

Whole-word versus part-word phonotactic probability/ neighborhood density in word learning by children

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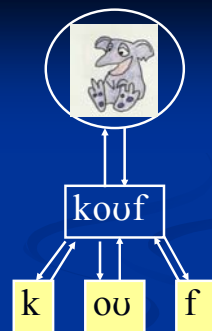
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Semantic Representation

Lexical Representation

Phonological Representation



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What do children have to learn to “know” a word?

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Phonological Characteristic

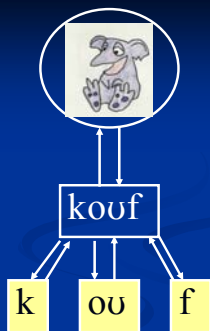
- Phonotactic probability (Vitevitch & Luce, 1999)
 - Frequency of occurrence of individual sounds (i.e., positional segment frequency)
 - Frequency of co-occurrence of pairs of sounds (i.e., biphone frequency)
 - High probability advantage in recognition and production

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Semantic Representation

Lexical Representation

Phonological Representation



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Lexical Characteristic

- Lexical neighborhood density (Luce & Pisoni, 1998)
 - Number of similar sounding words
 - Words that differ by only one phoneme in any word position
 - High density disadvantage in recognition
 - High density advantage in production and serial recall

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Relationship between Phonology and Lexicon

- Phonotactic probability correlated with lexical density (Vitevitch, et al., 1999; Storkel, 2004)
 - High probability ~ high density
 - Low probability ~ low density

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Does part-word probability/density affect word learning?

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Past Studies of Word Learning

- Children learned high probability/density novel words more rapidly than low (Storkel, 2001, 2003, 2004, Storkel & Rogers, 2000; Storkel & Maekawa, in press)
- Examined probability/density of the whole word

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Does the effect of part-word probability/density vary by age?

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Parts of Words Matter

- Onset density affects recognition and production by adults (Vitevitch, 2002; Vitevitch, Armbruster, & Chu, 2004)
 - e.g.: *mass – map, mad, man, pass*
sad – bad, fad, lad, sack

mass has many onset neighbors (few rhyme)
sad has many rhyme neighbors (few onset)
- Words with many onset neighbors recognized more slowly than words with many rhyme neighbors (few onset)
- Words with many onset neighbors produced more quickly than words with many rhyme neighbors (few onset)

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Shift from Whole to Part?

- Lexical re-structuring model (Metsala & Walley, 1998)
 - Posits holistic representation that changes to fine-grain
- Evidence from classification tasks that:
 - Young children classify words by overall similarity
 - Older children classify words by parts
 - First, rhyme
 - Then, onsets

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Purpose

- Pit whole-word probability/density against part-word probability/density
- Examine effect across age because sensitivity to parts of words may increase with age

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	Low CV/ Low VC	Low CV/ High VC	High CV/ Low VC	High CV/ High VC
CV probability	0.0004	0.0004	0.0046	0.0061
CV density	2	1	8	8
VC probability	0.0004	0.0030	0.0005	0.0057
VC density	1	8	1	10
Whole probability	0.001	0.003	0.005	0.012
Whole density	4	11	11	21

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Method

- 43 monolingual English-speaking children
 - 20 3-year-olds
 - 23 4- and 5-year-olds
- 16 CVC nonwords varying in whole-word and part-word phonotactic probability/neighborhood density
 - Low CV/Low VC Whole = low
 - Low CV/High VC Whole = medium
 - High CV/Low VC Whole = medium
 - High CV/High VC Whole = high

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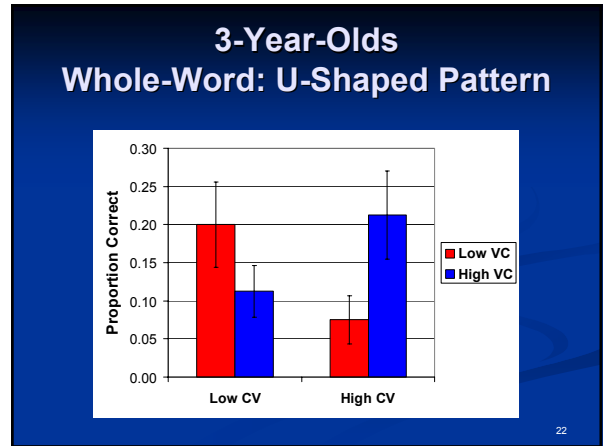
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CV	VC		Referent			
	High	Low	Item 1	Item 2	Item 3	Item 4
High	pid	kouf				
						
Low	yak	gib				
						



Procedure


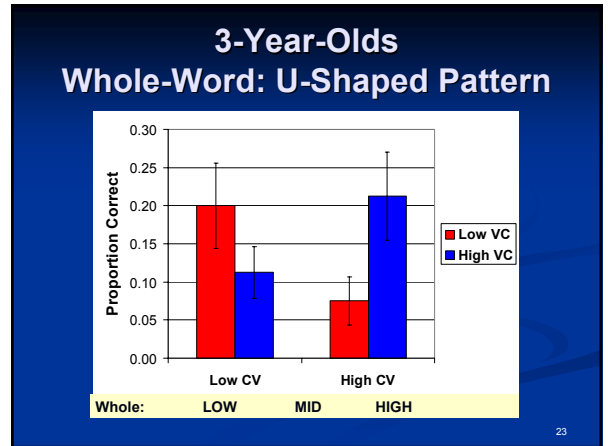
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 Episode 1 Episode 2 Episode 3
 8 exposure 8 exposures 8 exposures
 8 stimuli 8 stimuli 8 stimuli

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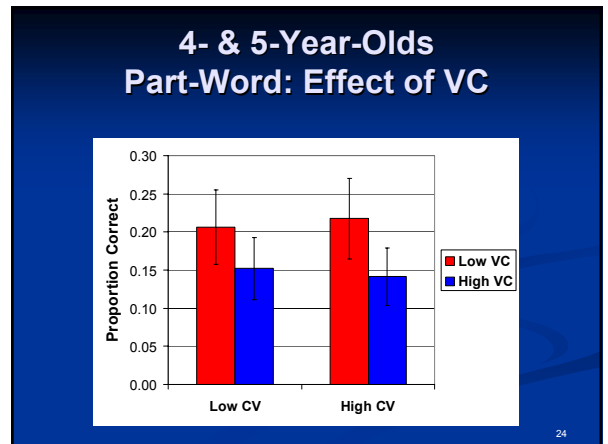
Test 0 Story 2 Test 1 Story 2 Test 2 Story 2 Test 3 Test 4
 Episode 1 Episode 2 Episode 3
 8 exposure 8 exposures 8 exposures
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- Picture Naming

Results

- 2 CV x 2 VC x 2 Age mixed ANOVA
- Significant 3-way interaction of CV x VC x Age
 - $F(1, 41) = 6.14, p = 0.02$
- Analyze each age separately



Summary

- 3-year-olds
 - Effect of whole-word probability/density
 - Low & High advantage over Mid
- 4- & 5-year-olds
 - Effect of part-word probability/density
 - Low VC advantage over High VC

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Interpretation: Development

- Effect of whole vs. part changes with development
- Supports shift from holistic to fine-grain processing
 - Coincides or precedes emergence of phonological awareness of the rhyme?

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Interpretation: “U” for Whole-Word

- Low = High > Mid
- Low advantage = unique
 - Sequence is novel and must be learned
- High advantage = cohesive, predictable
 - Easier to hold in memory
 - Easier to create a lexical representation
- Mid = not unique and not predictable

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Taken together, parts of words seem to influence word learning for older, but not younger, children

Emergence of the influence of part-words may be an important milestone

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Interpretation: Part-Word

- Low > High rhyme
 - Again, advantage for uniqueness
- Rhyme characteristics more influential than onset

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Thank you!

- Participants
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