



NERDY

New England Research on Dyslexia Society

2025 Conference

APRIL 04, 2025 - Boston (MA)

MASSACHUSETTS GENERAL HOSPITAL (MGH)
INSTITUTE OF HEALTH

Program at a glance

8:30-9:00 Breakfast

9:00 – 9:15 Welcome - Dr. Nicole Landi

9:15- 10:55 Session 1. Intervention & Environment

10:55 – 11:10 Break

11:10 – 12:50 Session 2. Effects of Psycholinguistic Properties on Reading and Learning

12:50 – 2:35 Lunch & Posters

2:35 – 4:15 Session 3. Neurobiological Mechanisms and Comorbidities

4:15 – 4:30 Break

4:30 – 5:30 Keynote - Dr. Rebecca Marks

Session 1:

Intervention & Environment

Julie Van Dyke *Research Scientist*

Yale-UConn-Haskins Global Literacy Hub, Yale Child Study Center

Linguistically-driven text formatting may be a powerful tool to support language development in dyslexic individuals

Angie Neal *Policy Advisor for Speech-Language Pathology and Early Language
and Literacy*

ASHA, South Carolina Department of Education

Impacts of screen time on reading development

Kate McElderry *Director of Outreach*

The Odyssey School

Methods matter: The speech to print advantage in structured literacy instruction

Rachel Brown-Chidsey *Chair & Associate Professor of Special Education
University of Southern Maine*

Reading is the worst: Students with dyslexia and their parents; experiences with schools and accessing service

Kelsey *Davison Doctoral Candidate, Speech Language and Hearing Sciences
Boston University*

Caregiver oral reading prosody in relation to preschoolers' storybook listening comprehension

Session 2.

Effects of Psycholinguistic Properties on Reading and Learning

David Kilpatrick *Professor Emeritus of Psychology*
State University of New York

The persistence of phonemic proficiency deficits in high school students with reading disability: How orthographic mapping theory explains dyslexia

Laura Steacy *Associate Professor of Educational Psychology*
Florida Center for Reading Research & University of Connecticut

Examining the set for variability-word reading relationship across grade and word complexity

Brynn Siles *Lab Manager*
Northeastern University

Auditory statistical learning predicts growth of phonological awareness in school-aged children: a summer reading intervention study

Don Compton *Professor of Psychology*
Florida Center for Reading Research, Florida State University

Evaluating the effects of short-term word exposures on the reading of nonwords with variable vowels: Are there differences across typical and dyslexic children?

Yasmin Shalhoub-Awwad *Senior Lecturer*
University of Haifa

Subtypes of dyslexia based on the distinction between reading accuracy and reading rate: Insights from a longitudinal study in Arabic

Session 3.

Neurobiological Mechanisms and Comorbidities

Daniel Kleinman *Associate Research Scientist*
Yale Child Study Center

Nonlinear growth in word reading ability among dyslexic children with and without ADHD

Vanessa Harwood and Alisa Baron *Assistant Professors of*
Communicative Disorders
University of Rhode Island

Electrophysiological markers to native and nonnative speech contrasts in monolingual and bilingual early school-aged children: Implications for typical and disordered reading

Ola Ozernov-Palchik *Research Faculty*
MIT & Boston University

Precision fMRI reveals functional specificity of right hemisphere recruitment in children with reading disabilities

Emily Harriott *Doctoral Candidate*
Vanderbilt University

Executive function moderates relationships between white matter tract “integrity” & reading comprehension growth

Meaghan Perdue *Postdoctoral Fellow*
UMass Chan Medical School

Phonological decoding ability is associated with fiber density of the left arcuate fasciculus longitudinally across reading development

Keynote

How do co-occurring learning challenges shape reading outcomes in dyslexia? Brain-behavior perspectives on complex learners

Abstract: Children with reading disabilities (RD) often have co-occurring challenges such as specific learning disabilities in mathematics (MD) or attention deficit/hyperactivity disorder (ADHD). Yet neurocognitive studies of dyslexia typically examine reading in isolation. This leaves an open question: Are co-occurring learning challenges associated with poorer reading than RD alone? This talk will unite two separate studies of brain and behavior in co-occurring RD+MD and RD+ADHD, and their replication in a large, independent dataset. Findings deepen our understanding of the intersecting challenges that face vulnerable learners to inform educational practice and advance a more nuanced understanding of neurodiversity.

Bio: Rebecca Marks is an Assistant Professor of Human Development and Family Science at Purdue University. She is a developmental cognitive neuroscientist studying the brain bases of language and reading across diverse learners. Dr. Marks received her Ph.D. from the Combined Program in Education and Psychology at the University of Michigan in 2021. As a postdoctoral fellow, she held appointments at the McGovern Institute for Brain Research at MIT, the Department of Communication Sciences and Disorders at the MGH Institute of Health Professions, and as an adjunct lecturer on education at Harvard University. Her postdoctoral work was funded by an NIH F32 fellowship titled Neurocognitive Foundations of Morphological Processing in Dyslexia. In 2024, she was awarded the Rebecca L. Sandak Young Investigator award from the Society for the Scientific Study of Reading. She has received university-wide recognition for teaching excellence as well as grant funding for successful mentors of minority women in STEM.



Book of Abstracts

Julie Van Dyke *Research Scientist*

Yale-UConn-Haskins Global Literacy Hub, Yale Child Study Center

Linguistically-driven text formatting may be a powerful tool to support language development in dyslexic individuals

Dyslexic individuals frequently present with co-occurring oral language deficits (Adlof & Hogan, 2018), suggesting that oral language support can be a crucial component of therapeutic practices. Results of a recent pilot study with self-identified 18-24 year old dyslexic individuals found that 72.5% found reading easier and 62.5% reported feeling more confident when reading using a text formatting system that provides visual cues to support language processing during reading. This system, known as Linguistically-driven Text Formatting (a.k.a Cascade Format) has previously been found to improve comprehension in 4th-5th grade typically developing elementary students, and in adolescent-age English language learners. Improvements can be attributed to the greater salience of syntactic relationships engendered by LDTF, as well as increased support for implicit prosody during reading. I will describe the system, including the linguistic principles it implements to support language and reading comprehension, as well as previous research findings. The chief goal of this presentation is to foster conversation about how to support and assess reading comprehension in dyslexic individuals, and to appeal for research partners to further examine effects of LDTF on comprehension and oral language outcomes in individuals with dyslexia and/or DLD.

Angie Neal *Policy Advisor for Speech-Language Pathology and Early Language and Literacy*

ASHA, South Carolina Department of Education

Impacts of screen time on reading development

The Impacts of Screen Time on Reading Development The Impacts of Screen Time on Reading Development will share information about how screen time may impact the development of critical skills necessary for deep reading. Specifically, the discussion will center around what happens when children are exposed to screens during critical periods of development, what happens when developmentally appropriate activities are replaced by screen-based activities, digital devices use during the school day, and strategies for how to support schools and families. The time period when screens are introduced, parent/caregiver use of hand held digital devices in front of children, and the amount of screen use have been found to have significant impacts on development. In one study, screen use before the age of two years resulted in significantly lower emotional functioning scores and higher risks of conduct problems, learning problems, psychosomatic problems, impulsive-hyperactive, and hyperactivity index, which were independent of excessive screen use (Xiang et al., 2022). Another study found that children with more than one hour of daily screen time prior to the start of kindergarten were more likely to be vulnerable in all five developmental health domains compared to children reporting up to one hour of screen time per day (Kerai et al., 2022). Yet another study found that when pre-kindergarten children have been exposed to screen time amounts that exceeded the American Academy of Pediatrics guidelines, there are lower measures of micro-structural organization and myelination of brain white matter tracts that support language and emergent literary skills as well as corresponding cognitive assessments (JAMA, 2020).

Kate McElderry *Director of Outreach*
The Odyssey School

Methods matter: The speech to print advantage in structured literacy instruction

For decades, research in the science of reading has shown that structured literacy is most effective for teaching children who have difficulties learning to read and spell. Structured literacy programs grounded in phoneme awareness, sound-symbol correspondence, patterns and conventions of print, morphology, syntax, and word meaning delivered through explicit, systematic, cumulative, and multi-modal instruction can support struggling students in their reading journey. Yet not all structured literacy programs are equally effective and also match their learners' full profiles. (Many students with dyslexia have something else, which can complicate and compound their learning challenges.) Learn why The Odyssey School, Baltimore County Maryland, uses Phono-Graphix and Spell Links, Language-Literacy Network as frameworks for successful reading instruction to meet the needs of students who have dyslexia and other language-based learning differences, including working memory and executive function deficits. This presentation will explain how Odyssey's reading instruction employs a speech-to-print framework, building off students' intact phonological system in a less cognitively taxing way that supports underdeveloped executive function skills. In turn, students are better supported, meeting them where they are by promoting a natural filing system for organizing newly learned information. Thus, the overall learning process for students is scaffolded by promoting organization of thought, planning, and prioritizing. Learn how Odyssey students actively discover the nature of the written code with teachers facilitating the organization of these tendencies in a structured context. Learn about Odyssey's multi-linguistic model and how their structured literacy approach is discovery-based and descriptive of the way written language works.

Rachel Brown-Chidsey *Chair & Associate Professor of Special Education*
University of Southern Maine

Reading is the worst: Students with dyslexia and their parents; experiences with schools and accessing service

This study explored the school experiences of parents and their students with dyslexia; 10 parents and 9 students were interviewed. All were located in the Northeast and the majority attended public schools. Students ranged from 4th through 8th grade; all but two had an IEP or Section 504 plan. Parents noticed their students' reading and writing challenges early on, and may have had a family history of dyslexia. Students shared that they like to read and write when they do well and are engaged, but also that they are not always good at it and are frustrated. Eight families reported obtaining outside evaluations due to challenges related to pursuing testing and/or services at school. Parents shared that the IEP or Section 504 plan did not always meet their students' needs such as not receiving the needed instruction, limited interventions, and IEP goals not leading to growth. They described advocating for services and seeking out others, such as private tutoring and summer programs. Parents and their students shared positive experiences with those teachers who provided effective instruction, listened, and those that got it. Both the parents and students wanted teachers to know how smart the students are and how hard they work. Parents acknowledged that teachers need resources to effectively teach students with dyslexia.

*Kelsey Davison Doctoral Candidate, Speech Language and Hearing Sciences
Boston University*

Caregiver oral reading prosody in relation to preschoolers' storybook listening comprehension

Converging literature emphasizes shared reading as one of the most language-enriched contexts in children's home environments. A salient, understudied characteristic of shared reading is caregiver oral reading prosody. While caregiver prosody in conversational contexts is linked to children's understanding of spoken language, it remains unclear whether caregivers' oral reading prosody relates to preschoolers' storybook listening comprehension. This raises an important gap in the literature, especially when considering that preschool-age listening comprehension is one of the strongest predictors of subsequent language and reading comprehension. In the present study, thirty-eight caregivers read a children's book to their child without extratextual discussion. Children then answered cued recall questions about the story and were assessed on broader listening comprehension via standardized assessment. Acoustic quantification captured caregivers' reading prosody, including intonation/pitch (fundamental frequency (fo) mean, range, and standard deviation) and timing (rate, frequency and duration of appropriate and inappropriate pauses). Initial correlations followed by multiple regression examined prosody measures in relation to children's cued recall accuracy, accounting for child age, broader listening comprehension skills, attention, and caregiver education. Findings revealed that caregiver fo range and appropriate pause duration positively predicted unique variance in children's cued recall accuracy scores. Given that listening comprehension is a well-established predictor of children's long-term academic success, this study carries implications for understanding how to support children's comprehension of linguistic input at the pre-literacy stage. Overall, results provide foundational insight to guide early intervention approaches aiming to facilitate positive language outcomes for children, especially those at risk for language-based learning disabilities.

*David Kilpatrick Professor Emeritus of Psychology
State University of New York*

The persistence of phonemic proficiency deficits in high school students with reading disability: How orthographic mapping theory explains dyslexia

Studies of phonemic awareness and reading normally conflate fast and slow responses to phonemic test items, giving equal credit for both. However, a body of studies since the late 1980s, conducted in English and in other alphabetic orthographies, has shown that instant access to phonemes correlates more strongly with word reading than simply conscious awareness of phonemes. This finding can be easily understood in the context of Ehri's orthographic mapping theory, which proposes that access to phonemes plays a central role in encoding written words into long-term orthographic memory. Because this encoding process is largely automatic and unconscious, orthographic mapping requires automatic access to the phonemic structure of spoken words, that is, phonemic proficiency. The implication for dyslexia is clear. Without proficient access to phonemes, it is difficult for those with dyslexia to add newly encountered words to the orthographic lexicon. After reviewing research on phonemic proficiency, we present data on 68 high school students with dyslexia and compare them to a general sample of K-5 students. On average, the high school students displayed a similar level of phoneme awareness as second graders. However, their instant access to phonemes was, on average, lower than the first graders. These results confirm that phonemic skill deficits persist in high school students with dyslexia. Further, they suggest these students with dyslexia are severely deficient in phonemic proficiency, a skill which orthographic mapping theory indicates is needed for efficiently encoding written words into long-term memory for later, instant retrieval.

Laura Steacy *Associate Professor of Educational Psychology*

Florida Center for Reading Research & University of Connecticut

Examining the set for variability-word reading relationship across grade and word complexity

Set for Variability (SfV) has been shown to be a robust predictor of word reading in developing readers. However, little consideration has been given to the developmental relationship between SfV and word reading in terms of word complexity and grade. In contrast to simple monosyllabic words, morphologically complex words present unique challenges to developing readers due to word complexities such as stress, vowel reduction, vowel pronunciation ambiguities, and morphological transparency and complexity. This poster presentation is intended to interrogate possible changes in the SfV-word reading relations as a function of child development and word complexity by presenting results from two studies that explore the role of set for variability across grade (Kindergarten to Grade 5) and word complexity. In two studies, we explore SfV as a predictor of word reading in words that vary in complexity. We explore this relationship in a sample of kindergarten students (N= 116) and a sample of students in grades 2-5 (N=96). Using crossed random effects models, we explore the relationship between SfV and word reading as a function of word complexity and stage of development. Results suggest that general child-level SfV performance is a predictor of word reading across development. However, our results indicate this relationship is stronger in students who have been exposed to reading instruction. Together, results support the hypothesis that set for variability is capturing dynamic changes in the distributed model of word reading and that SfV performance may be capturing more than purely phonological skills and vocabulary knowledge.

Brynn Siles *Lab Manager*

Northeastern University

Auditory statistical learning predicts growth of phonological awareness in school-aged children: a summer reading intervention study

There is a growing interest in whether statistical learning (SL) predicts real-world language outcomes in children with language and reading difficulties. This longitudinal study investigates the relationship between SL and gains in a reading intervention program in school-aged children with reading difficulties. Two cohorts of children reading below grade level (Cohort 1/ Year 1: N = 15; 7.08-12.00 years; Cohort 2/ Year 2: N = 21; 7.67-12.05 years) were recruited from a 4-week-long summer intervention program where children received evidence-based phonics instructions on phonological awareness, decoding, reading fluency, and comprehension. Children completed a gamified auditory SL task in the first and last week of the intervention. In the task, children were exposed to a five-minute syllable stream, where four three-syllable nonsense words (e.g., pa-bi-ku) were repeated and concatenated without pauses. SL was then tested using a 2-alternative forced-choice (2AFC) task and a statistically-induced chunking recall (SICR) task. In the 2AFC task, children across both cohorts successfully distinguished the artificial words learned in the exposure phase from foils, with an improvement in performance found in cohort 2 post-intervention. In the SICR task, children across cohorts recalled and repeated significantly more bigrams for artificial words than foils both pre- and post-intervention. Importantly, across both cohorts, better 2AFC accuracy pre-intervention predicted a greater improvement in phonological awareness skills post-intervention, as measured by TAPS-4 Deletion Subtest scores. These findings highlight that auditory SL might serve as a predictor for gains in phonological awareness skills in school-aged children reading below grade level.

Don Compton *Professor of Psychology*

Florida Center for Reading Research, Florida State University

Evaluating the effects of short-term word exposures on the reading of nonwords with variable vowels: Are there differences across typical and dyslexic children?

In this study we explored the extent to which vowel pronunciations in nonwords with variable vowels (e.g., zead) can be tuned by providing short-term exposures to different corpora of words containing a particular vowel pronunciation (e.g., bead vs. dead). We explored the facilitative effects of exposures to differential mixes of words in children grades 2-5 randomly assigned to corpora that support high vs. low frequency vowel GPC pronunciations, across six combinations of variable vowels ea, oo, in, ow, o-e, and u. Following repeated exposures to a corpus of 30 words repeated 4 times each day for 3 consecutive days (12 exposures for each word) supporting either high- or low-frequency vowel GPC pronunciations children were asked to read 24 nonwords that contain the target variable vowels (e.g., zead, zoot, zint). Overall typically developing children produced a high percentage (81.6%) of nonword pronunciations with either the high or low frequency vowel GPC, whereas dyslexics produced a significantly lower percentage (54.1%). In terms of vowel tuning, both groups exhibited a crossover effect of nonword pronunciation in which children in the HF vowel GPC condition tended to provide nonword pronunciations with HF GPCs and children in the LF vowel GPC condition provide nonword pronunciations with LF GPCs. In general, the crossover effect was larger in dyslexic children compared to typically developing children. Results suggest that children's assignment of vowel pronunciations in words containing variable vowels can be affected by short-term practice.

Yasmin Shalhoub-Awwad *Senior Lecturer*

University of Haifa

Subtypes of dyslexia based on the distinction between reading accuracy and reading rate: Insights from a longitudinal study in Arabic

Purpose: Previous studies by Shany and colleagues have provided a double dissociation between reading accuracy and rate among dyslexics. A rate-disabled subtype showed intact accuracy but deficits in rapid naming (RAN); conversely, an accuracy-disabled subtype had an intact reading rate but deficits in phonological awareness (PA) and morphological awareness (MA), not RAN. The present longitudinal study addressed four questions: (1) Is a dissociation between PA+MA and RAN apparent among pre-literate preschoolers? (2) Does the PA+MA-disabled subgroup constitute a mild form of Developmental Language Disorder (DLD)? (3) Can we differentiate the three disabled subgroups (PA+MA-only, RAN-only, and PA+MA-plus-RAN) based on early literacy in preschool? and (4) Will the at-risk subgroups develop into selectively rate-disabled, accuracy-disabled, or doubly-disabled (accuracy+rate) readers by Grade 1? Method: A cohort of 639 Palestinian Arabic-speaking children underwent a range of linguistic, cognitive, and early literacy measures in kindergarten and reading in Grade 1. Results: Using established <25/>35 cutoffs confirmed the existence of two distinct selectively disabled/at-risk subgroups in preschool: a RAN-only subgroup with intact PA and MA and a PA+MA subgroup with broad impairments across language measures but intact RAN. Grade 1 reading data also confirmed that the RAN-disabled subgroup became slow but accurate readers, whereas the PA+MA subgroup developed into inaccurate and slow readers. Our study indicates partial dissociation between early dyslexia subtypes, each displaying distinct and non-overlapping cognitive-linguistic profiles in preschool. Conclusion: This study highlights the importance of considering heterogeneity in reading outcomes and multiple oral language skills beyond the well-documented role of PA.

Daniel Kleinman *Associate Research Scientist*
Yale Child Study Center

Nonlinear growth in word reading ability among dyslexic children with and without ADHD

Reading disability is a common neurodevelopmental disorder, and many children with reading disability make limited gains even after receiving reading interventions. To better understand the factors that predict reading trajectories in this population, we conducted a longitudinal study with students enrolled at schools that administer intensive, evidence-based reading interventions. 101 participants (7-16 years old at study enrollment; M=10.6 years), including 54 with ADHD, completed a battery every 6 months (M=3.7 sessions over 18 months) comprising tasks which assess timed and untimed word reading (TOWRE-2 Sight Word Efficiency and WJ-IV Letter-Word ID); phonological awareness (CTOPP-2 PA), involving the manipulation of speech sounds within words; and rapid automatized naming (CTOPP-2 RAN), requiring speed and processing of visual and phonological information. Exponential growth models were used to estimate the upper asymptote of reading scores for each participant (their reading capacity), with PA and RAN treated as time-varying covariates. Results showed that greater PA was associated with higher word reading capacity, and greater RAN was associated with somewhat faster growth in word reading, on both timed and untimed assessments. In addition, positive ADHD diagnosis was associated with lower word reading capacity starting around 11 years, an effect that increased with age until it corresponded to a difference of about 15 percentile points for the timed assessment and 11 percentile points for the untimed assessment. These effects reveal how different phonological processing skills and attentional abilities predict different characteristics of word reading trajectories among individuals with reading disability.

Vanessa Harwood and Alisa Baron *Assistant Professors of Communicative Disorders*
University of Rhode Island

Electrophysiological markers to native and nonnative speech contrasts in monolingual and bilingual early school-aged children: Implications for typical and disordered reading

The neurophysiological basis of reading impairment remains unclear, particularly for bilingual Spanish-English children who navigate two phonological systems. Reading development is closely linked to phonological processing and to a certain extent, native language speech perception. Using event-related potentials (ERPs), we examined the relationship between speech perception, phonological processing skills, and early reading in 42 children (33 monolingual, 9 bilingual) aged 6-9. ERPs were recorded in response to English (/ta/, /pa/) and Spanish (/tãTMa/, /dãTMa/) phoneme contrasts. A robust P300 response was observed for the English contrast only across groups, with monolingual children showing higher amplitudes. The English P300 response was robustly related to English nonword repetition performance for all children. For the bilingual group, faster ERP latencies for the English contrast predicted stronger phonological awareness, rapid automatized naming (RAN), and nonsense word reading in English, yet these associations were not present for the monolingual group. These findings suggest speech perception may uniquely influence early reading skills in monolingual and bilingual learners. The results will be discussed in light of theoretical frameworks of typical and disordered reading, emphasizing the role of speech perception in literacy development across diverse linguistic backgrounds.

Ola Ozernov-Palchik *Research Faculty*

MIT & Boston University

Precision fMRI reveals functional specificity of right hemisphere recruitment in children with reading disabilities

Reading disabilities (RD) are associated with disruptions in the left-hemisphere (LH) language network. Surprisingly, several fMRI studies have revealed that children with RD who make the most progress in reading recruit the right hemisphere (RH), particularly the right inferior frontal gyrus (IFG). Although the RH IFG is typically linked to executive functions, it comprises distinct functional subdivisions that support both verbal processes such as phonological awareness, a core deficit in dyslexia and nonlinguistic functions like working memory. This compensatory activation of the RH IFG may facilitate reading development when LH networks are impaired, though mechanisms remain unclear. Using individual-subject fMRI analyses, which allow for precise and reliable dissociation of language-specific regions, we investigated hemispheric differences in the associations between reading comprehension and fluency, and the regions of the language network. Fourth-grade children with RD (N=34) and typical readers (N=17) completed an auditory language localizer task. In typical readers, better reading performance was associated with increased activation in the LH IFG and other LH language regions. In children with RD, better reading was associated with activation in the RH IFG and other RH language regions. Sensitivity analysis confirmed that these associations were specific to reading abilities and not related to phonological awareness or working memory. Our results indicate that enhanced engagement of RH IFG language regions promotes improved reading outcomes in RD, rather than representing effortful recruitment. This contributes to the broader debate on whether linguistic and/or domain-general skills enhance reading-specific outcomes and may inform future reading remediation strategies.

Emily Harriott *Doctoral Candidate*

Vanderbilt University

Executive function moderates relationships between white matter tract “integrity” & reading comprehension growth

Reading comprehension (RC) is a brain-based process that relies on the recruitment, activation, and coordination of many cortical regions, which communicate via white matter tracts. RC also relies on executive functioning (EF) processes such as cognitive flexibility (CF) and working memory (WM). While it is well known that the microstructure of these connecting white matter tracts relates to concurrent and longitudinal reading abilities, as well as EF, how EF and these white matter tracts' microstructures together predict RC growth has yet to be examined. Interactions between fractional anisotropy (FA), a diffusion weighted imaging metric quantifying the direction of water molecule moment along white matter tracts (thought to reflect tract integrity) and EF to predict RC one year later were investigated in 110 children (8.44 +/- 0.37 years old). Significant interactions involving left hemisphere tracts (left superior longitudinal fasciculus 1 and left corticospinal tract, and CF and WM, respectively) revealed that higher FA and better EF skills predicted substantially higher RC growth compared to those with the same FA levels, but poorer EF skills. Other findings involving the left superior longitudinal fasciculus 2 and right arcuate fasciculus revealed that EF may serve as a compensatory mechanism for lower integrity of these tracts: in children with lower FA, CF and WM respectively become increasingly predictive of RC. While these findings generally align with well-documented relationships between white matter tract integrity and reading, they reveal that EF moderates these relationships, therefore providing insights as to how EF may be linked to RC growth.

Meaghan Perdue *Postdoctoral Fellow*

UMass Chan Medical School

Phonological decoding ability is associated with fiber density of the left arcuate fasciculus longitudinally across reading development

Purpose Prior research linking reading ability to brain structure lacks neuroanatomical specificity, and longitudinal research is needed to understand the neural underpinnings of reading throughout childhood. Here, we applied diffusion-weighted magnetic resonance imaging (dMRI) to characterize white matter tract development in the reading network, and investigated associations between fiber density and phonological decoding ability. **Methods** This longitudinal study included 280 dMRI scans from 66 participants (34 females). dMRI scans were acquired (semi)annually from ages 2-13 years (mean = 7.23 \pm 2.43), and reading was assessed at ages \geq 6 years (mean = 8.5 \pm 1.82). We computed mean fiber density of 8 tracts in the reading network. Decoding ability was defined as each participant's mean Word Attack standard score across all available assessments. Fiber density of each tract was modelled as a function of age and decoding ability using linear mixed effects regression with a random intercept for participant. **Results** Better decoding ability was associated with greater fiber density in the left arcuate fasciculus (AF; which connects temporal and inferior frontal regions), and effects remained consistent over time. Asymmetry changes in the AF were moderated by decoding ability: good decoders showed leftward asymmetry from early childhood onward, while poorer decoders shifted toward leftward asymmetry over time. **Conclusions** These results suggest that densely organized fibers in the left AF support the development of reading skills from the pre-reading stage through fluent reading. Ongoing white matter development throughout childhood may reflect a reciprocal relationship in which reading experience refines and strengthens these pathways.

Posters

1. Maria Jose Macias Zuniga

Yale Child Study Center

Synchronizing minds: Intersubject correlations with EEG in children with RD and ADHD

Reading disability affects approximately 5-15% of children, co-occurring with attention deficit hyperactivity disorder [1]. Research shows that intersubject correlations (ISC) measure the similarity between different participants' neural responses to a naturalistic stimulus using EEG, effectively assessing engagement and attention to that stimulus [3]. We examined whether greater attention to a stimulus in both groups (RD and RD+ADHD) - as indicated by higher ISCs - was associated with significant reading gains over the following year. Participants (n=77) were children with RD (n=40) and RD+ADHD (n=37) who attended schools specializing in RD interventions. Reading ability was assessed using the TOWRE PDE, a timed test of nonword decoding at two-time points. We recorded participants' EEG while they watched a 3-minute clip from Despicable Me. ISC was calculated using correlated component analysis [2]. Linear regression models determined the relationships between ISC, ADHD status, and reading scores while controlling for age. ISCs were significantly lower for older participants, $t(74)=-3.53$, $p<.001$, replicating prior results [2]. ISCs were also significantly lower for the RD+ADHD group ($M=0.054$, $SD=0.016$) than for the RD group ($M=0.068$, $SD=0.015$), $t(74)=-4.59$, $p<.001$. We found that among children with RD, an ADHD diagnosis was associated with a lower ISC. We also found that ISC declines with age [2]. In our sample, ISC did not significantly predict reading gains. Future research with larger samples is needed to explore ISC's potential in predicting reading gains over the course of a year. [1] Horowitz-Kraus et al., 2019. [2] Petroni et al., 2018. [3] Poulsen et al., 2017.

2. Rachel Brown-Chidsey

University of Southern Maine

Letters and words dancing, flipping, and going upside down and backwards: Why do misperceptions of dyslexia matter for instruction?

As part of a larger study on general and special education teachers' reading instructional practices for students with and without dyslexia, a subset of these (N = 283) responded to a specific question asking them to describe characteristics of dyslexia. Of these, 68% described at least one misperception of dyslexia and/or reading in their response. The most common misperception was text-based (65%) with describing things such as how a student might write or read entire passages or individual words backwards, dancing or moving letters, and using specific fonts to fix reading. Others included those related to a student not being able to learn to read, inaccurate eye and brain-related assumptions, and other inaccuracies. Yet, a similar percent of teachers also included at least one accurate characterization such as general difficulties learning to read. It is likely that even one misperception could impact instruction (e.g., a teacher assuming that a colored overlay would correct decoding errors). Of those that had at least one misperception, teachers were less likely to be confident teaching students with dyslexia, reported not being prepared to do so, and described not being sure of how to select effective instructional strategies. Results and those from the larger study support the need for teaching having access to accurate information on dyslexia and reading along with teacher preparation and/or ongoing PD. Additional research is needed to better understand teachers' knowledge in relation to myths and misperceptions about dyslexia as well as other factors that contribute to reading instruction.

3. Olivia Baldi

Harvard Graduate School of Education

Investigating structural differences among children with developmental language disorder, dyslexia, and controls.

Developmental Language Disorder (DLD) is a neurodevelopmental disability characterized by difficulties comprehending and producing language and can lead to adverse social-emotional, academic, and vocational outcomes. A considerable number of children with DLD subsequently develop developmental dyslexia (DD), suggesting shared brain differences between DLD and DD. The DLD-DD Quadrant Model hypothesizes how individual differences in word recognition, affected in DD, and language comprehension, affected in DLD, contribute to reading comprehension deficits (RC). While this has been studied behaviorally, there are no current studies examining the underlying brain mechanisms of the model. To explore the neural underpinnings of the language comprehension component of the Quadrant Model, we acquired structural magnetic resonance imaging (MRI) data in children with DLD and typically developing children (TD). In this analysis, 5-6-year-old children were categorized as either DLD (n=18) or TD (n=21) based on measures of language comprehension, expressive language, receptive language, and syntactic processing. To identify differences in gray matter volume and cortical thickness between groups, a whole-brain analysis was conducted using FreeSurfer. The TD, compared to the DLD group, showed significantly greater gray matter volume in the inferior temporal cortex in the right hemisphere (vertex-wise threshold $p < 0.005$; cluster-wise threshold $p < 0.05$). This finding suggests structural differences between children with DLD and TD; however, future analyses will include a DD group and employ RC outcome measures to disentangle how deficits in word reading and/or language skills influence RC. Furthermore, implications will be discussed based on hypotheses within the Quadrant Model.

4.Allison Kalva

University of Connecticut

Exploring multidimensional reading anxiety and its relationship to reading performance: Evidence from children and adolescents

Reading proficiency is a critical determinant of academic success. However, only 32% of fourth-grade public school students in the U.S. reached the NAEP Proficient level in reading. Research highlights a link between reading challenges and reading anxiety a multidimensional construct encompassing somatic (e.g., sweating, stomachache), cognitive (e.g., worry, nervousness), and behavioral avoidance (e.g., avoiding reading) symptoms. These emotional reactions and negative perceptions could create significant barriers to literacy development. This study examines the nature and prevalence of reading anxiety in third- and fourth-grade students, addressing two primary questions: (1) To what extent do young readers exhibit anxiety across somatic, cognitive, and behavioral domains? (2) Does reading performance moderate the levels of anxiety in these domains? This study examines reading anxiety in 119 third- and fourth-grade students across these domains. Preliminary findings reveal that cognitive anxiety emerged as the most pervasive, while behavioral avoidance and physical symptoms were less common but notable. Nearly half (48%) of students reported no physical symptoms, suggesting that reading tasks do not consistently trigger physical anxiety. However, 24% of students experienced physical symptoms (e.g., heart racing, sweating, nausea) often or almost always, highlighting heightened physical anxiety during reading tasks. Cognitive anxiety was the most pervasive, with 29% of students experiencing worry, dread, and fear often or almost always. Notably, 16% reported cognitive symptoms almost always, the highest among all three components. Behavioral avoidance was less common, with 57% of students reporting never exhibit such behaviors. Further analysis will explore links between reading performance and anxiety levels.

5.Melissa Stalega

University of Connecticut & University of North Texas

Optimizing time in isolated phonological awareness instruction: A meta-analysis of cumulative dosage for improved reading outcomes

There is longstanding evidence of the relationship between phonological awareness (PA) and reading outcomes (Bruck, 1992; Melby-Lervåg et al., 2012; Pratt & Brady, 1988). However, research has only recently begun to investigate the causal effects of isolated PA instruction (oral PA activities without letters) on reading skills (Stalega et al., 2024). While PA instruction improves PA skills (Rice et al., 2022; Stalega et al., 2024), it has limited effectiveness for word reading (Stalega et al., 2024), raising the question: How much isolated PA instruction is ideal to improve reading skills? Current research suggests that approximately 10 cumulative hours is ideal for enhancing PA skills, but little is known about the optimal dosage for improving reading outcomes. This study addresses two questions: (1) What is the optimal amount of PA-only instruction and its maximum impact on word and nonword reading outcomes for preschool to first-grade students? (2) How do risk for reading disabilities, PA skill types, and grade moderate the optimal dosage and effect compared to overall results? A nonlinear meta-analysis of 15 experimental and quasi-experimental studies (46 effect sizes) was conducted to estimate the cumulative dosage effect of PA instruction on reading outcomes. Results showed a weakly concave curve, with the maximum effect size ($g = 0.23$, $p = .005$) at 10.29 hours, remaining stable from 1.2 to 10.29 hours before declining up to 30 hours. Moderator analyses found consistent results for word reading, kindergarten, and segmenting and blending skills, but varied effects for at-risk students. These findings offer valuable guidance for instructional planning.

6.Martina Villa

University of Connecticut

Does grit serve as a protective factor for individuals with dyslexia?

Studies of students with dyslexia have focused on reading and cognitive skills development and their relationship to academic outcomes. Yet, non-cognitive skills, such as resilience or grit, have been shown to positively contribute to life satisfaction and success (e.g., Aro et al., 2023; Casali et al., 2023; Hossain et al., 2021; Kortteinen et al., 2020), which may also influence academics and other important life outcomes such as health and well-being. However, this literature is small and inconclusive, with inconsistent definitions and measures of grit and resilience. There is, hence, a need for more well-powered empirical research that utilizes validated measures. In our study, we assess the relationship between resilience (from the GRIT short scale) and self-reported letter-grade academic success as well as parent-reported positive development (from the Child Flourishing Scale) in individuals with dyslexia using a large and diverse sample: the Healthy Brain Network (HBN) biobank. Preliminary results reveal a positive association between grit and child flourishing but no relationship to self-reported grade average. This study is grounded in a strength-based (rather than deficit-based) model of dyslexia, aiming to better support individuals with dyslexia through understanding and capitalizing on their strengths.

7.Hannah Ferguson

Yale Child Study Center

Distinguishing elision and blending measures of phonological awareness among students with dyslexia

Ongoing research in our lab focuses on identifying predictors of reading attainment among a unique population of students—those who attend private schools for students with reading difficulties (Landi et al. 2022). Initial findings suggest that, like students in mainstream schools, phonological awareness (PA), is a good predictor of reading attainment (Landi, Kleinman et al. in prep). Given the high prevalence of students in this population with a history of comorbid language difficulties, the current study sought to further explore the relationship between PA and reading attainment by breaking it down into subcomponent skills. While research shows that at least three subcomponents contribute to PA: blending words, elision, and phoneme isolation (Wagner et al., 2013), less is known about how performance on these individual subtests relates to reading attainment. The current study uses data from 81 2nd-10th graders including CTOPP-2 PA and rapid naming measures (Wagner et al., 2013) and both timed and untimed measures of word reading and nonword decoding from the TOWRE-2 (Torgesen et al., 2012) and Woodcock Johnson (Schrack et al., 2014). In an initial PCA, the first principal component revealed a strong association between elision and overall reading performance. The second principal component showed strong contributions from blending and age, which were positively associated, and weaker contributions from the other PA subtests. Ongoing analyses focus on predicting longitudinal reading performance based on blending and elision. Exploratory analyses will investigate the connection between PA subtests and history of language disorders comorbid with dyslexia in our sample.

8. Zhichao Xia

University of Connecticut

Examining the relationship between reading pause and articulation components with reading difficulty history

Background: Developmental dyslexia is marked by deficits in word recognition and grapheme-phoneme correspondence, though articulation often remains intact. Traditional assessments focus on accuracy and fluency, making it difficult to isolate cognitive components. Reading pauses may provide insight into print-sound mapping. Aim: This study examined the role of reading pauses (pause time, PsT) and articulation duration (articulation time, ArT) in individuals with varying reading abilities, particularly in relation to self-reported reading difficulties. Hypothesis: Greater reading difficulties would be associated with longer PsT, especially for longer words, but not with differences in ArT. Methods: Twenty-two adults completed the Sight Word Efficiency (SWE) and Phonemic Decoding Efficiency (PDE) subtests of the TOWRE. Audio recordings were analyzed for (1) PsT: interval between vocalizations and (2) ArT: vocalization duration. Linear mixed models (LMM) further estimated the intercept and slope of the word length effect individually. Relationships between all the above measurements with reading difficulty history (Adult Reading History Questionnaire, ARHQ) were examined. Findings: (1) ARHQ scores did not significantly correlate with SWE or PDE. (2) However, greater reading difficulties were linked to longer PDE PsT ($r = 0.473$), and (3) stronger word length effect on PsT (SWE-slope: $r = 0.653$; PDE-slope: $r = 0.449$). (4) No significant word-length effects were observed for ArT. Discussion: Reading pauses, rather than articulation time, may be a more sensitive measure of dyslexia-related challenges, potentially reflecting phonological rehearsal or print-sound mapping difficulties. Future research should explore the neurocognitive mechanisms underlying these effects and their diagnostic utility.

9. Yinuo Liu

Boston University

Neuroanatomical signatures of dyslexia found in microstructural but not macrostructural features of the superior temporal plane

Dyslexia is widely believed to have a neurological basis (Norton et al., 2015). Early neuroanatomical studies purported to find atypical gyrification of the superior temporal plane (STP, including Heschl's gyrus (HG) and planum temporale (PT)) in dyslexia. However, these findings were based on small samples that underestimate the enormous variation in these structures across the population. Here, we investigated whether features related to the cortical macrostructure (gyral configuration and local cortical curvature) or microstructure (intracortical myelination) of the STP differentiate the brains of adults with dyslexia. Manual labelling of the different morphotypes of HG revealed no difference in the likelihood of finding single, common-stem duplication, or complete posterior duplication of HG in control ($n=66$) vs. dyslexia ($n=68$). In a separate sample ($n=24$ control, $n=25$ dyslexia), we obtained local measures of curvature from FreeSurfer reconstructions and intracortical myelination based on the T1w/T2w ratio. Individual surfaces were registered to a common template, and we calculated the Gaussian similarity for each of these measures within the STP between all pairs of subjects. Common patterns of curvature or myelination were obtained using elbow-optimized k-means clustering. Clustering based on curvature revealed distinct configurations of HG, but did not differentiate the groups. Clustering based on patterns of local intracortical myelination did significantly distinguish dyslexia from control brains. Further examination revealed this distinction likely reflects overall greater intracortical myelination of STP in dyslexia vs. typical readers. These results suggest neuroanatomical signatures of dyslexia may be present in microstructural, but not macrostructural, features of the brain.

10. Megan Loh

Harvard Graduate School of Education

Examining associations between white matter microstructure in infancy and subsequent reading comprehension skills: A longitudinal investigation

Reading comprehension (RC) is a complex skill essential for functioning in modern society. Early reading models posit that RC requires word recognition (WR) and language comprehension (LC) skills but also emphasize reading fluency (RF) as a key factor for developing RC. The left-hemispheric arcuate fasciculus (AF) and inferior longitudinal fasciculus (ILF) are important white matter tracts linked with WR and RC in school-age children. Furthermore, fractional anisotropy (FA) of the left AF in infants has been linked to oral language skills in preschool, suggesting the emergence of a scaffold for reading development as early as infancy. We investigated whether FA in the AF and ILF in infancy is also related to subsequent RF and RC skills. Diffusion tensor imaging data were acquired in 31 infants, who had reading skills assessed nine years later at school-age. Whole-brain tractography was performed with MRtrix3 and fibers were segmented into canonical tracts, each 100 nodes, using pyBabyAFQ. Results showed that FA in infancy is positively associated with subsequent higher-order reading skills, specifically between; the left AF and RC, as well as between the left ILF and RF and RC. These results remained significant when controlling for age at time of scan, biological sex, and home literacy environments. These results highlight the role of the left AF and ILF in supporting the long-term development of RF and RC starting as early as infancy. Further analyses are necessary to understand the specific WR and LC mechanisms that connect early white matter organization and higher-order reading skills.

11. Katherine Trice

Northeastern University

The relationship between visual statistical learning, domain, and language experience in deaf and hard of hearing individuals

Visual statistical learning (VSL) correlates with literacy skills in hearing populations with and without reading difficulties (Qi et al., 2018; Singh & Conway, 2021). However, despite findings suggesting within-individual variability between linguistic and nonlinguistic SL domains in hearing individuals, current research in Deaf individuals has focused on solely nonlinguistic SL, with mixed findings on group differences and limited work on how this relates to concurrent reading skills (Siegelman & Frost, 2015; Conway, 2009; Monroy et al., 2022; Giustolisi & Emmorey, 2018). Here, we ask whether deafness changes how linguistic and nonlinguistic regularities are linked in artificial languages in the visual modality. 18 Deaf signing adults, 18 hearing non-signing adults matched on English literacy and nonverbal intelligence (Hearing-Matched), 18 hearing non-signing adults with higher literacy and non-verbal intelligence (Hearing-Higher), and 18 hearing signing adults (CODA) completed linguistic (letter) and nonlinguistic (image) VSL tasks. Triplet-recognition accuracy after familiarization measured learning. Only the Deaf group shows tight coupling across VSL domains (Deaf: $r=0.79$, $p<0.001$). Deaf showed no VSL differences from Hearing-Matched, but significantly lower performance than CODA or Hearing-Higher regardless of domain ($p's<0.05$). Hearing-Higher showed only marginally better VSL than Hearing-Matched across domain ($p's<0.10$). Thus, deafness alone does not affect VSL performance, as an interplay with literacy is seen, but connects, rather than dissociates linguistic and nonlinguistic regularities in the visual world. This link cannot be explained by sign language experience. Future work will determine the interplay of literacy, sign language, and deafness, as well as directionality and malleability of the VSL-literacy relationship.

12.Silvia Clement Lam

University of Connecticut

Unpacking mispronunciations: The cognitive-linguistic role of recoding verification

Recoding verification (RV) refers to linguistic processes that help individuals resolve variability in word pronunciation. It is often assessed through mispronunciation tasks, such as Set for Variability (SfV; Gibson & Levin, 1975; Venezky, 1999), where children identify target words from mispronounced stimuli (e.g., identifying head when pronounced as heed). Success in these tasks reflects awareness of letter-sound variability and the use of phonological or orthographic cues to infer words. For example, children might rely on phonological similarity or orthographic patterns (e.g., associating heed with head) to decode mispronunciations. RV is linked to phonemic awareness, word recognition, and decoding skills (Stalega, 2023) and mediates relationships between vocabulary and word reading (Tumner & Chapman, 2012). However, limited research has explored the roles of working memory and morphological awareness in RV. This study examines the role of recoding verification (RV) in children's reading skills, focusing on its links to various cognitive-linguistic skills. The study included 100 children aged 7–10 years (54 boys) recruited from local elementary schools. We found that (1) RV was positively correlated with word reading, phonological awareness, vocabulary, as well as working memory and morphological awareness; (2) RV uniquely accounts for reading performance beyond well-established cognitive-linguistic measures, and lastly (3) morphological awareness and phonological awareness are unique variables in explaining RV performance. These findings highlight the unique role of RV in explaining reading performance, as well as its specific linkage to phonology and morphology.

13.Alexander Kaminsky

MGH Institute of Health Professions

Reading comprehension and its relationship with visuo-spatial processing

Background Children with a reading disability (RD) are at risk for educational challenges. Confirming the component skills, including visuo-spatial processing (VSP), that contribute to RD will extend support opportunities for affected youth. The Rey Complex Figure Test (RCFT) is a standardized VSP test that requires copy (RCFT-C), immediate recall (RCFT-I), and delayed recall (RCFT-D) of a complex figure. The skills utilized in RCFT parallel the higher order reading demands required for comprehension. This study explores the proposed link by testing the association between the RCFT and reading comprehension. **Methods** Participants were 200 RD children (ages 8-12; IQ >70) from the Longitudinal Study of Genetic Influences on Cognition that completed the WIAT Word Reading (WR) and Reading Comprehension (RC) subtests. Hierarchical linear regression models assessed the associations between the RCFT-C, RCFT-I, and RCFT-D on RC controlling for age, sex, WIAT version, and WR. Follow-up models examined how the RCFT-I and RCFT-D were associated with RC over and above the RCFT-C. False discovery rate with a $q = .05$ was used to correct for multiple testing. **Results** The RCFT-C, RCFT-I, and RCFT-D were each significantly associated with RC (ΔR^2 's 4.8%, 8.2%, 6.5% respectively, p -values<.001). In models controlling for the RCFT-C, the RCFT-I ($R^2 = 3.2\%$, $z = 2.78$, $p = .006$) and RCFT-D ($R^2 = 2.2\%$, $z = 2.17$, $p = .032$) were still significantly associated with RC. **Conclusions** This study presents novel insights into the nature of VSP among students with RD, with implications for assessment and instruction.