

Measuring the phonological structure of children's vocabularies using a lexical decision task

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Introduction

- Late talkers have vocabularies with more densely connected semantic networks than typical talkers¹
- Differences in semantic networks discriminate late bloomers from children with Developmental Language Disorder (DLD)²
- Networks are traditionally created using corpora of adult/child productions, Age of Acquisition (AoA) norms, or parent-report checklists
- Using a lexical decision task, we measured the phonological structure of vocabularies for children with and without DLD
- **We hypothesized that children with DLD would have vocabularies with denser phonological networks**

Method

Participants

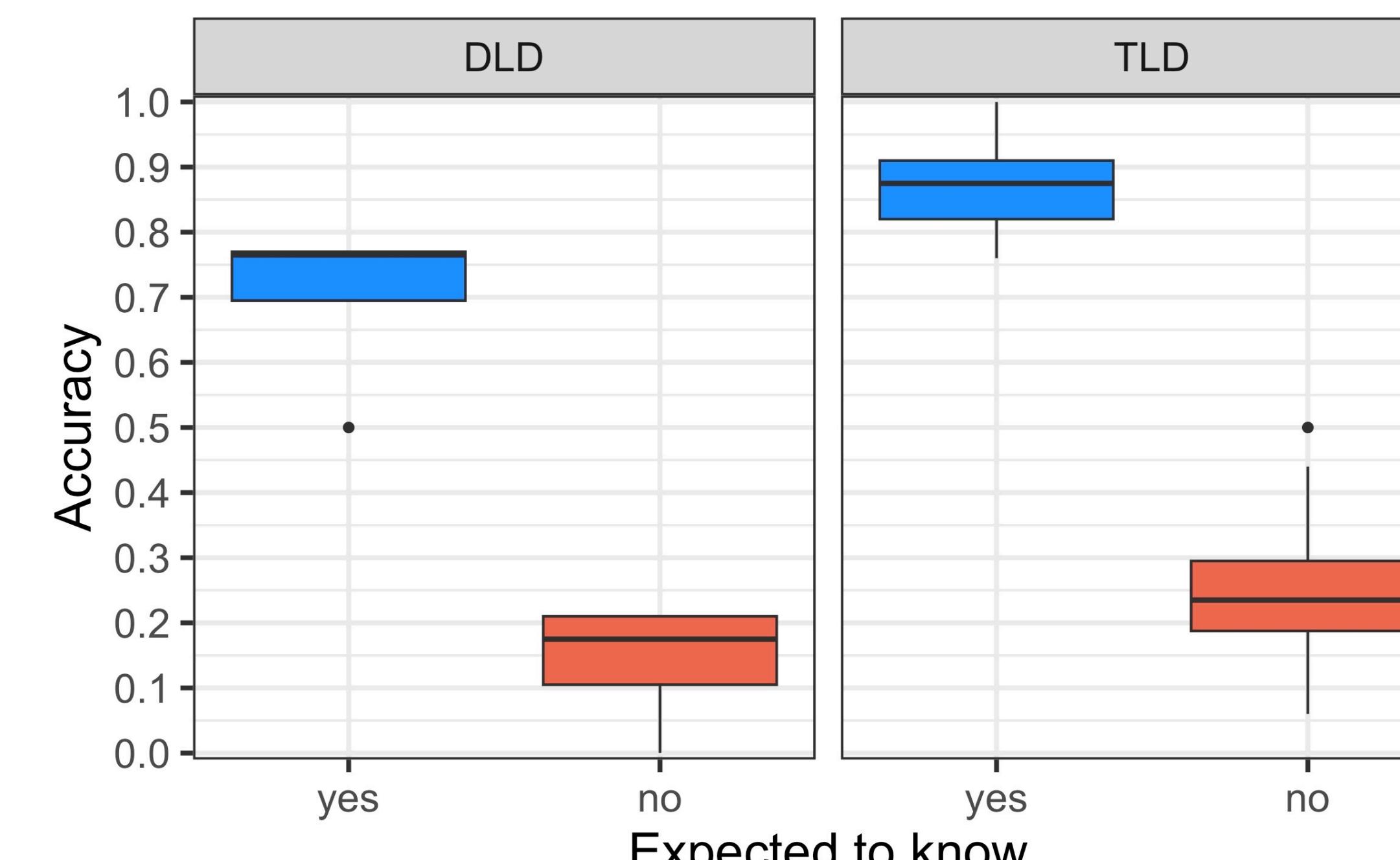
- 4 children with DLD & 29 children with typical language development (TLD), between 5;1 and 10;10 years of age
- Children with DLD had a standard score below 94 on the SPELT³ or below 80 on the CELF ELI⁴
- All were primarily English-speaking, normal hearing, NVIQ⁵ > 70, no ASD⁶ or neurological disorders (except ADHD)
- Remote data collection (via Zoom) ongoing

Tasks

- Taught 8 novel words (each had 8 real word neighbors)
- Neighborhoods varied in density (*clustering coefficient*): proportion of neighbors that are also neighbors
 - 4 high C: feidge, cuth, meeb, soog
 - 4 low C: chouse, wath, vib, nez
- Auditory lexical decision task: experimenter says word, child responds "yes" if it's a real word, a word you know; "no" if it's a made-up word, not a word you know
- 6 practice trials with feedback, 80 test trials
 - 64 real word neighbors of the 8 novel words
 - 16 made-up neighbors of the 8 novel words
- Children were expected to know 40 & not know 24 of the real words (equal "yes" and "no" responses)

Lexical Decision task validation

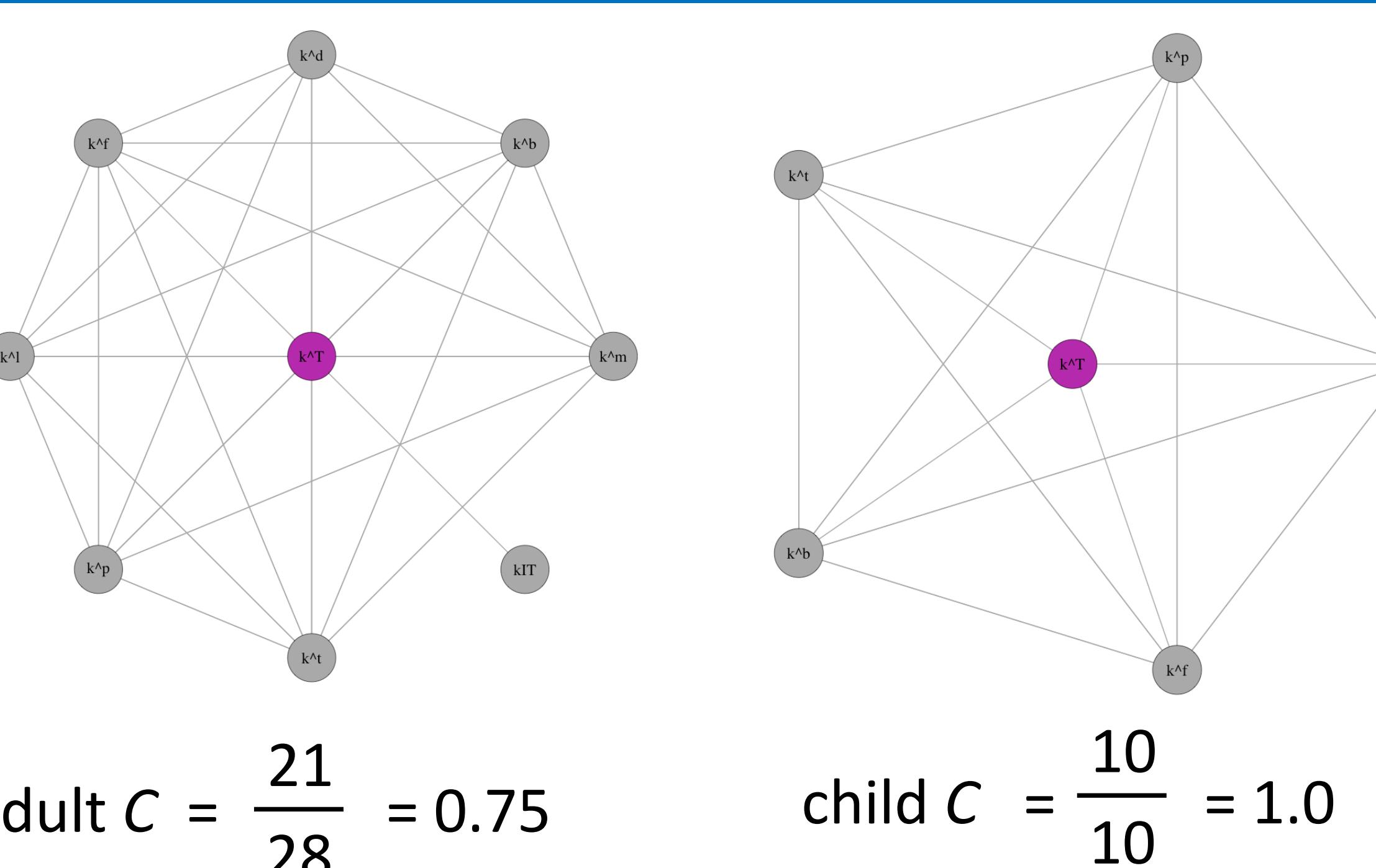
- Low false alarm rates ("yes" to made-up words)
 - 7% DLD & 6% TLD group
 - 2 children with rates above 20% (both TLD)
- Higher accuracy for real words they are expected to know vs. not know (per AoA norms)
 - 70% vs. 14% for DLD
 - 87% vs. 24% for TLD, $t(27) = 29.54, p < .001$



Individual Networks

Clustering coefficient (C)

= proportion of neighbors that are also neighbors
$$= \frac{\text{# of connections}}{\text{maximum # of connections}}$$

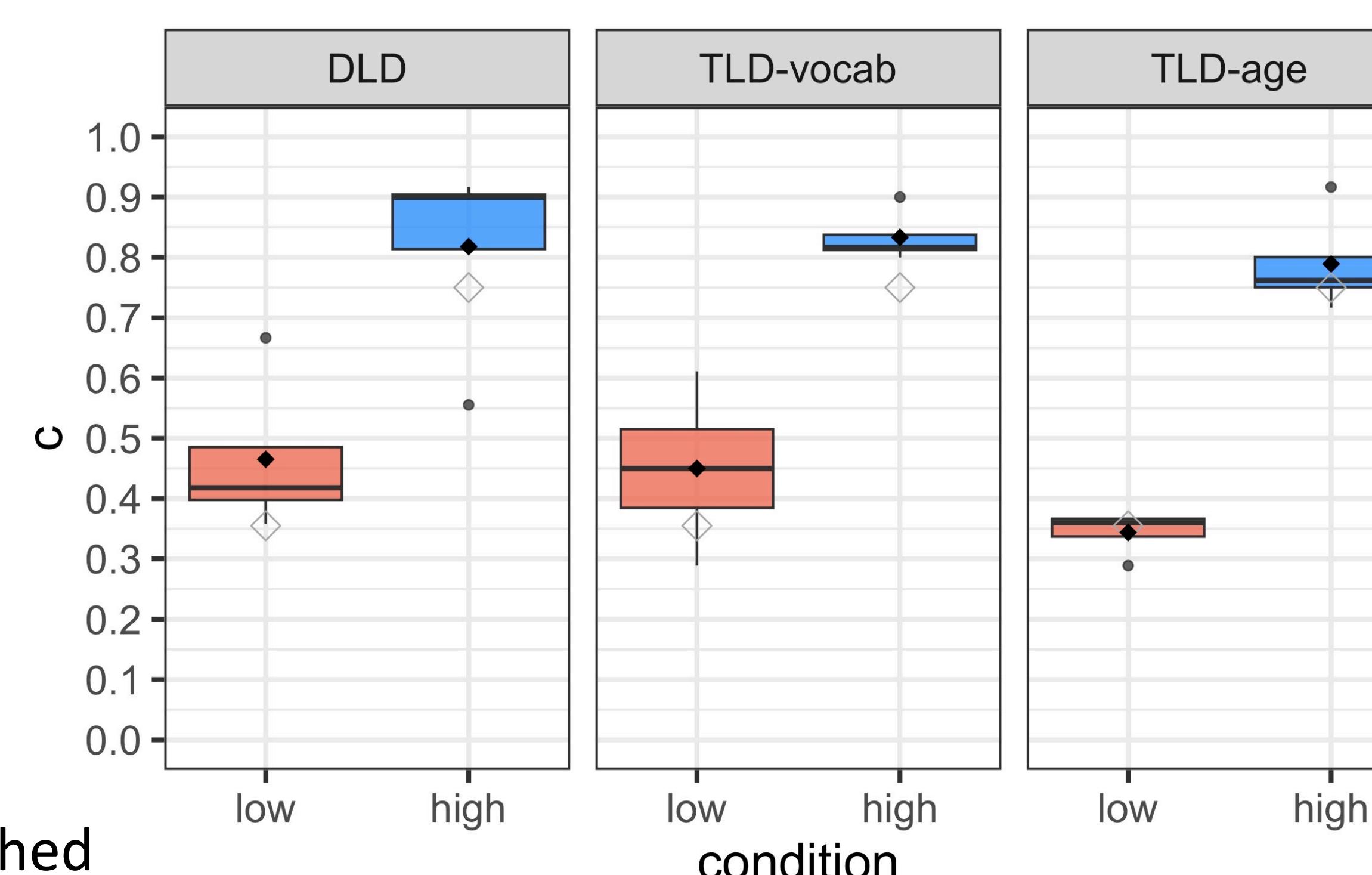


$$\text{adult } C = \frac{21}{28} = 0.75$$

$$\text{child } C = \frac{10}{10} = 1.0$$

Network density

- Children have denser phonological networks, average C is:
 - 0.55 for adults (i.e., all words)
 - 0.60 for TLD, $t(27) = 4.26, p < .001$
 - 0.65 for DLD
- Density decreases with age, $F(1,28.2) = 9.0, p = .006$
 - average C decreases 0.024 every year from 5 to 10 years
- Children with DLD are more similar to vocab-matched peers who are younger ($M_{DLD} = 8;1$ vs. $M_{TLD-v} = 5;7$)



Conclusions

- Children with and without DLD can complete auditory lexical decision tasks:
 - remotely (via Zoom)
 - with high phonological overlap between words
- The task is low tech & quick to administer:
 - for 80 trials, average duration of 14 minutes (including 5-minute break)
- It allows flexibility in sampling from a network:
 - narrow & deep (all words from few neighborhoods)
 - broad & shallow (some words from many neighborhoods)
- From 5 to 10 years of age, phonological networks become *less* dense/interconnected (lower C)
- Phonological networks for children with DLD are more similar* to vocab- than age-matched peers:
 - quantitative delay rather than qualitative difference

Disclosure

- Authors Ron Pomper, Karla McGregor, and Mike Vitevitch have no conflicts of interest
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