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Learning Disabilities Research Studies: Findings from NICHD funded Projects

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Abstract

Advancements in prevention and treatment of learning disabilities hold the promise of improving the educational, health, social and civic lives of affected children, adolescents, adults, and their families. To meet this promise, a continued, concerted effort is needed to develop and refine intervention approaches targeting struggling or at-risk learners and those identified with a specific learning disability. These interventions will be delivered in diverse settings by practitioners representing a range of disciplines. We need intervention options that address the developmental range of learners from our youngest to older secondary learners and include a sufficient breadth of intervention approaches to be relevant along the prevention to remediation (e.g., general education classroom and special education services in schools) spectrum. This special issue aims to move us closer to that promise by focusing on projects designed to inform intervention development and test specific intervention models for young, struggling learners at risk for or identified with a reading disability.

Learning Disabilities Research Centers and Learning Disabilities Innovation Hubs Consortia

Since 1989, the Learning Disabilities Research Centers Consortia, established by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development¹ (NICHD),

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The opinions and assertions presented in this article are those of the authors and do not purport to represent those of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development, the U.S. National Institutes of Health, and the U.S. Department of Health and Human Services.

¹The centers were established by the National Institute of Child Health and Human Development, which in 2008 was renamed the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development.

serve as NICHD's primary means for improving knowledge on the causes, origins, treatments, and developmental learning course of learning disabilities by supporting transdisciplinary research related to basic reading skills, reading fluency, reading comprehension, written comprehension, and response to intervention. Research studies funded through the LDRC consortia have influenced the field of reading and specific learning disabilities by contributing to: the understanding of phonemic awareness in reading, the importance of students needing explicit, high-quality instruction, the value of word reading approaches as well as fluency as contributors to reading comprehension, and the overall efficacy of response to intervention (RTI) approaches for identifying and treating individuals with learning disabilities. The contributions of research on reading disabilities through the LDRCs provide examples of how the depth of scientific knowledge accrues within a specific domain and then is meaningfully connected and integrated across disciplines to provide a more comprehensive explanation of a scientific finding – in this case knowledge about reading disabilities.

More recently, the NICHD enhanced its research investment in the area of learning disabilities by developing new Learning Disabilities Innovation Hubs (LD Hubs). The LD Hubs are intended to complement the LDRCs by focusing on understudied research topics in the area of learning disabilities (LDs) specific to reading, writing, or mathematics and include a focus on understudied populations at-risk for one or more LDs. This program intends to speed the cross-programmatic and transdisciplinary transitions underway in the learning disabilities research field to the benefit of all learners. To facilitate this transdisciplinary transition, both programs focus on mentoring of developing and early career investigators with a particular interest in increasing the representation of individuals from under-represented groups in science and hence, more broadly promoting diversity in the cadre of scientist conducting research. These projects provide mentored research opportunities to help ensure future researchers have the skills and experiences necessary to become integral parts of transdisciplinary teams.

Overview of Special Issue

In this special issue, investigators present research findings from three studies, funded wholly or in part through NICHD support of the LDRCs or LD Hub Consortia, related to high priority areas in the field of learning disabilities.

Accurate and appropriate early identification of students with learning disabilities has been an important, albeit somewhat contentious, issue for more than 50 years. Within the last ten years, multi-tiered systems of support or RTI frameworks have been implemented within states and schools across the country (for example, see www.intensiveintervention.org). With recent flexibility permitted by the Individuals with Disabilities Education Act (IDEA; U.S. Department of Education, 2004), states may allow data from RTI practices to influence decisions regarding identification and treatment of individuals with significant learning difficulties most frequently applied to students with reading problems.

We have made great strides in early and accurate screening for reading difficulties leading to early interventions. These approaches to screening are particularly effective in identifying

young children with reading difficulties (e.g., Jenkins, Hudson, & Johnson, 2007). Furthermore, we have experienced considerable success in developing and validating treatment protocols for young children (kindergarten through 2nd grade) with reading problems (e.g., Wanzek & Vaughn, 2007). Despite these successes, there remain considerable gaps in our research knowledge that inhibit appropriate identification and treatment of individuals with learning disabilities.

One significant gap involves education supports for learners who are minimal responders to research-based standard protocols. As a field, we know considerably more about effective treatments for students who respond to research-based standard protocols than we know about students who are minimal responders to these treatments (e.g., Barth et al., 2008; Denton, et al., 2006; Denton, 2012; Toste et al., in press; Vaughn et al., 2010; Vaughn & Fletcher, 2010). When students are provided reading treatments typically associated with improved outcomes, and these students make minimal gains, the solutions for next steps are inadequately defined (e.g., Vaughn & Fletcher, 2012). One common next step when students do not respond adequately to secondary interventions (Tier 2) is to provide additional dosage of the same treatment or a similar treatment. This increased dosage may take the form of increasing the amount of time students are treated in each session, the overall length of the treatment, and/or reducing the group size; however, far less research exists to help inform practitioners' decisions about how and when to increase an intervention dosage (e.g., Al Otaiba, Schatschneider, & Silverman, 2005; Denton et al., 2011; Faggella-Luby, & Deshler, D., 2008)

Additionally, we need to enhance considerably our understanding of the characteristics of learners who are minimally responsive to interventions that have demonstrated efficacy with the goal of informing prevention, early identification, and remediation strategies, not just for beginning readers, but data are needed across the developmental span. Understanding the relationship between the characteristics of learners who are minimal responders, their response to literacy interventions, and how their response may or may not be mediated by other attributes such as executive functioning skills is an imperative next step in LD research (see Bierman & Torres, in press). Such research should provide the foundational understanding of *who* minimally responsive learners are such that we can strengthen their remediation efforts. Research studies also need to better define the mechanisms for designing treatments that are optimally aligned with these learners' characteristics. For example, if the majority of minimally responding students with a reading disability display attention problems, are there mechanisms for enhancing attention during reading treatments that can also enhance learning outcomes? Identifying specific learner characteristics that impact on or interact with interventions requires systematic research with an individual-differences approach. Furthermore, there are a myriad of developmental issues including: how treatments need to vary with students in older grades, the extent to which dispositional factors such as engagement, motivation, and affect influence outcomes and can be treated, the reciprocal role of writing and reading, and mechanisms for identifying and treating students in relation to various aspects of executive functioning.

Understanding the continuum of learners' responses to intervention necessitates an additional focus on underlying causes and hypothesized mechanism leading to adequate or

minimal responses. These causes or mechanisms could be endogenous, exogenous or both. For example, there is robust evidence that reading disability and attention deficit-hyperactivity disorder (ADHD) have significant heritability (e.g., Bidwell, Willcutt, DeFries, & Pennington, 2007; Christopher et al., 2013; Christopher et al., 2012; Gayán & Olson, 2001; Olson et al. 2011; Petrill, Deater-Decker, Thompson, DeThorne, & Schatschneider, 2006; Willcutt, Pennington, & DeFries, 2000; Willcutt et al., 2010) and are associated with deficits in executive functioning. Although heritability estimates of reading are often high, environmental characteristics can modulate these effects. This gene-environment relationship is a complex interplay that changes over time in terms of the estimated variance accounted for in the development of reading skills (e.g., Harlaar, Dale, & Plomin, 2007; Petrill et al., 2007). From an instructional perspective, critically, increasing evidence indicates that reading disabilities are malleable suggesting a need for, and potential benefit from, further refinement of our understanding of effective treatments (e.g., Keller & Just, 2009; Shaywitz et al., 2004; Simos et al., 2002, 2006)

Neuroimaging is also providing insights to both the nature of response and as a predictor of response. Brain imaging has been successfully utilized to show both structural and functional changes in response to *successful* behavioral intervention, i.e., reading intervention (e.g., Keller & Just, 2009; Krafnick, Flowers, Napoliello, & Eden, 2011; Shaywitz et al., 2004; Simos et al., 2002, 2006). In the case of struggling and LD learners, these changes in response to intervention, appear to move brain systems closer to a normalized state consistent with more typically developing learners. Additionally, recent evidence suggests the potential power of imaging as predictive tool – to date in retrodictive studies, i.e., to ascertain who is likely to be responsive to a specific treatment (e.g., Hoeft et al. 2011). This is not to imply that we are advocating imaging learners to inform instruction, but rather these efforts help us understand the underlying mechanisms and causes of response (adequate or otherwise) in the hopes that this will help empower the next generation of interventions. A cogent understanding of risk could inform interventionists' efforts to focus resources on the most struggling learners and provide insights into the types of interventions that might be best applied to learners with historically less tractable learning disabilities. Studies addressing many of these topics are currently being investigated within the scope of work funded by the LDRCs, LD Hubs, and the broader NICHD investment in reading.

Contribution of Articles to this Special Issue

This special issue includes three research studies addressing issues related to reading difficulties in young students (1st through 3rd graders) and two commentaries. In the study reported by Miller and colleagues, teacher ratings of students' behavioral attention predicted at-risk 1st grade students' responses to word reading instruction and then their later (3rd grade) reading comprehension outcomes. This result emphasizes the importance of considering student's attention as it relates to reading outcomes. This finding is particularly notable given the expectation that in the one-on-one treatment intervention the children received, instructors would be more likely to minimize a student's attention related problems than in small or large group instruction. By the time students were in 3rd grade, the relationship between attention and reading comprehension was mediated by word reading

growth in 1st grade and 3rd grade word reading performance. This study provides evidence of potential value in assessing a learner characteristic, behavioral attention, as a means of interpreting at-risk students' responses to intervention.

The benefits of long-term research studies such as the one reported by Miller et al., are also evident in the study by Al Otaiba and colleagues. The Al Otaiba et al. study addresses the long-term effects of two, 1st grade models for implementing RTI on the reading outcomes of students in 2nd and 3rd grades. One of the approaches, referred to as Dynamic, was more responsive to students' individual reading profiles derived from the point of screening onward, whereas the second approach, referred to as Typical, corresponds to standard models of response to intervention. Students in the Dynamic condition demonstrated higher word reading scores at the end of 2nd grade than students in the Typical RTI group. These initial findings may provide important guidance to educators. Students who received interventions that were matched to their individual needs yielded better overall outcomes than those in more traditional, static approaches to intervention. This suggests that moving students to more intensive interventions earlier rather than waiting for them to demonstrate low response to less intensive interventions may be beneficial.

The third study in this special issue is reported by Denton and colleagues and addresses two theoretically different approaches to providing interventions to 2nd graders with significant reading difficulties. One approach is Guided Reading in which the emphasis is on text reading deemphasizing explicit instruction and reading skills. The second approach is described as explicit intervention and addresses more specific instruction in phonemic awareness, phonics, and word reading as well as text reading. Their findings suggest that more explicit instruction is likely to accelerate student progress in phonemic decoding, text reading fluency, and reading comprehension than guided reading. All students, regardless of condition, remained behind in word reading fluency at the end of the school year suggesting that these students require either a significantly more intensive intervention or interventions that are multi-year.

In the first commentary, Fletcher and Wagner (this issue) raise two key issues to inform one's determination of the impact of the studies in this issue and in the literature writ large: Specifically, are effects of intervention cumulative (if not, how do you make them cumulative?) and how does one know when to interpret smaller effect sizes as meaningful? In part through analogy, the authors highlight the potential of small effects being meaningful if they accumulate. Furthermore, they emphasize the import of examining outcomes in the context of findings from the field and general expectations for expected growth/gains for learners. Fletcher and Wagner also discuss conditions that are likely necessary to evaluate whether intervention effects are potentially cumulative (or could be). They emphasize the importance of rigorous designs that provide unbiased estimates of treatment effects, longitudinal designs for intervention to ascertain longer-term impact of intervention, and the inclusion of variables that align with the underlying causal model assumed by the intervention along with appropriate covariates in light of the intervention targets. This commentary further points out the value of context both in interpreting findings today as well as in considering the types of dosage and durations of intervention that may be necessary for struggling learners moving forward. Fletcher and Wagner's broader theme of

the interpretation of smaller effect size and implications for intervention is also carried through in the second commentary.

In the second commentary, Snowling and Hulme (this issue) continue the theme of contextualizing why the field may be obtaining small or modest effect sizes and importantly provide suggestions for approaches to strengthen intervention frameworks to increase effect sizes and the benefit of learners. They point out that interventions may lack the intensity necessary for larger effects and also allude to potentially thinking of years of intervention, particularly for the most struggling learners, and that increasing the literacy experience outside of school (e.g. in the home) is likely needed to support this effort. Additionally, they encourage more attention to enhancing motivation and engagement in the reading process for learners and point out environmental and cultural factors that could inform underlying theory driving intervention development; models are often underspecified regarding these factors and other within-child factors (e.g., attention) that could impact literacy outcomes. Finally, they point out the significant need for more attention to the potential mismatch of language between child and instructor (e.g., differences in dialect) and highlight its potential role in literacy development, particularly for children from diverse backgrounds. Critically, they more broadly highlight need for the development of strong oral language skills to support literacy development. These commentaries, taken together, highlight the need to contextualize our effects in light of their potential cumulative impact as well as their expected impact and emphasize the need to redouble our efforts to strengthen our interventions through an enhanced focus on learner characteristics, environmental conditions, strengthening oral language, etc. These characteristics (and others) will need to be formally incorporating these into theoretical and conceptual accounts of reading development and be combined with extended dosage and duration to help drive improved outcomes from the next generation of interventions.

Implications

In closing, this special issue provides a small sample of the many essential learning disability questions being addressed through current LDRC and LD Hub funding. The articles in this special issue reflect the promise in the continuing efforts of a large cadre of dedicated researchers for not only identifying the mechanisms underlying learning differences, but finding the pathways to more individualized and effective interventions for the children struggling with learning disabilities.

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