

# Screening for Early Literacy Milestones and Reading Disabilities

## The Why, When, Whom, How, and Where

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### WHY Should We Screen?

Every child has the right to learn to read. Proficiency in reading has been shown to be closely related to academic, vocational, economic, and social outcomes (Irwin et al., 2007). Difficulties learning to read have been linked to social-emotional and mental health challenges, and struggling readers are at greater risk for developing anxiety and depression (Dahle & Knivserg, 2014; Hendren et al., 2018; Mugnaini et al., 2009). How much education a person receives is highly dependent on reading proficiency and has been shown to be a crucial predictor of overall health and longevity (Johnston, 2019; Vernon et al., 2007). Students with dyslexia are less likely to enroll in postsecondary education programs (Horn & Berkold, 1999) and more likely to enter the justice system (Moody et al., 2000). It has been reported that up to 75% of incarcerated individuals do not complete high school and/or show low literacy skills, and incarcerated individuals who attend educational programming in the justice system are less likely to recidivate once released (Davis et al., 2013). Overall, the U.S. Department of Labor estimates that illiteracy costs the American economy about \$225 billion a year in lost human productivity, and it has been estimated that bringing all adults in the U.S. to an equivalent of a sixth-grade level would increase the Gross Domestic Product by 10%, or approximately \$2.2 trillion (Rothwell, 2020).

Despite the importance of reading proficiency, approximately 65% of fourth-graders are not reading at grade level, and the data look similar for later grades (National Assessment of Educational Progress, 2019). Struggling readers are four times more likely to drop out of school and African-American and Latinx/Hispanic children who are struggling readers are twice as likely as their White peers to drop out before high school (e.g., Hernandez, 2011).

However, not all of these children qualify for a dyslexia diagnosis, which has been suggested to have a prevalence of 5-17% (Grigorenko et al., 2020) but it is important to note that this prevalence is highly dependent on the employed diagnostic criteria. Dyslexia can be defined as severe word reading deficits, and its developmental progression suggests early difficulties with the “mechanics” of learning to read. This includes early difficulties with the ability to manipulate the sounds of one’s language (phonological or phonemic awareness), print

awareness, and severe difficulties with mapping the sounds of language onto print, namely letters and letter patterns (grapheme-phoneme mapping) (see Ozernov-Palchik & Gaab 2016a,b,c for an overview). These challenges then progress developmentally into difficulties with blending, which is the ability to pronounce individual speech sounds (phonemes) joined together to make a word. Subsequently, children are learning decoding skills, which require the ability to apply the acquired knowledge of these letter-sound relationships to pronounce written words correctly. It is important to note that mastering just the mechanics of reading is not sufficient to develop into a proficient reader. A child can be an excellent decoder, but a lack of oral language skills (e.g., vocabulary, syntactic complexity, and listening comprehension) can severely limit the development of reading fluency and reading comprehension (Adlof & Hogan, 2018; Alonzo et al., 2020; Catts et al., 2016; Snowling & Hulme, 2021). This illustrates the importance of a comprehensive approach when a) choosing appropriate early reading curricula b) screening children who are at risk for the development of deficient reading skills, and c) planning and delivering intervention approaches.

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Struggling readers and people with dyslexia process some reading-related information at the brain level differently than do people who are not struggling readers (Ozernov-Palchik & Gaab, 2016a,b,c; Richlan, 2012). Compared to typically developing readers, struggling readers show reduced gray matter in certain brain regions that process reading and reading-related information, different long-range connections between brain areas that process reading-related information, and reduced

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### Abbreviations

ADHD: Attention deficit hyperactivity disorder  
CAA: Computer adaptive assessment  
CBM: Curriculum-based measure

MTSS: Multi-tiered Systems of Support  
RTI: Response to Intervention

activation in these brain areas while performing prereading and reading-related tasks, as well as differences in how these brain areas communicate with each other (Grigorenko et al., 2020; Ozernov-Palchik & Gaab, 2016a,b,c). We now know that some of these brain differences are present before a child begins learning to read and may start developing differently as early as infancy (Ozernov-Palchik & Gaab, 2016a,b,c for an overview). As a result, children who will struggle to learn to read most likely start their first day of formal schooling with brains that are not as amenable to learning to read as peers without this deficit, which underlines the importance of early identification and intervention to help these children to become competent readers.

When it comes to learning differences, including dyslexia, we are still primarily focused on a reactive, deficit-driven, “wait-to-fail” model instead of on the development and implementation of preventive approaches. As a result, children are often not identified as having a reading difficulty until middle or late elementary school (often much later). This reactive model is highly problematic since up to 70% of below-average readers in first grade remain below-average readers in eighth grade (Landerl & Wimmer, 2008). Furthermore, children with reading difficulties in third grade are likely to struggle throughout their educational career (Francis et al., 1996). Early identification is so important because interventions are much more effective in kindergarten or first grade. Wanzek and Vaughn (2007) reported that word reading interventions were significantly more effective for improving reading outcomes when administered in kindergarten and first grade than when they were administered during later grades. The reason for the increased effectiveness in 4- to 6-year-olds is at least two-fold. First, it has been shown that the brain is much more malleable and shows increased structural and functional plasticity during early development (Gilmore et al., 2018), particularly language development. One prominent example is learning a second or third language, which has been shown to be less effortful in young childhood for most individuals. It has also been shown that it is harder to close the gap between poor readers and good readers in the higher grades of elementary school (Juel et al., 1988; McNamara et al., 2011; Shaywitz et al., 1999).

Overall, converging research points to the importance of early interventions for at-risk students for improving the effectiveness of remediation (Catts et al., 2015; Connor et al., 2009; Connor et al., 2013; Denton et al., 2008; Fletcher et al., 1997; Flynn et al., 2012; Morris et al., 2012; Shaywitz et al., 2008; Torgesen et al., 1999; Vellutino et al., 1996) but implementing early intervention requires early and accurate identification to maximize resource allocations.

#### **WHEN and WHOM Should We Screen?**

Although there have been several initiatives and policies on the national level since 2000 including the National Reading Panel, the No Child Left Behind Act including Reading First (NCLB, 2002), and the Individuals with Disabilities Education Act (IDEA, 2004), the percentage of children not reading on

grade level has not much changed since 1992 (NAEP, 2019). To move from a reactive to a proactive model, we need to initiate screening as early as preschool and no later than the fall/winter of formal schooling to identify at-risk students. Looking at the field of medicine may help because the idea of prevention is much more often embraced in a medical context. For instance, early screening for medical conditions, e.g., heart disease, is widely supported. If a risk is detected, the patient is usually carefully monitored and prescribed interventions designed to prevent or mitigate heart disease. Screening for reading failure including dyslexia follows the same strategy. Children at risk for reading disabilities should be identified through screening before the onset of struggling to read, followed by the necessary interventional strategies to mitigate reading difficulties. The idea here is NOT to diagnose a child with a reading disability or dyslexia in preschool but to prevent its manifestation so that the child will never develop problems with reading or, at least, show better outcomes due to the earlier start of appropriate remediation and intervention strategies during a time of heightened brain plasticity. A well-designed screening approach is the first step in supporting vulnerable populations. The next step should involve providing a detailed plan outlining the how and when of direct, explicit instruction and intervention to maximize the child’s potential to learn to read, which will strongly affect the child’s academic, vocational, economic, social, and health outcomes (Catts & Hogan, 2021) and reduce the overall number of children receiving Special Education services in later grades.

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As a first step during the development of a screening protocol, it is important to identify specific skills that predict reading outcome in children as early as age four. Numerous longitudinal studies have identified specific precursors that predict reading outcomes as early as preschool (Catts et al., 2001, 2015; Compton et al., 2006; Elbro et al., 1998; Lyytinen et al., 2001; O’Connor & Jenkins, 1999; Pennington & Lefly, 2001; Scarborough, 1998; Schatschneider et al., 2004; Stanley et al., 2018). These precursors include phonological awareness (the ability to manipulate the sounds of language), pseudoword repetition (the ability to repeat and reproduce orally presented nonwords or pseudowords), letter and letter-sound knowledge, oral language skills, including vocabulary and oral listening comprehension (Ozernov-Palchik & Gaab, 2016b for an overview) and rapid automatized naming (the ability to quickly retrieve and name a series of highly familiar stimuli arranged in reading direction), which has been shown to be a strong

predictor of later reading fluency (Norton & Wolf, 2012). Although we know HOW to identify children at risk for reading failure, including dyslexia, as early as age four, school districts and communities are best served by following published screening protocols that marry rigorous empirically supported screening tools that will be used early at the beginning of schooling and are culturally and linguistically appropriate for their constituents with efficient data collection and streamlined data scoring and interpretation.

### The HOW of Screening: Considerations and Practical Tips

HOW you screen is, in many ways, a complicated proposition. The very nature of HOW implies a process, and there are a number of processes to consider in screening. Two of these in particular that are minimally necessary are how to *choose* a screener and how to *use* a screener.

#### How to Choose a Screener

Based on conversations with test (assessment) takers, test developers, and test choosers, there is a core set of five question types that are typically asked:

1. Is this screener appropriate for my students/children?
2. Does this screener measure the right things?
3. Are the screening scores reliable?
4. Are the screening scores valid?
5. How well does the screener classify students/children as at-risk?

**Is this screener appropriate for my students/children?** One way to answer this question is to evaluate the norming sample from the published screener carefully. The norming sample refers to the specific group of “test-takers” who were assessed during the process of developing and validating scores for the specific screener. This group (sample) should be representative of the population for whom the screener is intended (see <https://improvingliteracy.org/brief/understanding-screening-sample-representativeness>). Critical aspects of evaluating the norming sample include examining the characteristics of the norming sample for important factors such as age, gender, socio-economic status, geographical region, and how many children had severe reading difficulties. If the children who were part of the norming sample are not representative of those students who will be evaluated with the screener, then the results will not be useful or meaningful. Furthermore, it is important to evaluate how risk of reading difficulty was *numerically quantified* in a norming sample. Numeric quantification refers to the percentage of individuals in the norming sample who were identified as having a reading difficulty. For example, a screener that is normed in a group where severe reading difficulties are considered to affect 10% of the population would theoretically identify half as many students as at risk for a severe reading difficulty compared to a screener that is normed in a group where severe reading difficulty is considered to affect 20% of the population. Careful consideration of the numerical quantification of risk and similarity of the norming sample to the local population are useful indicators of how well a published screener may work in the local environment.

**Does this screener measure the right things?** During the process of finding the most suitable screener for a local context, the scope of an assessment should be evaluated to ensure that developmentally appropriate content is being measured, if the screener has time limits or not, and whether a single-measure screening model or a multi-measure screening model is being implemented (Compton et al., 2006; Gilbert et al., 2012).

Many states adopting dyslexia screening legislation often include an array of skills that should be measured. For example, the state of Massachusetts’ dyslexia guidelines (Massachusetts Department of Elementary and Secondary Education, 2021) recommends that kindergarten students should be screened for dyslexia risk at the beginning of the year using phoneme segmentation (measuring phonemic awareness), letter identification and/or letter sounds (measuring alphabet knowledge), and rapid automatized naming. Correlations between phonemic awareness, letter knowledge, and later word reading are not perfect. This means that not all children with high letter knowledge scores at the fall of kindergarten will have high word reading scores later in the year (Swanson et al., 2003). Because of this phenomenon, a screening tool should include developmentally and culturally appropriate content that has been statistically vetted by scientists as being predictive of later student outcomes. Thus, it is important that the scope of what is included in a screener is vetted by a research team in the local context to judge the relative comprehensiveness of content as appropriate to the locale.

Curriculum-based measures (CBMs) and computer adaptive assessments (CAAs) each exist to maximize a particular aspect of the assessment. CBMs have a long-standing history of use as screeners in preventative model systems such as Multi-tiered Systems of Support (MTSS)/Response to Intervention (RTI) and are chosen due to their brevity in administration and appropriate levels of reliability and predictive validity (Petscher et al., 2013). A limitation of CBMs is that they provide fixed content to all participants and assume that the level of reliability is the same for each test taker. CAAs can produce participant-level reliability compared to fixed-content assessments (Wainer et al., 2000) and adjust the content to be dynamic based on the student’s actual ability. Students with lower ability are administered normatively easier items and students with higher ability are administered normatively more challenging items, yet each item set in a CAA is uniquely customized to the student in its administration.

**Are the scores reliable?** Reliability of scores is an important aspect of high-quality screeners to measure risk and can mean many things. A screener with good reliability can mean that scores are consistent if a child is assessed multiple times over short periods of time (e.g., a few days or weeks apart). Good reliability can also mean consistency in a child’s performance across items in an assessment (e.g., if a child answers a question correctly in the screener, they are more likely to have a higher overall total score compared to a child who answers the question incorrectly). The reliability of scores is an important characteristic of a screener and without reliability, the screener will be uninformative and inconsistent. Multiple types of reliability should be reported for screeners (see <https://improvingliteracy.org/brief/understanding-screening-reliability>).

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**Are the scores valid?** The validity (or accuracy) of scores is related to how well a score reflects what is supposed to be measured by the assessment. There are many forms of validity (Messick, 1989) to describe how accurate the screening tool is in terms of content, substance, structure, generalizability, and the ability to apply the scores from the screener to a particular school district. Each of these may or may not be present in reporting evidence for a screener. School systems that are considering potential screening tools should carefully examine the validity of that tool. An overview of validity types can be found here: <https://improvingliteracy.org/brief/understanding-screening-validity>.

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**How well does the screener classify students/children as at-risk?** Classification accuracy tells us how good a tool is at correctly distinguishing students who have a reading difficulty from students who do not. Classification accuracy of individuals who are at risk and not at risk based on a screener is often the hallmark indicator for the quality of a screener. The complexity of analyses that inform classification accuracy is beyond the scope of what we are able to cover here (see for example Schatschneider et al., 2008; Streiner, 2003). Common statistics used in classification accuracy include the sensitivity of scores (i.e., the ability of the screener to correctly identify those who will become struggling readers), the specificity (i.e., the ability of the screener to correctly identify those who will not become struggling readers), false positive and false negative rates, and other important features of technical adequacy (see <https://improvingliteracy.org/brief/understanding-screening-classificationaccuracy>).

#### **How to Use a Screener in a Local Context**

Beyond an evaluation of important characteristics in choosing a screener, it is equally important to create a screening plan that is optimal for a local context. This development should be informed by evidence-based resources that exist from established organizations such as the National Center on Intensive Intervention, which maintains an academic screening tool chart (<https://intensiveintervention.org/tools-charts/overview>), and the National Center on Improving Literacy (<https://improvingliteracy.org/>), which maintains tools related to screening terminology, use, and supports (e.g., <https://improvingliteracy.org/brief/>). When choosing a new screener, using a screener, or interpreting and implementing screening

results, it is helpful to identify a team of individuals in the local context with diverse skill sets and perspectives. This team includes data-literate individuals who will be essential for interpreting the data based on benchmarks, percentile ranks, or other statistical indicators, individuals who are knowledgeable of, or can identify local needs and priorities related to identification of at-risk children and available intervention strategies, and individuals who can design and oversee the implementation and intervention process. Lastly, it is important to identify individuals who can initiate and maintain conversations with others outside the local context (e.g., social workers, interventionists, pediatricians, scientists; Petscher & Suhr, 2021; Sanfilippo et al., 2020; Schelbe et al., 2021).

#### **What Else Is Important During the Screening Process?**

It is important that all stakeholders understand the difference between screening and diagnostic testing. Inclusive involvement of all stakeholders helps to develop a culture of trust in which there are no false expectations regarding what a screening tool can and cannot do, and that administrators, educators, and parents understand the screening and response-to-screening process. This approach can reduce the perception that the screening process will automatically lead to overcrowded special education services (the goal of screening is the exact opposite) and/or the misunderstanding that screening will lead to the identification and diagnosis of reading difficulties or dyslexia in children as young as four. Furthermore, a well-designed screening approach becomes useless if it is not followed by a well-designed evidence-based response-to-screening approach. This approach illustrates the need for adequate interpretation of the data by data-literate staff or for screening systems that ease data interpretation and the implementation of evidence-based response to screening. Additionally, a screener should directly measure a child's ability and not rely solely on teacher observation or teacher/caregiver surveys. It has been shown that teacher surveys are less accurate and can introduce significant biases (see Martin & Shapiro, 2011). For instance, a kindergarten teacher may not know within the first week of school if a student knows all his or her letter names or sounds. Asked via a survey approach during this time frame, the educator may subjectively respond based on the child's attributes that are not aligned well with the actual behaviors in question, such as general behavior, educational history, or familial background. Furthermore, teacher surveys could be (implicitly or explicitly) influenced to show high or low rates of children at risk and do not provide an objective measure of the child's strengths and weaknesses.

Screening is an important step for preventing the achievement gap and is crucial for achieving equity in education by identifying and supporting vulnerable populations from the beginning of their school careers. However, it is important to note that no screening approach is perfect and that there are many additional factors in a child's environment that can influence reading outcomes. These include neighborhood factors, socio-economic status, caregiver's education, language/literacy environments in the home, and whether or not they have

endured trauma and stress in these environments (Catts & Petscher, 2021). Despite the fact that these factors are important to consider, most of the aforementioned currently are not included in the screening process. It is also important to note that children who have a parent or a sibling with a reading disability or dyslexia have a 40-60% chance to experience reading failure themselves (e.g., Astrom et al., 2007), a factor that also should be included in the screening process.

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### Preventative Models and MTSS/RTI

The concept of a "preventive model" in education is not a new idea and one of the goals of the Individuals with Disabilities Education Act in 2004 was a new identification strategy for children at risk for learning disabilities within public schools, named RTI. The RTI approach consists of assessment, instruction, and intervention within three tiers in order to support students at risk for learning disabilities and is the primary approach of preventive education. Whereas RTI is a model for prevention and intervention to address the specific needs of students who struggle, MTSS has a much broader scope. It provides a systematic, flexible, improvement-oriented framework in which data-based problem solving and decision making in the domains of academic, social, and emotional areas is practiced across various levels and educational and community settings. In theory, RTI as it is outlined offers a flexible and practical approach for identifying and remediating children's skills at risk for dyslexia. However, in practice, its current implementation

in U.S. schools has not led to impactful change and has lacked demonstrable, measurable differences. For instance, Balu et al. (2015) reported that first-grade students who received RTI services showed lower academic performance than students in schools that did not implement RTI. The reasons for this lack of measurable differences in an RTI environment can be multifaceted and include suboptimal identification of children at risk, poor Tier 1 instruction or a lack of fidelity during the implementation process (Fuchs & Fuchs, 2017). Miciak and Fletcher (2020) proposed a "hybrid dyslexia identification process" designed to be implemented within the MTSS framework. Their model recommends collecting data using prereading and spelling measures as specific markers for dyslexia in combination with insufficient response to evidence-based interventions as part of the RTI approach. In this model, a student who shows low performance on prereading and spelling measures and who fails to adequately respond to evidence-based intervention can be classified as having dyslexia.

Recently, advocacy and clinical groups (e.g., Decoding Dyslexia, Ward-Lonergan & Duthie, 2018, or the American Speech-Hearing-Language Association) have pushed the idea of early screening forward legislatively. This legislative push was primarily parent-driven and resulted in over 35 states in the U.S. that now have legislation related to screening for dyslexia. So where does the screening fit within this proposed model? Figure 1 illustrates an integration of screening at the beginning of an academic year followed by RTI components within a general MTSS framework.

It is important to state that many stakeholders think that children with dyslexia need something qualitatively or fundamentally different than typical developing children or children whose reading struggles are less severe. The truth is that children with dyslexia need structured, explicit, high-frequency intervention, and the core components of instructions are the same as for children who do not experience reading failure

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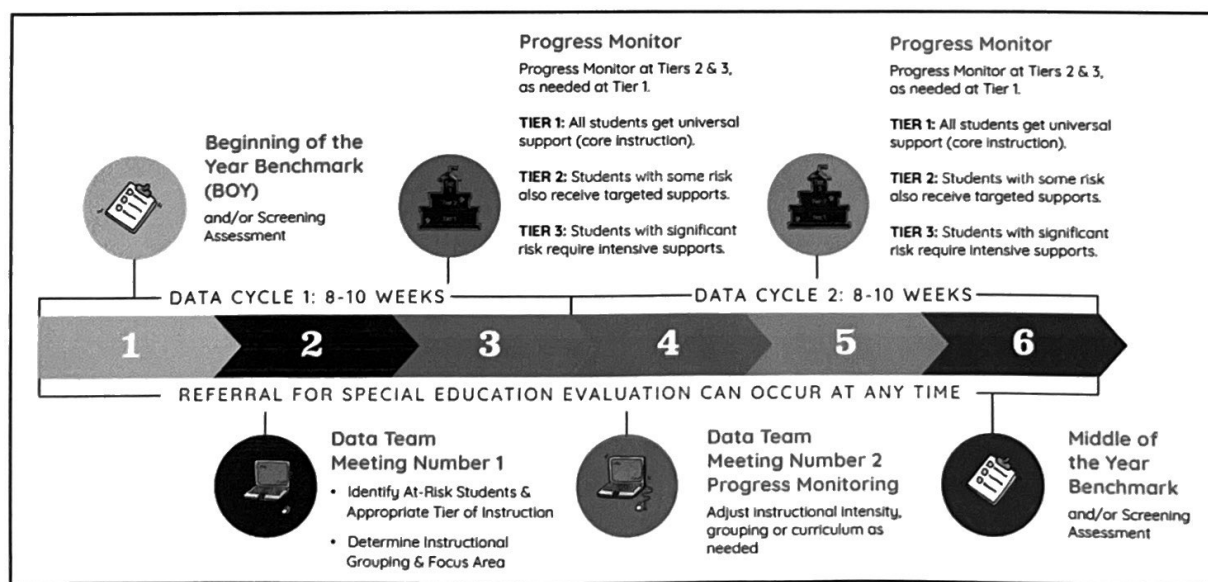


Figure 1.  
Courtesy of the Massachusetts Department of Elementary and Secondary Education, 2021.

(see <https://dyslexiaida.org/what-is-structured-literacy/>). That is, all children benefit greatly from high-quality reading instruction in Tier 1 and this type of instruction is the first and most important step to the implementation of a preventive model in an educational setting. The implementation of a screening protocol should not distract the school district from the maintenance or implementation of their high-quality Structured Literacy-based Tier 1 instruction. If screening and Tier 1 instruction are siloed and seen as separate entities, that will undermine a preventive effort. Children may receive high-quality intervention in Tier 2 and 3 but with a flawed and ineffective Tier 1 program, the outcomes of these intervention efforts will be diminished.

### **WHERE Should We Screen?**

As described above, screening for learning differences/disabilities has been primarily applied within educational systems. However, more recently, there has been a push to implement screening approaches in medical and community settings (Sanfilippo et al., 2020; Schelbe et al., 2021). While pediatricians routinely screen for early precursors of autism-spectrum disorder and attention deficit hyperactivity disorder (ADHD) within annual checkups at age four to seven, they currently do not screen for learning disabilities. Pediatricians argue that they screen for autism and ADHD and not for learning disabilities because autism and ADHD primarily require medical-based interventions, while learning disabilities require educational interventions. However, this argument neglects the fact that children with learning disabilities have an increased risk of developing internalizing and externalizing behaviors, including anxiety, depression, and aggressive behaviors. Given the significant implications of learning disabilities for health outcomes, pediatricians are well-positioned to recognize early signs of learning disabilities even before a child enters a formal educational setting, and this screening should be part of a preventive approach to the early identification of children at risk. Additionally, offering screening days in community settings (e.g., in libraries) has been proposed. For example, screening in libraries could be paired with book or app recommendations in the child's home context and may help with early identification, home literacy interventions, and increased kindergarten readiness. Similar efforts toward increased community screening protocols have focused on social workers (Schelbe et al., 2021) and speech-and-language pathology environments (Adlof & Hogan, 2018).

### **Implications and Future Directions**

Every child has the right to learn to read well. However, we have a global reading skill crisis, and many children are not learning to read proficiently. The civil right of learning to read is deeply connected to many socio-cultural and economic aspects, and the duration of education, which is strongly linked to reading proficiency, is also linked to economic and health outcomes. Moving from a reactive to a proactive model in education through the implementation of evidence-based

screening and intervention protocols will prevent the development of reading disabilities and mitigate the negative impacts on mental health and economic outcomes. However, we are still facing a long journey and future directions need to focus on reducing and eliminating biases and accessibility in dyslexia screening, identification, intervention, support-systems, and awareness. Disproportionately, reading difficulties are more often misdiagnosed, undiagnosed, and/or untreated in children who are Black, Indigenous, or who live in poverty (Odegard et al., 2020; Robinson & Thompson, 2019; Schelbe et al., 2021; Shillingford et al., 2021). Future directions will need to incorporate environmental/socio-cultural risk factors in the screening process, including a history of child neglect/abuse, family stress, trauma, neighborhood factors, caregiver's education, and home literacy variables because all of these have been shown to negatively impact reading outcomes. New advances in screening methodology will be important to improve identification accuracy. Algorithms estimating screening profiles based on multifactorial screening measures are beginning to emerge (Petscher et al., 2018). Globally, we need to encourage funding agencies to increase support of research on language-specific risk factors and the development of screening instruments that are fast, reliable, valid, culturally appropriate and easy to administer and interpret. Each step will help to increase reading proficiency globally and, most importantly, will maximize the joy of learning to read for every child.

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