

Introduction

- Developmental dyslexia (dD) is a neurodevlopmental disorder characterized by difficulties in reading despite adequate intelligence and education
- Aims:
- Identify distinct cognitive profiles of dD in a well-characterized cohort
- of children with persistent dyslexia despite intervention Increase precision and efficiency in characterizing learning profiles by using data-driven methods
- Hypothesis: Deviation from typical performance in specific cognitive subdomains may provide insight into subtypes of dyslexia

Methods

Study Sample

- Participants (n=147) received a comprehensive battery (15+ hours) of neuropsychological, academic, and language tests and MRI (3T Siemens Prisma) by an interdisciplinary team at the UCSF Dyslexia Center
- Children were referred with dD diagnosis and also diagnosed with dD by our team of trained neurologists and neurospsychologists
- Exclusion criteria: did not have at least one reading scores (TOWRE-2 or GORT) < 20th
- percentile (i.e. indicating partially remediated reading ability) clinically significant MRI findings warranting an immediate referral
- non-verbal reasoning (WASI Matrix Reasoning) or verbal reasoning (ROWPVT-4) < 9th percentile
- diagnosis of autism spectrum disorder



Sample Characteristics (<i>n</i> = 14 ⁻
kge mean (SD) range
Sex: male <i>n</i> (%)
landedness right: non-right
Schooling public: private
Ion-verbal Reasoning NASI Matrix Reasoning) mean percentile (SD) range
erbal Reasoning (ROWPVT-4) mean percentile (SD) range
Single Word Reading
TOWRE-2 Sight Word Efficiency
TOWRE-2 Phonemic Decoding Efficiency
WJ-IV Letter Word Identification
WJ-IV Word Attack
Dral Paragraph Reading
GORT-5 Rate
GORT-5 Accuracy
GORT-5 Comprehension
Single Word Spelling
WJ-IV Spelling
WJ-IV Spelling of Sounds

Data-driven Cognitive Clusters in Persistent Dyslexia

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Figure 4 - Distributions of pairwise stability scores indicating profile stability across 1,000 model iterations. Figure 5 - Proportion of co-occurring diagnoses per profile with total counts indicated on top of bars.

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Discussion

Interpreting Dyslexia Phenotypes

- Profile 1: relative weakness in verbal
- short-term memory and word retrieval
- Profile 2: relative weakness in processing speed and executive function (impaired performance)
- No difference in reading performance between profiles
- Both profiles show relative weakness in visuospatial and mathematical reasoning
- Profile 2 has statistically significantly higher verbal intelligence percentile scores (ROWPVT-4: *p*=0.016)
- ADHD:
- No statistically significant difference in the proportion of ADHD
- Supports literature stating that up to 50% of children with dyslexia show impaired executive functioning¹

Summary

- Findings highlight the importance of comprehensive neuropscyhlogical evaluation of children with dD.
- i.e. working memory, executive function, word retrieval, visuospatial, and mathematical assessment, beyond traditional reading, spelling and phonology measures
- Results suggest distinct heterogeneity in dD manifestations, emphasizing the need for personalized assessment and intervention tailored to specific deficits

Future Research

- Focus on identifying dD subtypes based on cognitive profiles and their corresponding neurodevelopmental trajectories
- Examine neuroanatomical correlates of identified profiles i.e. biomarkers from sMRI, DTI, and rs-fMRI
- Continue building a larger, more population-representative database of children: diverse geographical regions, races & ethnicities, and socioeconomic backgrounds

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