Working Memory in Preschool Children with and without Phonological Delays

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Assessment of Word Learning

- **Nonword Repetition vs. Standardized Tests**
  - Less culturally biased (e.g., Rodekohr & Haynes, 2001)
  - Sensitive to individual differences (e.g., Gray, Plante, Vance, & Henrichsen, 1999)
  - Process versus product based (Dollaghan & Campbell, 1998)
- **Form Characteristics**
  - Phonotactic Probability
    - Likelihood of occurrence of a sound sequence (Common vs. Rare)
  - Neighborhood Density
    - The number of similar sounding words (Dense vs. Sparse)

Effects of Phonotactic Probability and Neighborhood Density

- **Word Learning (Storkel, 2004)**
  - Children with phonological delays learned a similar number of words, however…
    - Common-Dense >Rare-Sparse (TD children)
    - Rare-Sparse >Common-Dense (PD Children)
- **Nonword Repetition**
  - Manipulating form characteristics in NWRT affects performance but does not differentiate groups
    - Common > Rare (TD & PD) (e.g., Gathercole, Frankish, Pickering, & Peaker, 1999; Munson, Edwards, & Beckman, 2005)
- **Mismatch between word learning and nonword repetition results**

Questions

- **Do form characteristics have the same effect on performance across two different working memory tasks?**
- **Is the effect the same for children with and without phonological delays?**

Two Tasks

- **Nonword Repetition (NWRT)**
  - Repetition of lists of nonwords varying in the number of nonwords to be recalled
- **Nonword Language Processing Task (NLPT)**
  - Maintenance of a nonword in memory while processing the meaning of a sentence

Participants

	Age	GFTA Raw Score	ROWPVT Raw Score	EOWPVT Raw Score
*TD (N = 20)	59 (41-76)	5 (0-14)	63 (51-78)	57 (38-81)
**PD (N = 13)	63 (48-79)	32 (18-51)	65 (48-74)	59 (43-71)

*All children were WNL on Hearing

**Children in the PD group scored WNL on an omnibus language test, oral motor test, and nonverbal IQ test

Stimuli

Common – Dense	Common-Sparse	Rare-Dense	Rare-Sparse
wæt	hɛb	hɔɪt	hɔɪp
hʌb	jɪb	maʊd	haʊp
moʊb	nɛp	naʊt	mʊb
nʌb	jɛm	wʌd	nɔɪt
wʌt	jɪm	wʊp	wɪb
wɛp	mɪb	wɪm	waʊt
jæd	wʌm	jɛɪd	jɛb
jæp	wæb	jɪd	jɪm
joʊt	jɪd	jɪp	joʊd
jaɪn	haʊn	jɪt	joʊp

NWRT Procedures

- **Brief training**
- **Four list lengths (1,2,3,4)**
- **16 trials per list length**
- **List length 3**

jɛb haʊp waʊt

jɛb haʊp waʊt

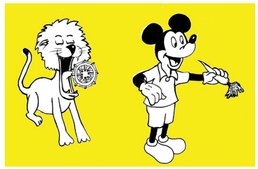
- **Dependent variable**
  - Proportion of phonemes correct

NLPT Procedures

- **Extensive 3-step training**
  - Yes/no judgment
  - Nonword recall
  - Multiple nonword recall
- **Four list lengths (1,2,3,4)**
  - 16 trials per list length
  - Discontinuation rule

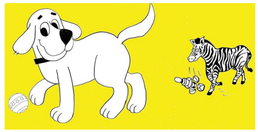
NLPT Procedures (List length 3)

Mickey Mouse is eating the jɛb



Was that right? No

Clifford is kicking the haʊp



Was that right? No

The girl is catching the waʊt

Was that right? Yes

Nonword Recall Prompt

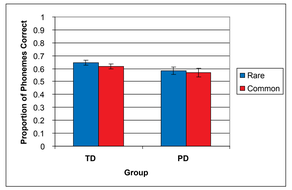
jɛb haʊp waʊt

- **Dependent variable**
  - Proportion of phonemes correct in nonword recall

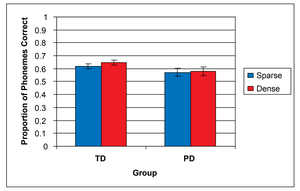
NWRT (Proportion of phonemes correct)

- **2 (density) x 2 (phonotactic probability) x 4 (length) ANOVA**
- **Significant effect of phonotactic probability**
  - $F(1, 31) = 17.623$, $p = .000$
  - Rare > Common
- **Significant effect of neighborhood density**
  - $F(1, 31) = 6.327$, $p = .017$
  - Dense > Sparse
- **No interaction with group**

NWRT Phonotactic Probability



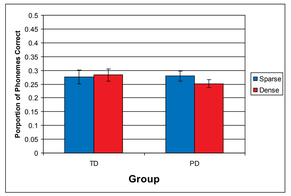
NWRT Neighborhood Density



NLPT (Proportion of phonemes correct)

- **2 (density) x 2 (phonotactic probability) x 4 (length) ANOVA**
- **Significant Interaction between group and density**
  - $F(1, 31) = 5.156$, $p = .030$
- **Significant effect of density for PD group only**
  - $F(1, 12) = 7.937$, $p = .016$
  - Sparse > Dense

NLPT Density * Group



Summary

- **NWRT**
  - Rare > Common and Dense > Sparse for TD & PD
  - Inconsistent with previous effect of phonotactic probability (Gathercole et al. 1999, Thorn & Frankish, 2005)
    - Partial- versus whole-word scoring method
    - Younger versus older children & adults
  - Consistent with previous effect of neighborhood density (Thorn & Frankish, 2005).
  - Consistent with previous lack of group differentiation (Munson et al. 2005)
    - NWRT may not be sensitive enough to detect subtle differences in children with PD
- **NLPT**
  - Sparse > Dense in PD only
  - Consistent with sparse advantage in novel word learning (Storkel, 2004)
  - Children with PD require additional cues in a more demanding working memory task
- **Different tasks differentially tap phonological versus lexical representations (Vitevitch, 2003)**
- **NWRT**
  - Taps both phonological & lexical representations
- **NLPT**
  - Taps lexical representations only (PD only)
  - May be more sensitive than NWRT in predicting word learning performance

Ongoing Data Collection

- **Compare performance to a phonology-equivalent group**
- **Examine differences in experimental and naturalistic word learning tasks**
- **NWRT, NLPT, & standardized vocabulary tests as predictors of novel word learning**

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