Examining the associations between parent concerns and school-age children's language and reading abilities: A comparison of samples recruited for in-school vs. online participation.

Jessica Chan¹

Suzanne M. Adlof¹

Dawna Duff²

Alexis Mitchell¹

Maalavika Ragunathan²

Anna Ehrhorn¹

Department of Communication Sciences and Disorders, University of South Carolina¹

Department of Communication Sciences and Disorders, University of Pittsburgh²

Submitted May 21, 2021

Correspondence to:

Suzanne M. Adlof

Department of Communication Sciences and Disorders

University of South Carolina

1705 College Street, Office 275

Columbia, SC 29205

sadlof@mailbox.sc.edu

Abstract

Purpose: To examine the relationship between parent concerns about children's oral language, reading, and related skills and their children's performance on standardized assessments of language and reading, with a particular focus on whether those relationships differed between children recruited for in-school versus remote participation.

Methods: This study used data from a larger, longitudinal project focused on children with and without developmental language disorder (DLD) and/or dyslexia. The "in-school" sample ($n = 133$) completed assessments in-person before the COVID-19 school closures, and the "remote" sample ($n = 84$) recruited via advertisements completed all assessments online. Parents completed a checklist of concerns regarding language and literacy development, attention and executive functions. All children completed norm-referenced assessments of language and reading.

Results: The two recruitment strategies yielded samples that differed in racial diversity (higher in the in-school sample), caregiver education levels and financial resources (higher in the remote sample), and word reading test scores (higher in the remote sample). Parents in both samples reported higher levels of concerns about literacy skills than oral language skills, and the correlation between parent concerns about literacy and children's word reading test scores was stronger than the correlation between parent concerns about oral language and children's language test scores. We did not find higher level of concerns or a higher correlation between concerns and reading and language performance in the remote sample than the in-school sample.

Conclusions: Researchers should be aware of the impact of different recruitment strategies on sample attainment. Referral models that rely on parent and teacher concerns about oral language to prompt a language evaluation may contribute to low rates of identification of children who meet criteria for DLD. Future research can consider parent concerns about literacy, attention, and executive functions as indicators of a need for language evaluation, especially considering the high comorbidity between language and other developmental disorders.

Introduction

Moving a research project online involves more than just a change to the medium in which we interact with children. For researchers who typically recruit children from schools for in-person assessments during the school day, it also changes the way that we recruit participants. Furthermore, a different level of parent involvement is required for scheduling and setting up the environment and technology for students to participate remotely. Considering these differences, it is reasonable to think that the subset of children that we recruit for participation in research online may be different from those we recruit in schools (Sylvan et al., 2020). In particular, levels of parental awareness of, and concerns about, language development in their children may differ in participants recruited by these different mechanisms. This is one aspect of a broader question about the extent to which clinical or convenience samples in research represent the broader population of interest, and whether we can generalize findings to the broader population (Bornstein et al., 2013). The current study examines the relationship between parent concerns about children's oral language, reading, and related skills and their children's performance on standardized assessments of language and reading, with a particular focus on whether those relationships differed between children we recruited for in-school versus remote participation.

The study took place in the context of a larger project focused on children with impairments in spoken language (e.g., developmental language disorder (DLD)) and/or word reading (e.g., dyslexia). Consistent with the Simple View of Reading (Gough & Tunmer, 1986), deficits in both of these areas convey risk to children's reading comprehension but reading comprehension problems can manifest at different points of academic development. Word reading abilities are strongly predictive of reading comprehension in the early grades, whereas oral language skills (including vocabulary, semantics, syntax, and inference) are more predictive

of reading comprehension in later school grades where the linguistic demands are higher (Foorman et al., 2018). Although language difficulties can be measured in the early grades, their impacts on reading comprehension may not be observable until the later grades (Catts et al., 2012; Fong & Ho, 2019; Justice et al., 2013; Lipka et al., 2006; Nation et al., 2010). Thus, the impacts of DLD and dyslexia are expected to have different trajectories through the school years.

Past research suggests that there is less public and parent awareness of oral language difficulties compared to literacy difficulties (Adlof, 2020; Bishop, 2010; McGregor, 2020). Regarding public awareness, McGregor (2020) reported the number of peer-reviewed journal articles published on DLD versus dyslexia for the years 2000-2019. Although these two disorders have similar prevalence rates, there have been more than twice the number of publications on dyslexia than DLD. Turning to parent awareness, Adlof et al. (2017) compared rates of parent-reported concerns about children's language, reading and academic development and/or a past history of support services in children classified as DLD-only, dyslexia-only, combined DLD and dyslexia, or typical reading and language skills. Parents of children with dyslexia, with and without DLD, reported concerns and/or prior history of services at significantly higher rates than children with DLD-only (56.2% and 60% vs. 29%, respectively). The authors interpreted these results as an indication that parents of children across the three impairment groups may be less aware of children's oral language difficulties than their reading difficulties (see also Hendricks et al., 2019).

Low levels of parent awareness about oral language development and disorders are important because access to speech and language services typically relies on a referral model, initiated by concerns from parents, teachers, or other professionals about a child's language development. Moreover, language weaknesses may present differently in social and academic

settings due to the differing linguistic demands, making language difficulties difficult to detect without direct measurement. In contrast, reading difficulties may be easier to detect because reading is directly taught and monitored in schools. In the clinical context, low rates of identification of language and reading impairments raise concerns about the number of children who are not identified and not receiving academic supports. In research contexts, recruitment methods that rely on referrals or parent concerns may produce different samples than those that use community-based methods. This is because identification rates for DLD vary with many factors, including gender, race, socio-economic status, and presence of factors including speech sound disorders, attention and executive function deficits (Morgan et al., 2016; McGregor, 2020; Redmond, 2016; Wittke & Spaulding, 2018; Zhang & Tomblin, 2000). Furthermore, rates of comorbidity of language and reading impairment are generally higher in studies that use clinical or convenience samples than community-based samples (Catts et al., 2005; Dewey, 2021; McArthur et al., 2000).

The sudden shift to tele-assessment as a result of COVID-19 restrictions affected clinicians and researchers alike. In research contexts, one impact was on recruitment. In the case of the current study, recruitment for our larger project could no longer rely on a community-based sampling approach. Instead, we shifted to recruitment from advertisements that targeted children with suspected reading or language difficulties as well as those with typical development. Another impact was on the level of parent involvement required for children to participate in the study. For in-person, in-school data collection, minimal parent involvement was required other than the return of the signed consent form and parent questionnaires. Researchers worked with school administrators and teachers to arrange student testing schedules, and the data collectors worked with students individually on site. For remote data collection,

parents were the primary contact for all communication, including scheduling multiple appointments for their child and setting up equipment for data collection on the participant's end (e.g., computer or tablet with a camera in a quiet environment). This presented a unique opportunity to study differences between samples of children recruited via community-sampling (in schools), versus convenience sampling (advertisements in a variety of mediums). Such differences are of importance not only to this study but are important to the interpretation of other studies about DLD which use convenience sampling. We were especially interested in levels of parental concern, and the extent to which those concerns match measured language and reading abilities. This is important because when the recruitment strategy itself (whether for research or for school or clinical practice) requires high levels of parental initiative, levels of parental concern may be different from the population as a whole.

This study addressed three research questions: First, considering reading, language, and related skills, what are the most commonly reported areas of concern by parents in the school-based versus remote sample? Based on results of past studies (e.g., Hendricks et al., 2019; McGregor, 2020), we hypothesized that parents would be more likely to report concerns about children's literacy skills than their oral language abilities. Considering the higher level of parent involvement required for remote vs. in-school participation, and the fact that we advertised for children with language or reading difficulties, we hypothesized that parents in the remote sample would report more concerns overall than parents in the school sample. Second, what are the associations between parent concerns and children's language and word reading abilities as measured by norm-referenced assessments? We hypothesized that parent concerns and children's performance on standardized tests would be more strongly correlated for word reading than oral language because word reading difficulties may be more visible than oral language difficulties.

Third, do the associations between parent concerns and children's language and word reading scores differ between the two samples? We hypothesized that parent concerns and children's language and word reading scores would be more strongly correlated in the remote sample than in the school sample.

Method

This study used data from a larger, longitudinal project focused on children with DLD, dyslexia, both disorders, or typical development. Data were collected at the University of South Carolina and the University of Pittsburgh, and all study procedures were approved by IRBs at each site.

Participants

Participants included a total of 217 second grade students recruited through two sampling methods. The "in-school" sample ($n = 133$) included children recruited from twelve classrooms across three schools in one school district in South Carolina in the 2018-2019 school year, and ten classrooms in two schools in the 2019-2020 school year before the COVID-19 school closures. One of the schools participated both years. Those who spoke English as their primary language were invited to participate in a larger, ongoing study in which all data collection was conducted in person during school hours.

Participants in the "remote" sample ($n = 84$) were recruited via advertisements posted on local and national research participant registries; on ASHA SIG message boards; on websites and email lists for the South Carolina Speech-Language Hearing Association and Georgia Speech-Language-Hearing Association; on email lists for local public libraries and tutoring centers for children with reading difficulties; and on social media groups for parents, educators, and speech-language pathologists that were organized around topics such as dyslexia, the science of reading,

evidence-based practice in speech-language pathology, and local and regional school district issues. Advertisements targeted children with reading or language difficulties as well as typically developing children, and all advertisements were sent with requests to re-share. The remote sample includes participants from 21 states in the United States.

For all children included in this study, parents reported no history of autism, uncorrected vision, or motor disorder (including apraxia of speech). Parents of a few children who were included in the study reported other diagnoses such as attention (ADHD/ADD), dyscalculia, slow processing disorder, and anxiety disorder. Standardized assessments of language and reading ability were administered individually in person or on Zoom, depending on the sample.

Measures

Parent Questionnaire

Parents completed an intake questionnaire requesting demographic information as well as information about their child's medical and educational history, family history of language or reading disabilities, history of prior support services¹ (e.g., speech, language, or special education services and/or extra supports specifically in the areas of reading or math), school lunch status, and a checklist of concerns regarding language and literacy development addressing receptive and expressive oral language, speech production, literacy (word reading, spelling, reading comprehension, and writing), and attention and executive functions. The checklist was adapted from Hendricks et al. (2019) with a few additional items. Parents checked all areas of concern for their child and indicated additional concerns under "other". Parents of in-school participants completed the questionnaire in paper form and parents of remote participants were invited to complete the questionnaire using REDCap electronic data capture tools hosted at the

University of South Carolina and University of Pittsburgh (Harris et al., 2009; Harris et al., 2019).

Oral language

The Clinical Evaluation of Language Fundamentals, Fifth Edition (CELF-5; Wiig, Semel, & Secord, 2013) was administered as a comprehensive measure of language ability assessing domains including semantics, morphology, and syntax. It is normed for students between 5–21 years old. The Core Language Score represents a composite of scores on the Sentence Comprehension, Word Structure, Formulated Sentences, and Recalling Sentences subtests for children up to 8 years old, and Word Classes, Semantic Relationships, Formulated Sentences, and Recalling Sentences for children 9–21 years old.

Word reading

The Word Identification and Word Attack subtests of the Woodcock Reading Mastery Test, Third Edition (WRMT-III; Woodcock, 2011) were administered to assess children's ability to read real words and decode nonwords, respectively. The Basic Skills score is a composite of scores on these two tests.

Results

Table 1 lists the descriptive statistics for both samples. The samples were similar in terms of age and gender. Both samples included a majority of White and Non-Hispanic participants, but there was a greater proportion of participants who identified as Black or African American in the in-school sample than the remote sample. A higher number of parents in the in-school sample indicated eligibility for free or reduced-price school lunch (42.9%) compared to the remote sample (14.3%). For both samples, "Mother" represented the majority of responses for Caregiver 1. The most common response for Caregiver 2 in both samples was "Father", but this represented

a smaller proportion of the in-school sample than the remote sample (57.9% vs. 83.3%).

Although there was some overlap across samples, caregivers in the remote sample tended to report higher levels of education than caregivers in the in-school sample. In terms of history of services, the remote sample had slightly higher reports of history of services (29.8%) compared to the in-school sample (24.8%). However, the number of families with a family history of language or reading disabilities were similar for the in-school (17.3%) and remote samples (16.7%).

[INSERT TABLE 1 ABOUT HERE]

Table 2 shows the descriptive statistics for norm-referenced measures of word reading and oral language abilities for each sample. Both samples scored near the normative mean on the CELF-5 Core Language and were not significantly different from each other, $t(215) = -1.005$, $p = .32$. Considering word reading abilities, the mean for the in-school sample was significantly lower than the remote sample, who scored near the normative mean, $t(215) = -3.243$, $p = .001$, and the effect size was medium ($d = -.45$, $p < .01$). Although the mean average oral language abilities of children recruited from each of the two sampling methods were similar, a wide range of abilities is represented across both samples.

[INSERT TABLE 2 ABOUT HERE]

Research Question 1: Considering reading, language, and related skills, what are the most commonly reported areas of concern by parents in the school-based versus the remote sample? Do the samples differ in frequency of reported concerns?

Our first research question focused on the extent to which parents reported concerns related to reading, language, and related skills in each sample (see Table 3). Overall, the rate of concerns in any category was relatively low across both samples. Slightly less half of parents in

the in-school sample (43.6%), and just over half of parents in the remote sample (54.8%) reported no concerns in any area. Of the concerns that were reported, “paying attention” was the highest reported concern by parents for both samples (27.1% in-school; 25% remote). For the in-school sample, the second highest concern was “Understanding what he/she reads” followed by “Remembering instructions or personal belongings”. For the remote sample, the second highest concern was “Writing sentences or longer texts” followed by “Spelling”.

We hypothesized that parents would be more likely to report concerns about literacy than oral language. Consistent with this hypothesis, parents in both samples reported concerns related to receptive and expressive oral language less often (6.8 – 9% in-school; 1.2 – 3.6% remote) than concerns about literacy, including word reading (12.8% in-school; 11.9% remote), spelling (15% in-school; 20.2% remote), writing (18.8% in-school; 21.4% remote) and reading comprehension (26.3% in-school; 14.3% remote). To further examine this hypothesis, we computed an average score for the three indicators of oral language including: “Understanding what you tell him/her at home”, “Understanding teachers at school”, and “Expressing his or her thoughts when speaking” and an average score for four indicators of literacy-related concerns including: “Reading individual words”, “Spelling”, “Understanding what he/she reads”, and “Writing sentences or longer texts”. Wilcoxon Signed-Ranks tests confirmed that average parental concern about literacy was significantly higher than average parental concern about language in both the in-school sample ($Z = 3.89, p < .001$) and the remote sample ($Z = 4.32, p < .001$).

We also hypothesized that parents in the remote sample would report more concerns about language, literacy, and related areas than parents in the in-school sample. The range of concerns was similar across both samples, but the distributions were positively skewed (in-school = 1.60, remote = 2.18). Therefore, we used Mann-Whitney U tests to examine group

differences in the total number of concerns (max =12); no significant difference was detected ($U = 4963.00, p = .141$). We further examined differences in averaged language vs. literacy concerns. For language concerns, the in-person sample scored significantly higher than the remote sample ($U = 4832.50, p = .003$). For literacy concerns, no significant difference was found between groups ($U = 5400.50, p = .619$). Thus, the hypothesis of higher rates of concerns for the remote sample was not supported, whether considering total concerns, language-related concerns, or literacy-related concerns. Overall, parents in both samples reported significantly more concerns related to literacy than oral language.

[INSERT TABLE 3 ABOUT HERE]

Research Questions 2 & 3: What are the associations between parent concerns and children's oral language and word reading abilities as measured by norm-referenced assessments? Do these differ between in-school and remote samples?

To address research questions 2 and 3, we examined correlations between parent-reported concerns on the intake questionnaire and children's abilities on norm-referenced measures of language and word reading for each sample (see Table 4). We hypothesized that the correlation between parent concerns about children's literacy skills and their word reading scores would be higher than the correlation between parent concerns about children's oral language abilities and their oral language scores. We also hypothesized that the relationship between parent concerns and children's scores on reading and language tests would be stronger in the remote sample than the in-school sample. First, we considered the alignment of parent concerns about oral language abilities and children's scores on oral language tests. The correlation between mean oral language concerns and CELF-5 Core Language scores was significantly stronger in the in-school sample than the remote sample (in-school $r = -.28, p < .01$; remote $r = .04, p > .05$; $z = -2.315, p$

= .01). The lack of a significant correlation in the remote sample is consistent with the finding of low rates of reported oral language concerns in the remote sample. The same patterns were reflected in the correlations between individual checklist items related to oral language and CELF-5 Core Language scores for each sample.

Turning to reading abilities, the mean parent concerns about literacy abilities was significantly and moderately correlated with WRMT-3 Basic Skills scores in both samples (in-school $r = -.41, p < .001$; remote $r = -.44, p < .001$; $z = 0.259, p = .40$). Likewise, the correlations between individual checklist items related to literacy and WRMT-3 Basic Skills scores were of similar magnitudes for the two samples. Consistent with our hypothesis, the correlations between literacy concerns and WRMT-3 Basic Skills scores were numerically larger than the correlations between concerns about oral language and CELF-5 Core Language scores for both samples; however, this difference was only significant for the remote sample ($z = 3.26, p = .001$; in-school $z = 1.19, p = .12$).

It is also important to consider the significant positive, moderately high correlation between children's language and word reading scores, reflecting shared variance between these skills ($r = .59, p < .001$ in-school; $r = .61, p < .001$ remote). Given this relationship, parent concerns about literacy may indicate potential weakness in oral language and vice versa. Indeed, mean literacy concerns were significantly correlated with CELF-5 Core Language scores for both samples, with a similar magnitude ($r = -.38, p < .001$ and $r = -.37, p < .01, z = 0.082, p = .47$) that was numerically higher than the correlation between CELF-5 Core Language scores and mean language concerns for both samples, but only significant for the remote sample (remote $z = 2.73, p = .003$; in-school $z = 0.906, p = .18$). On the other hand, mean literacy concerns were more strongly correlated with WRMT-3 Basic Skills scores than mean language concerns for both

samples (in-school $z = 1.961$, $p = .025$; remote $z = 3.02$, $p = .001$). Overall, these results suggest a greater alignment between parent concerns about literacy and both reading and language scores than between parent concerns about oral language and oral language scores.

Last, we examined correlations between total parent concerns and language and reading scores. Overall, the strength of these associations was similar across both samples. Total parent concerns was correlated with CELF-5 Core Language scores at $r = -.33$ ($p < .001$) for the in-school sample and $r = -.28$ ($p < .01$) for the remote sample. Total parent concerns was correlated with WRMT-3 Basic Skills scores at $r = -.33$ ($p < .001$) for the in-school sample and $r = -.36$ ($p < .01$) for the remote sample.

[INSERT TABLE 4 ABOUT HERE]

Discussion

With the rise in the number of studies utilizing tele-assessment to study clinical populations, including young children, it is important to consider how sampling methods influence study outcomes. The nature of tele-assessment and the level of involvement required of families necessitates that only a subset of children who could be typically assessed in schools will be able to participate in remote research. Such issues may be particularly important for research focused on “hidden” disorders, such as DLD, which are known to be under-identified, yet primarily rely on referrals for identification in both research and clinical practice. Past studies of DLD which have recruited from clinical or convenience samples have shown higher rates of word reading impairment in those samples than studies that used community-based sampling (Dewey, 2021). With this context in mind, we examined parent concerns about reading, language, and related skills across two samples, an in-school sample and a remote sample, and investigated the associations between parent concerns and children’s performance on norm-

referenced measures of language and word reading ability. As we predicted, parents reported higher levels of concerns about literacy skills than oral language skills in both samples, and the correlation between parent concerns about literacy and children's word reading test scores was stronger than the correlation between parent concerns about oral language and children's language test scores. However, we did not observe higher level of concerns or a higher correlation between concerns and reading and language performance in the remote sample than the in-school sample.

The in-school sample was recruited with a community sampling approach. All second-grade students enrolled in the participating schools who spoke English as their primary language were invited to participate, and all who met broad inclusionary criteria (i.e., no medical history that would be expected to impact reading or language development) were included in the study. The community represented by this sample is drawn from a single school district, whereas our remote sample was recruited nationally through targeted advertisements and word of mouth. Although we made efforts to recruit participants with a range of backgrounds and were successful in recruiting participants with a wide range of oral language and word reading abilities, the two samples differed in several ways. First, there was somewhat more variability in racial diversity and household caregivers in the in-school sample than in the remote sample. Second, the average participant in the remote sample had higher socio-economic status, as indicated by school lunch and caregiver educational attainment, than the average participant in the in-school sample. This is not surprising considering that the remote sample was recruited primarily through digital advertisements as well as the greater level of parent involvement for remote participation. Despite these demographic differences, we nonetheless found that the mean language scores in both samples fell within the average range and were not different from each

other. In contrast, there was a significant difference between groups for word reading scores. Both group means fell within normal limits, but the in-school sample mean was in the low-average range and significantly lower than the remote sample mean that was near the normative mean. Although we cannot draw strong conclusions about these sample differences as they relate to language or reading impairment with the data we have, they highlight the importance of considering how recruitment methods may influence sample attainment.

We first investigated the rates and types of concerns reported by parents in each sample. The rate of concerns in each category was low overall, and the total number of concerns reported by parents did not differ significantly between groups. Approximately half of the parents in each sample reported no concerns in any area, which is consistent with the finding that most children scored within normal limits on both language and word reading assessments. As we predicted, parents in both samples reported literacy concerns significantly more often than language concerns. However, the single most common parent concern in both samples was related to attentional processes. A few children in both samples had a prior diagnosis of attention deficit disorder; however, even when these children were excluded from the study, concerns about attention remained the highest reported area of concern in both samples. Similar results were reported by Hendricks et al. (2019) and may be related, in part, to a greater public awareness of ADD/ADHD as compared to DLD (Bishop, 2010).

Next, we considered the alignment between parent concerns about literacy and oral language and children's performance in these areas. Across both samples, we found that parent concerns about literacy were more strongly correlated with children's performance in word reading *and* oral language than parent concerns about oral language were. Indeed, for the remote sample, there was a near-zero correlation between concerns about oral language and children's

oral language test scores. This may be partly due to the low rate of concerns about oral language in the remote sample, despite the fact that the range of scores included several children who scored in the range of language impairment. Overall, these results extend those of past studies suggesting lower levels of parent concerns about oral language than reading in children with DLD (Hendricks et al., 2019) and lower rates of parent concerns in general for children with oral language difficulties than those with word reading difficulties (Adlof et al., 2017).

Third, although we hypothesized that there would be stronger correlations between parent concerns and children's test scores in the remote sample than the in-school sample, the results did not support this. Instead, both samples exhibited similar correlations between parent concerns about literacy and language and reading scores, and the in-school sample showed stronger correlations between parent concerns about oral language and children's language scores. Thus, although the samples were recruited by different means, and differed in average caregiver education levels and financial resources (as measured by eligibility for free or reduced-price school lunch), the relationship between parent concerns and child abilities were generally similar across groups.

In considering these results, we acknowledge a few limitations. First, although a wide distribution of both language and reading abilities was observed in both samples, most children in both samples were performing within normal limits. Future studies with a larger number of children scoring in the below average range will have more power to detect significant relationships between parent-reported concerns and child abilities. Second, we must be cautious about any interpretations related to the history of support services within the in-school sample and between the in-school and remote samples due to differences in the question wording in different years of the study. Finally, we acknowledge that binary responses about parent

concerns may be less sensitive to the range of abilities as other types of parent reports, such as those that include a rating scale (e.g., Nelson et al., 2016), or ask parents to indicate the presence or absence of specific behaviors (e.g., Bishop, 2003). To this end, we are currently collecting data using a parent report measure that invites parents to rate their child's ability in various oral- and written-language domains.

Despite these limitations, we believe these findings have important implications for how children with language disorders are identified in research and in clinical practice. First, referral models that rely on parent and teacher concerns about language to prompt an evaluation may be contributing to the low rates of identification of children who meet criteria for DLD (Christopoulos & Kean, 2020; Norbury et al., 2016; Tomblin, 2014). Tomblin (2014) reported that the majority of children with DLD who were identified in an epidemiologic study in kindergarten and followed through high school did not receive intervention at any point. This is unfortunate, considering the high rate of reading comprehension difficulties observed in the same sample of children, especially in the later school grades (Catts et al., 2012), which may have been prevented or mitigated with effective language intervention. Secondly, the high comorbidity between language and other neurodevelopmental disorders including ADHD and dyslexia (Adlof & Hogan, 2018; Redmond, 2016; Snowling et al., 2020) suggest that when parents raise concerns about literacy, attention, or executive functions, an evaluation of oral language abilities is warranted. One possibility is that the observations that lead parents to be concerned about attention (not following directions, for example) may actually be an indicator of language difficulties, but parents may not attribute those observations to oral language. Alternatively, language impairment may be a contributing source to the visible symptoms manifested in other domains.

Conclusions and Future Directions

This study is part of a larger longitudinal project about children with and without language and reading impairments. We found that parent concerns about oral language were low in school-aged children, which may be attributed to lack of public awareness about language development and language disorders and the difficulty tracking language development without direct measurement. In raising public awareness about language development and language impairments specifically for DLD, we must consider methods that promote the identification of children with weaknesses. The present study highlighted the relationship between parental concerns and children's scores on language and literacy, however, further research is needed to examine the extent to which parent awareness and parent concerns about language development and language disorders for children with and without language-based impairments can inform differences in identification rates in clinical and research settings.

Another line of research inquiry that requires further investigation is the relationship between parental concerns and children's language and literacy performance on standardized measures as a result of recruitment methods. Tele-assessment has provided many benefits including broadening representation of learners in studies not bound by geographic location, but access to teletherapy services was not equal for students from lower vs. higher socioeconomic backgrounds during the COVID-19 pandemic (Sylvan et al., 2020). Responses to our advertisements for remote participants yielded a sample of participants with relatively highly educated parents with greater financial resources on average than our in-school sample. In future analyses, we aim to recruit a more racially, ethnically, and economically diverse sample of participants for remote participation. Still, the relationship between parent concerns and child abilities was largely similar across our two samples, despite their demographic differences.

460 Overall, we hope this research inspires researchers and clinicians alike to consider the influence
461 of recruitment methods on understanding children with DLD in the broader population.

462

Acknowledgements

Research reported in this article was supported by the National Institute on Deafness and Other Communication Disorders Grants R01DC017156, awarded to the University of South Carolina (Principal Investigator: S. M. Adlof). The content is solely the responsibility of the author and does not necessarily represent the official views of the National Institutes of Health. We are grateful to the students, parents, and teachers who assisted with our project and to all members of the SCROLL Lab at the University of South Carolina and the Child Language and Literacy Lab at the University at Pittsburgh who assisted with data collection and processing.

References

- Adlof, S. M. (2020). Promoting reading achievement in children with developmental language disorders: What can we learn from research on specific language impairment and dyslexia? *Journal of Speech, Language, and Hearing Research*, 63(10), 3277–3292. https://doi.org/10.1044/2020_JSLHR-20-00118
- Adlof, S. M., & Hogan, T. P. (2018). Understanding dyslexia in the context of developmental language disorders. *Language, Speech, and Hearing Services in Schools*, 49(4), 762–773. https://doi.org/10.1044/2018_LSHSS-DYSLC-18-0049
- Adlof, S. M., Scoggins, J., Brazendale, A., Babb, S., & Petscher, Y. (2017). Identifying children at risk for language impairment or dyslexia with group-administered measures. *Journal of Speech, Language, and Hearing Research*, 60(12), 3507–3522. https://doi.org/10.1044/2017_JSLHR-L-16-0473
- Bishop, D. V. M. (2003). *Children's Communication Checklist (CCC-2)*. London: Psychological Corporation.
- Bishop, D. V. M. (2010). Which neurodevelopmental disorders get researched and why? *PLoS One*, 5(11), e15112. <https://doi.org/10.1371/journal.pone.0015112>
- Bornstein, M. H., Jager, J., & Putnick, D. L. (2013). Sampling in developmental science: Situations, shortcomings, solutions, and standards. *Developmental Review*, 33(4), 357–370. <https://doi.org/10.1016/j.dr.2013.08.003>
- Catts, H. W., Adlof, S. M., Hogan, T. P., & Weismer, S. (2005). Are specific language impairment and dyslexia distinct disorders? *Journal of Speech, Language, and Hearing Research*, 48, 1378–96. [https://doi.org/10.1044/1092-4388\(2005/096\)](https://doi.org/10.1044/1092-4388(2005/096))
- Catts, H. W., Compton, D., Tomblin, J. B., & Bridges, M. S. (2012). Prevalence and nature of late-emerging poor readers. *Journal of Educational Psychology*, 104(1), 166–181. <https://doi.org/10.1037/a0025323>
- Christopoulos, T. T., & Kean, J. (2020). General education teachers' contribution to the identification of children with language disorders. *Perspectives of the ASHA Special Interest Groups*, 5(4), 770–777. https://doi.org/10.1044/2020_PERSP-19-00166
- Dewey, K. (2021). *Systematic review of factors impacting reading impairment rates in studies of children with developmental language disorder (DLD)*. [Senior Thesis, University of South Carolina]. Scholar Commons. https://scholarcommons.sc.edu/senior_theses/459
- Fong, C. Y.-C., & Ho, C. S. H. (2019). Poor oral discourse skills are the key cognitive-linguistic weakness of Chinese poor comprehenders: A three-year longitudinal study. *First Language*, 39(3), 281–297. <https://doi.org/10.1177/0142723719830868>

- 518 Foorman, B. R., Petscher, Y., & Herrera, S. (2018). Unique and common effects of decoding and
 519 language factors in predicting reading comprehension in grades 1–10. *Learning and*
 520 *Individual Differences*, 63, 12–23. <https://doi.org/10.1016/j.lindif.2018.02.011>
 521
- 522 Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and*
 523 *Special Education*, 7(1), 6–10. <https://doi.org/10.1177/074193258600700104>
 524
- 525 Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009). Research
 526 electronic data capture (REDCap) -- a metadata-driven methodology and workflow process
 527 for providing translational research informatics support. *J Biomed Inform.*, 42(2), 377–81.
 528 <https://doi.org/10.1016/j.jbi.2008.08.010>
 529
- 530 Harris, P. A., Taylor, R., Minor, B. L., Elliot, V., Fernandez, M., O’Neal, L., McLeod, L.,
 531 Delacqua, G., Delacqua, F., Kirby, J., Duda, S. N., & REDCap Consortium (2019). The
 532 REDCap consortium: Building an international community of software partners. *J Biomed*
 533 *Inform.*, 2019 May 9. <https://doi.org/10.1016/j.jbi.2019.103208>
 534
- 535 Hendricks, A. E., Adlof, S. M., Alonzo, C. N., Fox, A. B., & Hogan, T. P. (2019).
 536 Identifying children at risk for developmental language disorder using a brief, whole-
 537 classroom screen. *Journal of Speech, Language, and Hearing Research*, 62(4), 896–908.
 538 https://doi.org/10.1044/2018_JSLHR-L-18-0093
 539
- 540 Justice, L. M., Mashburn, A., & Petscher, Y. (2013). Very early language skills of fifth-grade
 541 poor comprehenders. *Journal of Research in Reading*, 36(2), 172–185.
 542 <https://doi.org/10.1111/j.1467-9817.2011.01498.x>
 543
- 544 Lipka, O., Lesaux, N. K., & Siegel, L. S. (2006). Retrospective analyses of the reading
 545 development of grade 4 students with reading disabilities: Risk status and profiles over 5
 546 years. *Journal of Learning Disabilities*, 39(4), 364–378.
 547 <https://doi.org/10.1177/00222194060390040901>
 548
- 549 McArthur, G. M., Hogben, J. H., Edwards, V. T., Heath, S. M., & Mengler, E. D. (2000). On the
 550 “specifics” of specific reading disability and specific language impairment. *Journal of*
 551 *Child Psychology and Psychiatry*, 41(7), 869–874. [https://doi.org/10.1111/1469-](https://doi.org/10.1111/1469-7610.00674)
 552 [7610.00674](https://doi.org/10.1111/1469-7610.00674)
 553
- 554 McGregor, K. K. (2020). How we fail children with developmental language disorder.
 555 *Language, Speech, and Hearing Services in Schools*, 51(4), 981–992.
 556 https://doi.org/10.1044/2020_LSHSS-20-00003
 557
- 558 Morgan, P. L., Hammer, C. S., Farkas, G., Hillemeier, M. M., Maczuga, S., Cook, M., &
 559 Morano, S. (2016). Who receives speech/language services by 5 years of age in the United
 560 States? *American Journal of Speech-Language Pathology*, 25, 183–199.
 561 https://doi.org/10.1044/2015_AJSLP-14-0201
 562

- Nation, K., Cocksey, J., Taylor, J. S., & Bishop, D. V. M. (2010). A longitudinal investigation of early reading and language skills in children with poor reading comprehension. *The Journal of Child Psychology and Psychiatry*, 51(9), 1031–1039. <https://doi.org/10.1111/j.1469-7610.2010.02254.x>
- Nelson, N.W., Howes, B., & Anderson, M.A. (2016). *TILLS Student Language Scale (SLS)*. Paul Brookes Publishing.
- Norbury, C. F., Gooch, D., Wray, C., Baird, G., Charman, T., Simonoff, E., Vamvakas, G., & Pickles, A. (2016). The impact of nonverbal ability on prevalence and clinical presentation of language disorder: Evidence from a population study. *J Child Psychol Psychiatry*, 57(11), 1247–1257. <https://doi.org/10.1111/jcpp.12573>
- Redmond, S. M. (2016). Language impairment in the Attention-Deficit/Hyperactivity Disorder context. *Journal of Speech, Language, and Hearing Research*, 59(1), 133–142. https://doi.org/10.1044/2015_JSLHR-L-15-0038
- Snowling, M. J., Hayiou-Thomas, M. E., Nash, H. M., & Hulme, C. (2020). Dyslexia and developmental language disorder: Comorbid disorders with distinct effects on reading comprehension. *The Journal of Child Psychology and Psychiatry*, 61, 672–680. <https://doi.org/10.1111/jcpp.13140>
- Sylvan, L., Goldstein, E., & Crandall, M. (2020). Capturing a moment in time: A survey of school-based speech-language pathologists' experiences in the immediate aftermath of the COVID-19 public health emergency. *Perspectives of the ASHA Special Interest Groups*, 5(6), 1735–1749. https://doi.org/10.1044/2020_PERSP-20-00182
- Tomblin, J. B. (2014). Educational and psychosocial outcomes of language impairment in kindergarten. In J. B. Tomblin & M. A. Nippold (Eds.), *Understanding individual differences in language development across the school years* (pp. 166–203). New York, NY: Psychology Press.
- Wiig, E. H., Semel, E., & Secord, W.A. (2013). *Clinical Evaluation of Language Fundamentals-Fifth Edition Screening Test*. Bloomington, MN: NCS Pearson.
- Wittke, K., & Spaulding, T. J. (2018). Which preschool children with specific language impairment receive language intervention? *Language, Speech, and Hearing Services in Schools*, 49(1), 59–71. https://doi.org/10.1044/2017_LSHSS-17-0024
- Woodcock, R. W. (2011). *Woodcock Reading Mastery Tests—Third Edition (WRMT-III)*. San Antonio, TX: Pearson.
- Zhang, X., & Tomblin, J. B. (2000). The association of intervention receipt with speech-language profiles and social-demographic variables. *American Journal of Speech-Language Pathology*, 9(4), 345–357. <https://doi.org/10.1044/1058-0360.0904.345>

Endnote

¹ The question about history of prior support services differed in the 2018-2019 (in-school sample) and 2019-2020 parent questionnaire (in-school and remote samples). In 2018-2019, the question was worded as “Has your child ever received speech, language, reading or other special education services? If yes, please describe.” In 2019-2020, the question was presented as “Has your child received any of the following reading/math services? If yes, for how long?” The parent was instructed to identify length of participation (e.g., “Never” to “3+ years”) for each type of reading/math service (e.g., private school, RTI, summer camp, etc.)

Tables

Table 1

Demographics of participants across sites

	In-School (n = 133)	Remote (n = 84)
Age in Months, <i>M</i> (SD)	97.72 (4.86)	95.08 (5.72)
Gender (%)		
Female	50.4	46.4
Male	49.6	51.2
Other	0	2.4
Race (%)		
American Indian/Alaska Native	.8	0
Asian	.8	1.2
Black or African American	20.3	8.3
Native Hawaiian or Other Pacific Islander	.8	0
White	69.9	82.1
Other	4.5	4.8
More than one race	3.0	3.6
Ethnicity (%)		
Hispanic or Latino	4.5	4.8
Not Hispanic or Latino	86.5	95.2
Unknown/Not Reported	9.1	0
School Lunch		
Free or Reduced-Price School Lunch	42.9	14.3
Paid Lunch	50.4	83.3
Caregiver 1 is		
Mother	88.7	91.7
Father	5.3	4.8
Other	3.8	2.4
Unknown/Not reported	2.3	1.2
Caregiver 1 Education (%)		
Less than high school	3	0
High school diploma/ GED	18.8	3.6
Some College	30.1	4.8

Associate's Degree/ Technical Certification	17.3	6
Bachelor's Degree	15.8	20.2
Master's Degree or higher	11.3	64.3
Unknown/Not reported	3.8	1.2

Caregiver 2 is

Mother	3.8	6
Father	57.9	83.3
Other	22.6	3.6
Unknown/Not reported	15.8	7.1

Caregiver 2 Education (%)

Less than high school	6.8	1.2
High school diploma/ GED	27.8	8.3
Some College	17.3	2.4
Associate's Degree/ Technical Certification	13.5	7.1
Bachelor's Degree	12.8	29.8
Master's Degree or higher	5.3	44
Unknown/Not reported	16.5	7.1

Percentage of parents reporting

History of Services ¹	24.8	29.8
Family history of language or reading disabilities	17.3	16.7

¹ The question about history of prior support services differed in the 2018-2019 (in-school sample) and 2019-2020 parent questionnaire (in-school and remote samples). In 2018-2019, the question was worded as "Has your child ever received speech, language, reading or other special education services? If yes, please describe." In 2019-2020, the question was presented as "Has your child received any of the following reading/math services? If yes, for how long?" The parent was instructed to identify length of participation (e.g., "Never" to "3+ years") for each type of reading/math service (e.g., private school, RTI, summer camp, etc.)

Table 2*Descriptive statistics for children's language and literacy abilities*

	In-School	Remote
CELF-5 Core Language Index Score, <i>M</i>	98.92	100.90
<i>SD</i>	13.89	14.66
Range	70 – 146	57 – 137
WRMT-III Basic Skills Standard Score, <i>M</i>	95.47	102.18
<i>SD</i>	14.45	15.42
Range	64 – 135	67 – 134

Table 3*Reports of parental concerns for children recruited through in-school sample and remote sample*

	In-School (n=133)	Remote (n = 84)
Percentage (%) of parents reporting concerns		
Understanding what you tell him/her at home ¹	6.8	2.4
Understanding teachers at school ¹	9	1.2
Expressing his or her thoughts when speaking ¹	9	3.6
Reading individual words ²	12.8	11.9
Spelling ²	15	20.2
Understanding what he/she reads ²	26.3	14.3
Writing sentences or longer texts ²	18.8	21.4
Saying words correctly	12	9.5
Paying attention	27.1	25
Remembering instructions or personal belongings	24.1	15.5
Following routines	3.8	7.1
Other related concerns	3.0	2.4
Number of reported concerns (max = 12), <i>M (SD)</i>	1.68 (2.22)	1.35 (2.14)
Mean of Oral Language Concerns	.08 (.20)	.02 (.13)
Mean of Literacy Concerns	.18 (.30)	.17 (.30)

Note. Three indicators for Oral Language Concerns¹; four indicators for Literacy Concerns²

Table 4*Correlations between parent concerns and children's language and reading abilities*

Variables	In-School (n=133)					Remote (n=84)				
	1	2	3	4	5	1	2	3	4	5
1. Total Parent Concerns	—					—				
2. Mean Oral Language Concerns	.80***	—				.64***	—			
3. Mean Literacy Concerns	.82***	.49***	—			.89***	.45***	—		
4. CELF-5 Core Language Score	-.35***	-.28**	-.38***	—		-.28**	.04	-.37**	—	
5. WRMT-III Basic Skills	-.33***	-.19*	-.41***	.59***	—	-.36**	.002	-.44***	.61***	—
Parent Concerns										
Understanding what you tell him/her at home	.55***	.75***	.28**	-.20*	-.18*	.60***	.94***	.44***	.09	.02
Understanding teachers at school	.65***	.80***	.42***	-.27**	-.19*	.50***	.80***	.31**	-.04	-.04
Expressing his or her thoughts when speaking	.52***	.62***	.35***	-.14	-.04	.60***	.92***	.43***	.03	.01
Reading individual words	.59***	.30**	.72***	-.20*	-.31***	.65***	.39***	.75***	-.30**	-.41***
Spelling	.65***	.39***	.82***	-.28**	-.32***	.74***	.28*	.86***	-.31**	-.46***
Understanding what he/she reads	.66***	.41***	.77***	-.37***	-.30***	.70***	.44***	.74***	-.32**	-.26*
Writing sentences or longer texts	.71***	.45***	.88***	-.34***	-.37***	.73***	.34**	.83***	-.26*	-.29**
Saying words correctly	.48***	.39***	.33***	-.15	-.18*	.56***	.45***	.33**	-.02	-.16
Paying attention	.53***	.37***	.19*	-.11	-.05	.69***	.31**	.50***	-.19	-.24*
Remembering instructions or personal belongings	.66***	.62***	.26**	-.18*	-.10	.60***	.25*	.37**	-.17	-.16
Following routines	.35***	.18*	.14	-.03	-.11	.56***	.30**	.35**	-.21	-.24*
Other related concerns	.01	-.07	-.11	.19*	.08	-.03	-.03	-.09	.14	.14

Note. * $p < .05$; ** $p < .01$; *** $p < .001$