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The Effect of Delayed Phonological Development on Sublexical and Lexical Processing in Preschool Children

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Phonological Delay

- Significant delay in the acquisition of speech sounds with no obvious cause
- Other language skills are typically developing (Shriberg, Tomblin, & McSweeney, 1999)
- Group differences between children with phonological delays and typical development are observed in word learning (Storkel, 2004) but not in nonword repetition (Gathercole, Frankish, Pickering & Peaker, 1999; Munson, Edwards & Beckman, 2005)
- Are there differences in the processes that are tapped by these tasks in children with phonological delays?

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Sublexical Processing

- Entails processing of individual sounds and sound pairs, e.g. /kiwi/
- Nonword repetition and short-term word learning tap sublexical processing (Gathercole et al., 1999; Munson et al., 2005, cf Roodenrys & Hinton, 2002)
- Sublexical processing is influenced by phonotactic probability (Vitevitch & Luce, 1999)
- Phonotactic probability is the frequency of occurrence of individual sounds or sound pairs
 - » Common → “coat”
 - » Rare → “watch”

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Lexical Processing

- Entails processing of word forms as a whole unit, e.g. /kiwi/
- Short-term and long-term word learning tap lexical processing
- Lexical processing is influenced by neighborhood density (Vitevitch & Luce, 1999)
- Neighborhood density is the number of similar sounding words based on a one phoneme difference
 - » Dense → “sit”
 - » Sparse → “these”

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Purpose of Current Research

- To compare sublexical and lexical processing by children with phonological delays to children with typical development by manipulating phonotactic probability and neighborhood density in three tasks:
 - » Nonword repetition (sublexical processing)
 - » Short-term word learning (sublexical & lexical processing)
 - » Long-term word learning (lexical processing)

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Participants

	*Children with Phonological Delays (n = 17)	*Children with Typical Development (n = 17)
GFTA-2 Percentile Rank	*7 (1 – 16)	*62 (27-93)
Chronological Age	58 (41-49)	56 (36-68)
ROWPVT Standard Score	103 (88-118)	105 (90-115)
EOWPVT Standard Score	102 (79-117)	104 (84-126)

*Significant difference $t(32) = 9.52, p < .001$
 * All children were native speakers of English

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Nonword Repetition Task (Sublexical Processing)

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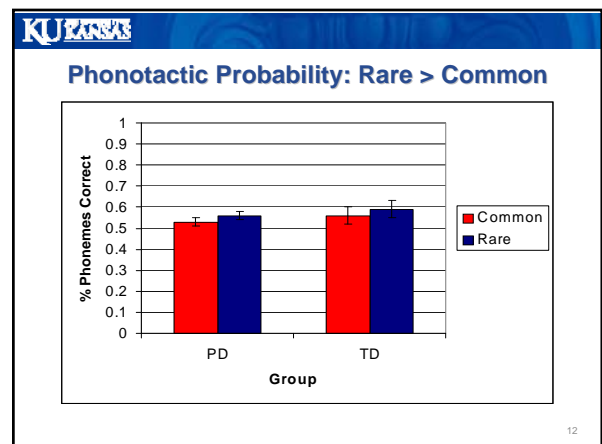
Nonword Repetition Task Stimuli

Common – Dense	Common-Sparse	Rare-Dense	Rare-Sparse
wæt	hɛb	hɔɪt	hɔɪp
hɒb	jɪb	mɔʊd	hɔʊp
mɔʊb	nɛp	nɔʊt	mɒb
nɒb	jɛm	wɒd	nɔɪt
wɒt	jɪm	wɒp	wɪb
wɛp	mɪb	wɪm	wɔʊt
jæd	wɒm	jɛɪd	jɛb
jæp	wæb	jɪd	jɪm
jɔʊt	jɪd	jɪp	jɔʊd
ʒɒm	hɔʊn	jɪt	jɔʊp

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- ### Nonword Repetition Task Procedure
- Brief training
 - 4 list lengths
 - 16 trials per list length
 - Dependent Variable = proportion of phonemes correct
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- ### Nonword Repetition Task Results
- 2 (neighborhood density) x 2 (phonotactic probability) x 4 (length) x 2 (group) repeated measures ANOVA
 - Main effect of phonotactic probability was significant
 - Supports initial hypothesis that nonword repetition taps sublexical processing
 - Main effect of neighborhood density was not significant
 - Supports initial hypothesis that nonword repetition does not tap lexical processing
 - Main effect of group and interactions with group were not significant
 - No group difference in sublexical processing in this task
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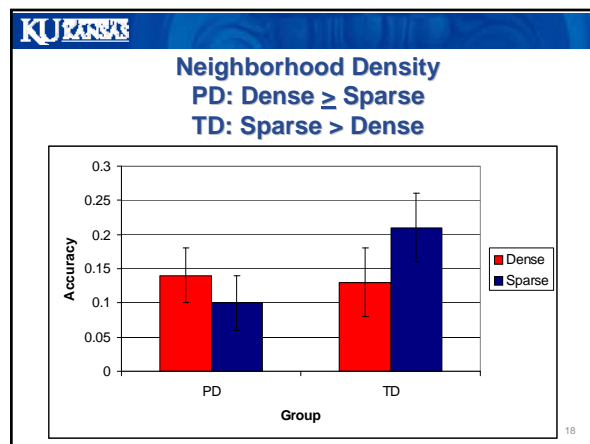
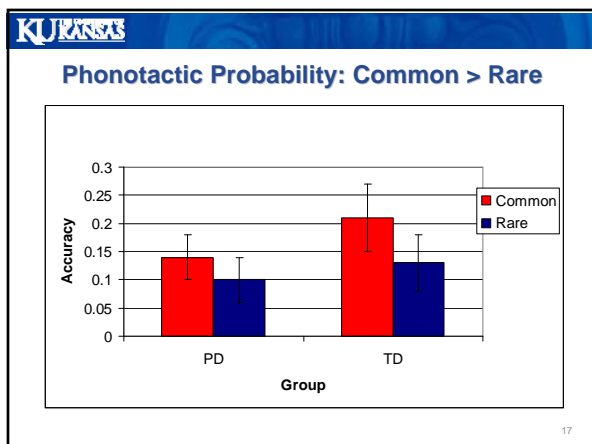
**Short Term Word Learning Task
(Sublexical & Lexical Processing)**

Short-term Word Learning Stimuli

Common-Dense	Rare-Sparse	Common-Sparse	Rare-Dense
paun	wap	paib	nad
jæt	nib	han	wud
nrd	tom	jaun	jem
woun	hub	meb	haud

- Short-term Word Learning Procedure**
- Nonword stimuli were paired with novel object referents
 - Embedded in the context of a three-episode story
 - Number of exposures increased with the three story episodes
 - Retention of the nonword was measured via picture naming after 1-week following exposure

- Short-term Word Learning Results**
- 2 (neighborhood density) x 2 (phonotactic probability) x 2 (group) repeated measures ANOVA
 - » Main effect of phonotactic probability was significant
 - Supports initial hypothesis that short-term word learning taps sublexical processing
 - Similar sublexical processing across groups
 - » Interaction of neighborhood density and group was significant
 - Supports initial hypothesis that short-term word learning taps lexical processing
 - Differences in lexical processing across groups



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Long Term Word Learning (Lexical Processing)

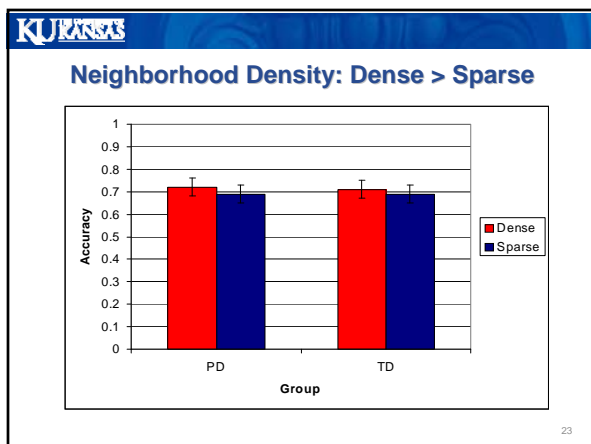
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- ### Long-term Word Learning Procedure
- 121 real nouns
 - » Orthogonally varying phonotactic probability and neighborhood density
 - » Matched on other phonological (e.g., canonical structure), lexical (e.g., age of acquisition, word frequency), and semantic characteristics (e.g. imagery, semantic set size)
 - Expressive Task
 - » Children named the target noun
 - Receptive Task
 - » Children selected the target noun from a field of 4 pictures

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Long-term Word Learning Stimuli

Matched Variables	Common-Dense	Rare-Sparse	Common-Sparse	Rare-Dense
Early AoA, High freq	car	fish	pig	duck
Early AoA, Mid freq	pants	frog	dress	swing
Mid AoA, Mid freq	ladder	tiger	hammer	turtle
Mid AoA, Low freq	mitten	beaver	hanger	feather
Late AoA, Low freq	toaster	donkey	banjo	thimble

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- ### Long-term Word Learning Results
- 2 (phonotactic probability) x 2 (neighborhood density) x 2 (task) x 2 (group) repeated measures ANOVA
 - » Main effect of phonotactic probability was not significant
 - Supports initial hypothesis that long-term word learning does not tap sublexical processing
 - » Main effect of neighborhood density was significant
 - Supports initial hypothesis that long-term word learning taps lexical processing
 - » Main effect of group and interactions with group were not significant
 - No group difference in lexical processing in this task



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Summary of Results

	Nonword Repetition	Short-term Word Learning	Long-term Word Learning	
	Sublexical	Sublexical	*Lexical	Lexical
Phonological Delay	Rare > Common	Common > Rare	*Dense = Sparse	Dense > Sparse
Typical Development	Rare > Common	Common > Rare	*Sparse > Dense	Dense > Sparse

* Significant Group Difference Observed

Sublexical & Lexical Processing Tasks

- The effects of phonotactic probability and neighborhood density confirmed the role of sublexical and lexical processing across tasks
 - » Phonotactic probability affects nonword repetition confirming the hypothesis that it taps sublexical processing (Gathercole et al., 1999; Munson et al., 2005)
 - » Phonotactic probability and neighborhood density affect short-term word learning confirming the hypothesis that it taps both sublexical and lexical processing
 - » Neighborhood density affects long-term word learning confirming the hypothesis that it taps lexical processing

Sublexical Processing

- Performance on nonword repetition and novel word learning tasks is influenced by sublexical processing
 - » Sublexical processing appears to be similar between children with phonological delays and children with typical development
 - Despite delays in sound development, sublexical processing may be intact for children with phonological delays

Lexical Processing

- Performance by preschool children on short- and long-term word learning tasks is influenced by lexical processing
 - » Differences are observed in lexical processing between children with and without phonological delays on a short-term word learning task
 - Processing of nonwords in a short-term word learning task may be influenced by phonological development status
 - Performance on vocabulary measures may not capture the nuances of lexical development in children with delayed phonological development

Lexical Processing Cont.

- Lexical processing by children with phonological delays and typical development is similar in a long-term word learning task
 - Recalling known vocabulary words may be unaffected by phonological development status

Future Directions

- Examine sublexical & lexical processing across a wider range of development
- Examine lexical processing in children whose phonological delay has resolved
- Compare sublexical and lexical processing by children with typical development to children who show delays in other aspects of language (e.g. vocabulary, grammar)

Thank you!

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