyslexia. One reason for this is that time is a measure of a variable, not a variable itself. This means that amount of instruction will usually be confounded with the content of the curriculum or the type of teaching. For example, in one study, increased instruction only led to increased learning when there was differentiation (Hong & Hong, 2009). Often, studies compare approaches with little regard for dosage variation. In a study of high-risk primary-grade students, the experimental group received arts-based instruction in phonemic awareness, phonics, and oral reading fluency (Rose & Magnotta, 2012). Learning was monitored, and students who lagged received additional small-group reteaching

within the classroom by the classroom teacher—not a pull-out intervention. The experimental classrooms outperformed the comparison groups, but it is impossible to distinguish how much of the advantage was due to the explicit foundational curriculum instruction and how much to the extra teaching.

Increased amounts of instruction often have been found to have a positive impact on learning (Aarnoutse, van Leeuwe, Voeten, & Oud, 2001). However, most of this research has been either correlational studies carried out with the normal distribution of students or experimental studies that added to the classroom instruction in Tier 2 settings. There is not strong direct evidence supporting increases in the amount of Tier 1 instruction for students with dyslexia, and yet, given the extant evidence and the substantial variability in allocation of classroom reading instruction (Foorman, Goldenberg, Carlson, Saunders, & Pollard-Durodola, 2004; Kent et al., 2012; Vaughn et al., 2003), it seems prudent to presume that Tier 1 instruction should be maximized for these students when possible. There is evidence that at least some classroom teachers try to provide additional instruction to their struggling students (McIntosh, Graves, & Gersten, 2007); studies of the effects of this practice would be useful.

Curriculum: What Is Taught

There is substantially more, and more direct, evidence on the benefits of teaching various curricular components. Reading is a skilled activity, and to become proficient, students must master particular abilities and skills. It should not be surprising that teaching aimed at developing certain skills would have a positive impact on reading achievement. As already noted, what must be taught to improve reading achievement could be universal, although the amount of instruction in a particular component, how that instruction is delivered, or the point in development when it should be offered might vary. All students, for instance, must learn to decode to become readers, and perhaps all students gain an advantage from explicit decoding instruction. Yet, students with dyslexia, who especially struggle with this component of reading, might require more extensive or intensive decoding instruction, or this teaching may need to continue to be delivered into later grade levels (Kent et al., 2012). Unfortunately, this research has not sorted out those finer calibrations, mainly identifying which skills or abilities lead to improved reading proficiency.

Alphabetics: Phonological Awareness and Decoding

English is an alphabetic language, meaning that the letters represent the sounds of the language rather than the meaning. Readers have to develop the ability to translate the written symbols to oral language representations. A meta-analysis of 235 correlational studies showed that students with dyslexia were less phonemic sensitive than age-matched typical readers and reading-level-matched students (Melby-Lervåg, Lyster, & Hulme, 2012). Moreover, studies have identified key differences in neurological correlates of phonological processing in students with dyslexia when compared with normally progressing readers (e.g., Kovelman et al., 2012). These kinds of data reveal the potential importance of a variable, but they cannot tell whether instruction aimed at fostering this ability will be effective. Accordingly, many studies have explored directly the effectiveness of teaching students to decode and to improve their phonological sensitivity. Five meta-analyses that focused on improving phonological processing or word-reading outcomes were examined. These included studies of explicit instruction in phonemic awareness (Bus & van IJzendoorn, 1999; Ehri, Nunes, Willows, et al., 2001), phonics (Ehri, Nunes, Stahl, & Willows, 2001), the combination of phonemic awareness and phonics (National Early Literacy Panel, 2008), or spelling instruction (Graham & Santangelo, 2014). The results of these are summarized in Table 2.

Only *d* statistics for the most relevant reading outcomes are included in Table 2 (in this case, word reading), distinguishing the performances of normally achieving students and various populations of struggling readers. These struggling reader populations are designated using the terms of the meta-analysts themselves. The table only summarizes those meta-analyses that disaggregated data for struggling readers. However, one analysis, which included several studies of students with students with learning disabilities (Graham & Santangelo, 2014), found no differences in performance due to learning status and only reported a single effect size, combining the results for all students. The table also includes information on whether the teaching was delivered in the regular classroom (Tier 1) or through some kind of pull-out intervention (Tier 2); this was not always possible to determine, and none of the meta-analyses made this distinction. In all cases, the original meta-analyses provided substantially more detail and elaboration beyond the purposes of this article.

Considering all of the evidence, explicit phonemic awareness, phonics, and spelling instruction enhanced reading achievement measured in various ways and for a wide variety of readers. One of these analyses (Ehri, Nunes, Stahl, & Willows, 2001) found that phonics improved young students' performance on word reading, nonsense word reading, spelling, and reading comprehension, but with older students, results were more constrained (gains in word and nonword reading). That analysis concluded that effective phonics teaching should be systematic (i.e., following a specific curriculum). A later examination of this meta-analysis (Stuebing, Barth, Cirino, Francis, &

TABLE 2
Summary of Meta-Analyses of Studies on Phonological Awareness and Word-Reading Instruction

Study	Instruction	Number of studies	Grades	Tier 1	Tier 2	Reading outcome (*d*)	Special population(s)
Bus and van IJzendoorn (1999)	Phonological awareness	34	Pre-K–2			• Normally achieving readers: 0.40* • Strudents struggling with beginning reading: 0.60*	• Students experiencing difficulties in the early stages of learning to read
Ehri, Nunes, Stahl, and Willows (2001)	Phonics	38	K–6	Yes	Yes	• Normally achieving readers in grade 1: 0.48* • Normally achieving readers in grades 2–6: 0.27* • At-risk readers in kindergarten: 0.58* • At risk readers in grade 1: 0.74* • Low-achieving readers in grades 2–6: 0.15 • Students with reading disabilities: 0.32*	• At-risk readers (any reason) • Students with a reading disability (IQ discrepancy) • Low-achieving readers (no discrepancy)
Ehri, Nunes, Willows, et al. (2001)	Phonological awareness	52	Pre-K–6			• Normally achieving readers: 0.47* • At-risk readers: 0.86* • Students with reading disabilities: 0.45*	• At-risk readers in grades pre-K–1 (any reason) • Students with reading disabilities in grades 1–6 (reading difficulty, any reason)
Graham and Santangelo (2014)	Spelling	20	K–12	Yes		• Normally achieving readers: 0.40*	• Students with significant literacy difficulties
National Early Literacy Panel (2008)	Code-focused	83	Pre-K and K			• Normally achieving readers: 0.41*	• The researchers did not separate effects.

*$p < .05$.

Fletcher, 2008) found the degree of explicitness and the intensity of the teaching to be implicated in the success of phonics instruction as well.

Across all five of these meta-analyses, such teaching was found to be beneficial for most types of students, whether they had reading problems due to constitutional or environmental etiologies. Only one of the meta-analyses identified students with reading disabilities, in this case using IQ and reading performance discrepancy as the determiner (Ehri, Nunes, Stahl, & Willows, 2001); the meta-analysts' found explicit phonics instruction equally beneficial for students with reading disabilities and for normally achieving readers. Nor did it seem to matter whether this instruction was delivered in the regular classroom or through interventions, although both kinds of instruction tended to be implemented within small groups. It seems likely that the effectiveness of such teaching would be affected by the degree to which it is appropriate to student needs (Connor et al., 2013; Connor & Morrison, 2016); if students already can decode words reasonably well, additional phonics instruction would be contraindicated.

Text-Reading Fluency

Oral reading fluency or *text-reading fluency* refers to the degree to which students can read text accurately (reading the author's words), with automaticity (decoding the words in a text with little conscious attention, usually estimated by reading rate), and with prosody or proper expression. This aspect of reading is kind of a mash-up of decoding skills and first-wave reading comprehension (e.g., appropriate pausing, appropriate pronunciation of homographs); it may be best thought of as a coordination of skills rather than as a discrete skill itself. Research has found that it is possible to explicitly teach text-reading fluency through instruction that emphasizes the oral reading practice of challenging text with feedback and repetition (Kuhn & Stahl, 2003; National Reading Panel, 2000).

There have been several literature reviews and meta-analyses of explicit fluency instruction studies. Only two of the meta-analyses on this topic are included in Table 3, following the conventions noted earlier for Table 2. Some fluency meta-analyses and reviews are discussed here but not included in Table 3 because they did not consistently distinguish between those that considered the generalization of fluency practice to other texts and those that measured improvements with the practice texts themselves. Only those that considered transfer or generalization are included in the table. The effect sizes for the two meta-analyses included in Table 3 (NRP, 2000; Therrien, 2004) are for transfer—to fluency with other texts (Therrien, 2004) and for multiple reading measures (word reading, fluency, and comprehension; NRP, 2000). In both of these analyses, struggling readers benefited from the instruction, and there were no statistically significant differences in results for normally achieving and low-achieving readers.

TABLE 3
Summary of Meta-Analyses of Text-Reading Fluency Instruction

Study	Instruction	Number of studies	Grades	Tier 1	Tier 2	Reading outcome (*d*)	Special population
National Reading Panel (2000)	Repeated reading	14	1–9	Yes	Yes	• Average readers: 0.47* • Low-achieving readers: 0.49*	Low readers (any reason)
Therrien (2004)	Repeated reading	5			Yes	• Normally achieving readers: 0.59* • Students with learning disabilities: 0.79*	Learning disability (IQ discrepancy)

$^{*}p < .05$.

There have been additional qualitative reviews on this topic as well. For instance, a literature review of 71 published and unpublished studies reported improvements in fluency and comprehension for both normal and struggling readers (Kuhn & Stahl, 2003). No attempt was made to either sort out the types of struggling readers or distinguish effectiveness under different instructional conditions (Tiers 1 and 2). Two other meta-analyses (Chard, Vaughn, & Tyler, 2002; Lee & Yoon, 2017) of 24 and 34 studies, respectively, reported that such teaching had a powerful impact on the oral reading fluency of students with learning disabilities with both practice texts and transfer texts (but did not separate these effects). These analyses only included data from students with learning disabilities (determined by discrepancy methods), but all of these studies appear to have taken place in interventions rather than regular classrooms.

Reading Comprehension Strategies

Executive functions refers to self-regulation abilities such as planning, memory, time management, attentional focus, ability to shift across multiple tasks, and the control or direction of other goal-directed behaviors. Metacognition is a related concept that focuses on strategic decision making and self-awareness (e.g., "Am I understanding?"). Good readers are intentional. They try to understand text, and this requires an ability to set goals, select and implement strategies, monitor success, and make adjustments. Many studies have shown that students with dyslexia struggle with these abilities (e.g., Baker, 2009; Sesma, Mahone, Levine, Eason, & Cutting, 2009). Given the importance of these skills to successful reading, researchers have focused on the effectiveness of teaching comprehension strategies such as summarization, self-questioning, visualizing, seeking main ideas, and inferencing. Table 4 provides a summary of the relevant meta-analyses on this teaching to struggling readers.

An examination of Table 4 reveals that strategy instruction has a positive impact on the reading comprehension of struggling readers of a wide range of description (Elleman, 2017; Gajria, Jitendra, Sood, & Sacks, 2007; Hall, 2016; Kaldenberg, Watt, & Therrien, 2015; Okkinga et al., 2018; Swanson et al., 2014, 2017). The effect sizes are fairly large, but this is likely due to studies with small numbers of subjects and the use of experimenter-designed measures well aligned with the treatments. These findings have been bolstered by a number of qualitative literature reviews. For example, one such review (NRP, 2000) examined more than 200 studies with consistently positive effects on reading comprehension, without, however, any consideration of different types of learners. Reviews of these instructional practices focused specifically on struggling readers have also had positive results (Bogaerds-Hazenberg, Evers-Vermeul, & Bergh, 2020; Edmonds et al., 2009; Gersten, Fuchs, Williams, & Baker, 2001; Sanders et al., 2019; Wanzek, Wexler, Vaughn, & Ciullo, 2010; Weisberg, 1988).

Particularly relevant are two meta-analyses of comprehension strategy instruction that focused on Tier 1 teaching for various types of struggling readers (Okkinga et al., 2018; Swanson et al., 2017). Both analyses found advantages from such teaching. Swanson et al.'s (2017) study illustrates the sampling problems noted earlier, with several categories of struggling readers being combined for the analysis.

Two additional meta-analyses on strategy instruction deserve note because of their content area focus. As previously noted, Tier 1 instruction in secondary school focuses on subjects such as science and social studies rather than reading per se. These meta-analyses examined strategy teaching in the context of school subjects (Kaldenberg et al., 2015; Swanson et al., 2014), and both found positive results, suggesting the possibility of providing effective comprehension strategy instruction in content area classes.

Reading Comprehension: Written Language

Another approach to improving reading comprehension is the teaching of written language, including vocabulary, syntax, cohesion, and text structure. Table 5 summarizes the "written language" meta-analyses. These showed that instruction in morphology (Bowers, Kirby, & Deacon, 2010; Goodwin & Ahn, 2013) and text structure (Hebert, Bohaty, Nelson, & Brown, 2016; Pyle et al., 2017) has consistently benefited a variety of struggling readers, including those with learning disabilities or speech and language disabilities. According to Goodwin and Ahn (2013), morphology instruction improved not only reading comprehension but also other outcomes (e.g., phonological awareness, morphological awareness, vocabulary, reading comprehension, spelling). Although these analyses did not compare classroom instruction with Tier 2 interventions, there were several instances in each analysis in which the teaching was classroom based, suggesting the potential value of such for students with dyslexia in the classroom.

What about other areas of written language instruction? Studies have found that context use instruction improves comprehension (Fukkink & de Glopper, 1998), but with no specific consideration of the effectiveness of such teaching on struggling readers. Likewise, syntactic knowlege (Brimo, Lund, & Sapp, 2018; Deacon & Kieffer, 2018; Foorman, Petscher, & Herrera, 2018) and cohesion (Cain, 2003) have both been implicated in reading comprehension development, particularly for struggling readers (Dalgleish & Enkelmann, 1979; Robertson, Joanisse, Desroches, & Ng, 2009), and instruction in these has been found to improve reading achievement (Elleman, 2017; Hattie, 2009; Neville & Searls, 1991). It should be noted

TABLE 4
Summary of Meta-Analyses of Comprehension Strategy Instruction

Study	Instruction	Number of studies	Grades	Tier 1	Tier 2	Reading outcome (*d*)	Special population(s)
Elleman (2017)	Inference training	25	K–12	Yes		• Skilled readers: 0.55* • Unskilled readers: 0.80*	• Unskilled readers, including students with learning disabilities and poor comprehenders
Gajria, Jitendra, Sood, and Sacks (2007)	Comprehension strategies	3	4–12	Yes		• Students with learning disabilities: 1.75*	• Students with learning disabilities (discrepancy)
Hall (2016)	Inference training	9	2–9	Yes		• Struggling readers: −0.27–1.96	• Struggling readers based on test scores or learning disability status
Kaldenberg, Watt, and Therrien (2015)	Comprehension strategies (science)	11	3–12		Yes	• Students with learning disabilities: 0.64*	
Okkinga et al. (2018)	Comprehension strategies	15	3–12	Yes		• Typical readers: 0.61* • Low-achieving readers: 1.12*	
Swanson et al. (2014)	Comp strategies (social studies)	27	K–12	Yes	Yes	• Students with learning disabilities: 1.02*	
Swanson et al. (2017)	Comprehension strategies	10	4–12	Yes		• Struggling readers: −0.05–0.49	• Students with learning disabilities • Low-achieving readers • Readers below the 25th percentile

*$p < .05$.

TABLE 5
Summary of Meta-Analyses of Written Language Instruction

Study	Instruction	Number of studies	Grades	Tier 1	Tier 2	Reading outcome (*d*)	Special populations
Bowers, Kirby, and Deacon (2010)	Morphology	11	Pre-K–9	Yes	Yes	• Less able students: 0.99* • Undifferentiated .65*	• Students with learning disabilities • Students with dyslexia • Students with speech and language disabilities
Goodwin and Ahn (2013)	Morphology	17	K–12			• Students with learning disabilities: 0.22* • Students with reading disabilities: 0.17* • Struggling readers: 0.46* • Students with speech and language disabilities: 0.77*	• Students with reading disabilities • Students with learning disabilities • Struggling readers • Students with speech and language disabilities
Hebert, Bohaty, Nelson, and Brown (2016)	Text structure	8	2–12			• Low readers: 0.96	• Students with learning disabilities • At-risk readers
Pyle et al. (2017)	Text structure	11	1–12	Yes	Yes	• Typically achieving readers: 1.09* • At-risk readers: 0.99* • Students with learning disabilities: 1.65*	

*$p < .05$.

that cohesion instruction often goes under the label of inference teaching, because linking ideas across a text requires a type of inferencing. Unfortunately, none of these meta-analyses disaggregated the effects for different types of readers, and the syntax-oriented instructional studies have been particularly weak in design. Individual studies have shown the effectiveness of explicit cohesion instruction with struggling readers, however (e.g., Gallini, Spires, Terry, & Gleaton, 1993). It would be premature to conclude that classroom instruction in sentence grammar or text cohesion would necessarily be beneficial for students with dyslexia, although the effects that have been identified are encouraging, if not definitive.

Research has found that teaching phonemic awareness, phonics, text-reading fluency, reading comprehension strategies, and written language features, such as vocabulary or text structure, are all beneficial. The learning advantages conferred by such instruction appear to be reasonably robust across learner types and instructional settings. In other words, such teaching has potential value for students with dyslexia in the regular classroom. The research record is not equally strong in all cases. There have been markedly fewer studies on text-reading fluency or vocabulary than on phonemic awareness, phonics, comprehension strategies, or text structure. Likewise, few studies have been sufficiently powered to permit direct tests of the impact of instruction on students with learning disabilities, so the degree of certainty underlying these conclusions is not particularly high; even those individual studies that were so powered were not able to distinguish Tier 1 effects from the combination of Tiers 1 and 2 effects (as noted earlier, it is possible to distinguish these effects, but none of these studies provided that kind of analysis).

Quality of Instruction

The third, and final, component of instruction that affects reading achievement is quality of instruction. Unlike content instruction, quality focuses on how the teaching is delivered. Some approaches to instruction are either more powerful (i.e., greater effect sizes) or more efficient (i.e., more learning for the amount of instruction) than others. Regrettably, as with amount of classroom instruction, quality of teaching has not generated a great deal of experimental study recently, so reliance on meta-analyses of numerous experimental studies is not possible.

A number of sources have hypothesized what quality Tier 1 instruction should include; these speculations have taken the form of instructional advice (Fletcher et al., 2019; Gersten et al., 2008; Spear-Swerling, 2018) or features designed into complex Tier 1 intervention studies (Al Otaiba et al., 2016; McIntosh et al., 2007; Smith et al., 2016). For the most part, these sources were not specific about the empirical evidence supporting the effectiveness of these features. Here is a list of these hypothetical characteristics of quality Tier 1 reading instruction thought to advantage readers with disabilities:

- Explicit instruction (e.g., systematic and sequential curriculum coverage, clear learning goals, increased instructional modeling, deliberate and ongoing review)
- Differentiated instruction (e.g., small-group teaching targeting specific student needs, homogeneous grouping, close monitoring of student progress, varied curriculum coverage and instructional support)
- Intense lessons aimed at the needs of struggling readers (e.g., high level of response accuracy; elicits responses from all students; modifies instruction for students as needed; provides extra instruction, practice, and review)
- Well-designed lessons (e.g., secures and maintains student attention, carefully chosen examples and nonexamples, emphasis on distinctive features of new concepts, high level of student–teacher interaction, relations made overtly, guided and independent practice)
- Well-implemented lessons (e.g., high level of student–teacher interaction; keeps students on task; prompt, corrective feedback; short and efficient transitions; incorporates student input; practice in materials aligned with the skills taught)

There is sufficient evidence to suggest that at least some of these quality factors could matter in student learning. For example, there is a substantial base of evidence showing that students' ability to sustain attention is correlated with their reading and math achievement (Daucourt, Erbeli, Little, Haughbrook, & Hart, 2020). However, there seem to have been no studies, monitoring the learning of struggling readers, in which Tier 1 teachers were trained to do a better job of gaining and maintaining student attention. Even when there is direct evidence of positive Tier 1 effects with such students, as there is with explicit teaching (Hattie, 2009) and differentiated instruction (Al Otaiba et al., 2016; Connor et al., 2013; Connor & Morrison, 2016; Smith et al., 2016; Stuebing et al., 2008), the evidence is often flawed or confounded. There have been no studies, for instance, that separated the effects of the explicitness of direct instruction from the actual content being taught. Also, most of these studies on explicit teaching and differentiated instruction failed to separate out effects that may have been due to the provision of Tier 2 supports to some of these students and suffered from the Tier 2 confound as well.

There have been some ambitious and provocative Tier 1 intervention studies focused on trying to improve the quality of instruction for struggling readers. For

instance, in a study focused on the professional development of kindergarten classroom teachers, it was found that the professional development led to a statistically significant reduction in the numbers of students identified with early reading problems (Scanlon, Gelzheiser, Vellutino, Schatschneider, & Sweeney, 2008). The study was well designed and carefully implemented, but because of the scope of the training provided, it is impossible to determine exactly which elements were effective. Teachers in the experimental conditions increased the amount of language arts instruction, placed greater emphasis on key curricular components (e.g., phonemic awareness, decoding), adopted instructional materials that provided greater practice with what was taught, and used more differentiated instruction (e.g., small-group teaching) and explicit teaching (e.g., more modeling and scaffolding). Similar results were obtained in a more narrowly focused two-year study in kindergarten. The teachers increased the amount of differentiation over the duration of the study, and students' word-reading scores improved against the initial baseline. Finally, in a similar study conducted in grade 1 classrooms, teachers were induced to increase the explicitness of their teaching and to increase the amount of practice opportunities provided to students within lessons; students gained advantages in both decoding and fluency, but the Tier 1 efforts were hopelessly entangled with Tier 2 support.

The best we can say about these quality factors is that there is strong correlational evidence behind most of them and that many have been part of complex interventions that have been effective with struggling readers in the classroom (Al Otaiba et al., 2016; Fien et al., 2015; Mathes et al., 2005; Scanlon et al., 2008; Smith et al., 2016), although it is impossible to distinguish and evaluate the individual contributions to learning of the various quality elements. With regard to quality of instruction, the research has far to go before it will reduce uncertainty as to the best ways to plan and deliver classroom lessons that will have a positive impact on the learning of students with dyslexia. These quality factors would logically be beneficial, but with few exceptions, they have as yet been validated by empirical study. Even the best research into these quality factors requires substantial assumptions on the part of the practitioner or policymaker when it comes to applying this research to the Tier 1 learning needs of students with dyslexia.

Conclusions

In this article, I provided an explanation of several of the complications of studying and applying research to the classroom instructional needs of students with dyslexia. I explained why it is so difficult to determine what the best classroom choices would be to meet the needs of those students and where there is the greatest uncertainty. Then, recognizing these important limitations, I explored the research evidence concerning the impacts of amount of classroom teaching, the curriculum or instructional content, and the quality of classroom instruction on the progress of students with dyslexia and other reading problems. Despite the barriers to drawing conclusions with high levels of certainty from extant research, policy and practice cannot wait until research provides the best answers possible. Given these analyses, the best current evidence can inform us as to what needs to be taught to these students. In all cases, those things proven advantageous to teach to students with dyslexia have been found beneficial for normally achieving students as well. There are still questions as to the most efficacious amounts and timings of such teaching, however. The most certain results were for phonemic awareness, phonics, reading comprehension strategies, and text structure instruction.

To increase the certainty with which Tier 1 practice could best proceed for students with dyslexia, there is a need for more directly appropriate empirical research. First, studies of instructional practices aimed at teaching reading in regular classrooms should be sufficiently well powered to allow for comparisons not only between experimental and control groups but also for adequate comparisons of readers with learning disabilities within these groups. Good examples of this kind of design are Vaughn et al. (2013, 2015). Second, studies of classroom instruction should simultaneously consider data from Tier 2 programs to allow the attribution of results to Tier 1 versus Tier 1 plus Tier 2 (e.g., Mathes et al., 2005). Finally, although no instructional study can consider all possible effects, researchers could facilitate what can be learned from later meta-analysis by providing a more detailed disaggregation of their data, particularly with regard to different kinds of readers, including those with multiple sources of interference. When studies cannot be adequately powered to allow a meaningful analysis of the students with dyslexia, it would help if researchers would still report the data separately for these students to facilitate the combination of these data in future meta-analyses. Good examples of that kind of reporting are Ehri, Nunes, Stahl, and Willows (2001) and Goodwin and Ahn (2013).

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