Encoding vs. Retrieval in Nonword Repetition Tasks:
Comparing Children with SLI-only, Children with SLI and Dyslexia, Typically Developing Children, and Adults

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Introduction

- Nonword repetition (NWR) is correlated with vocabulary size in young children.
- Nonword repetition tasks have been proposed as a marker of language learning difficulty because children with Specific Language Impairment (SLI) tend to underperform on those tasks relative to TD peers.
- However, SLI and Dyslexia (DYS) frequently co-occur.
- Children with DYS also underperform on NWR tasks.
- Mixed evidence regarding whether children with SLI, but not DYS, have difficulties with NWR.
- NWR was originally proposed to measure phonological short-term memory.
- However, NWR is a complex task. Therefore, performance may also be affected by other factors, including phonological segmentation, encoding, retrieval, and/or production.
- Thus, despite extensive research on NWR tasks, questions remain about developmental and cognitive factors that influence performance, as well as the extent to which NWR tasks index language-learning (dis)abilities.

- Purpose: To examine developmental differences in NWR and potential sources of NWR difficulty in children with SLI-only (SLI), children with SLI and dyslexia (SLI-DYS), typically developing children (TDC), and Adults. Our tasks, adapted from Bishop and colleagues, are designed to assess encoding and retrieval of phonological information.

Participants

- Adults: 18 undergraduate students (mean age: 22.2 years) from USC with normal reading and vocabulary skills.
- Children (7-9 years old) were recruited for the following subgroups:
  - Typically Developing Children (TDC, n=50) scored between the 40th and 85th percentile on the Clinical Evaluation of Language Fundamentals – 4 (CELF) and Woodcock Reading Mastery Test-3 Basic Skills (WRMT).
  - Children with Specific Language Impairment (SLI, n=21) scored above the 40th percentile on the WRMT and below the 16th percentile on the CELF.
  - Children with Specific Language Impairment and Dyslexia (SLI-DYS, n=41) scored below the 16th percentile on both the WRMT and CELF.

- All children had nonverbal IQ within normal limits as demonstrated by standard scores ≥ 85 on the Test of Nonverbal Intelligence (TONI-4).

Method

- Enforcing Task:
  - Participants listened to and repeated three nonwords five times.
  - Nonwords followed English phonemic conventions and followed a CV/CVC pattern.
  - The nonwords were: vabimu, zunuva, niga'du.

- Nonverbal Distractor Task:
  - Participants given 1 minute to complete a maze.

- Old/New Task:
  - Participants listened to a series of new vs. previously repeated nonwords and indicated if each had been heard before.

- Retention:
  - Delayed repetition
  - Participants were asked to repeat the three target nonwords once more.

Results

- Significant Group x Encoding Session interaction (p=.04): Adults and TDC performed at ceiling across all encoding blocks.
- SLI did not differ from any other group until block 5, when they were less accurate than TDC and Adults (p=.002).
- SLI-DYS was significantly less accurate than TDC and Adults across all encoding blocks (p=.001).
- SLI-DYS was the only group to show significant improvement across encoding blocks; there was significant growth between block 1 and block 3 (p=.003), which was maintained across all other blocks.
- There were no significant differences in production performance between the fifth encoding trial and the delayed repetition trial for any group.

- A significant developmental effect was observed: Adults were more accurate than TDC (p=.001), as well as SLI and SLI-DYS (p=.001).
- SLI did not perform significantly different from either TDC (p=.304) or SLI-DYS (p=.169).
- TDC were more accurate than SLI-DYS (p=.003).

Discussion

- Encoding:
  - Adults encoded quickly and performance was stable. TDC also displayed maximum performance from the first trial.
  - The performance of children with SLI suggested weaker encoding that reached statistical significance at block 5.
  - Children with both SLI-DYS displayed delayed encoding. They reached maximum performance by block 3, but were still significantly less accurate than TDC.

- Retrieval:
  - Findings from the Old/New task indicated developmental differences between TDC and Adults, even when NWR performance was similar (i.e., in the encoding task).
  - Children with SLI and TDC performed equally well in phonological retrieval after encoding.

- Retention:
  - Performance on the delayed repetition task was equal to the fifth encoding trial for all groups.
  - Children with SLI continued to underperform in the final production task compared to their typically developing peers, possibly due to inefficient encoding of phonological information.

- Developmental and Subgroup Differences
  - TDC and Adults encoded similarly but showed differences in retrieval. Unlike Bishop et al. (2012), we did not observe differences in retention, but their retention interval was substantially longer than the current study.

- Results suggest that NWR difficulties are more severe for children with SLI-DYS than SLI. Similar to the findings of Bishop et al. (2012), the locus of NWR difficulty appeared to be in encoding phonological information rather than retrieval.

- Future Directions
  - Examine consistency of errors across blocks
  - Examine performance of children with DYS only

References