



# Phonological and lexical effects on word variability



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## ABSTRACT

Lexical and phonological characteristics of words were examined for their effect on spoken word accuracy and variability in children with typical language development. Phonological complexity and age of acquisition of words significantly affected word accuracy. Phonological complexity but not age of acquisition significantly affected word variability. Late-acquired words and those with less complex speech sounds were produced more accurately. Words with more complex speech sounds were produced with more variability.

## INTRODUCTION

- Word variability: variability in repeated productions of the same word by the same speaker, e.g., “chair”: “sair”, “shair”, and “tsair”
- Feature of both typical and disordered speech

### Typical Development

- 3-year-old children have shown significantly more word variability than older children (Holm, Crosbie, & Dodd, 2007)
- Only 13% of target words were variable
- Children aged 3;6-3;11 showed similar amounts of variability to older children
- As children get older, word variability decreases
- Word variability is mostly adult-like by 3;6
- What about children younger than 3;0?

### Disordered Development

- Word variability is most often associated with childhood apraxia of speech (CAS)
- Word variability in these children may be due to their speech motor planning/programming deficits
- 3-5-year-olds with CAS showed decreasing word variability with increasing age (Iuzzini & Forrest, 2011)
- Children with speech sound disorders (SSD, but not CAS) and high word variability showed deficits in spontaneously producing, imitating, and spelling nonsense words and spelling real words (Holm, Farrier, & Dodd, 2008)
- Holm et al. (2008): deficit in phonological assembly
- Very few studies have investigated factors that might have an effect on word accuracy and variability
- E.g., consonant age of acquisition, word frequency, and neighborhood density were significant predictors of word variability in children aged 2;0-2;5 (Sosa & Stoel-Gammon, 2012)

## PARTICIPANTS

- 18 children aged 1;9 to 3;1
- Age-appropriate expressive vocabulary, as confirmed by percentile ranks of 16 or higher on the MacArthur-Bates Communicative Development Inventories, Second Edition (Fenson et al., 2007)

## PROCEDURES

- 20 target words were elicited a minimum of 3 times each using toys and other objects during a play session
- Children’s productions were recorded using a Shure wireless microphone system and a Marantz professional portable field audio recorder
- Target words varied according to their age of acquisition and to the complexity of the speech sounds they contained:

	LEAST COMPLEX SOUNDS	MOST COMPLEX SOUNDS
EARLY-ACQUIRED WORDS	DOG KITTY MEOW BANANA COOKIE	SHOES CHEESE JUICE FISH THANKYOU
LATE-ACQUIRED WORDS	CUP BUNNY BUTTON OPEN TUMMY	FLOWERS CRACKER BRUSH CHAIR GRAPES

- Word accuracy and variability measures:
- Target Accuracy (TA): proportion of attempts that were accurate
- 4 measures of variability:
  1. Target Variability (TV):  
 $0 = \text{all productions identical}$   
 $1 = \text{variable productions}$
  2. Total Token Variability (TTV):  
 $\frac{\# \text{ variants} - 1}{\# \text{ productions} - 1}$
  3. Error Token Variability (ETV):  
 $\frac{\# \text{ incorrect variants} - 1}{\# \text{ incorrect productions} - 1}$
  4. Proportion of Whole-Word Variation (PWV):  
 $\frac{\# \text{ different variants}}{\# \text{ productions}}$

## RESULTS

- 2 X 2 factorial ANOVAs used to test the effects of phonological complexity and age of acquisition on word accuracy and variability
- Significant main effects for lexical ( $p < .05$ ) and phonological ( $p < .001$ ) variables for Target Accuracy
- Late-acquired words and those with less complex speech sounds more accurate
- Significant main effects for the phonological variable for all measures of word variability ( $p < .001$ )
- Words with more complex speech sounds more variable

- Nonsignificant main effects for the lexical variable and nonsignificant interactions for all measures of word variability

## DISCUSSION

- Age of acquisition of words AND phonological complexity affect word accuracy
- Late-acquired words most accurate – unexpected
- ONLY phonological complexity affects word variability
- Consistent with Sosa and Stoel-Gammon (2012)
- Speech-language pathologists may need to consider using late-acquired words with the least complex speech sounds as treatment targets for children with speech sound disorders