Effects of Neighborhood Density and Phonotactic Probability on Word Learning

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Form Representation

- Sublexical representations
  - Individual sounds
  - e.g., /b/, /i/, /d/
- Lexical representations
  - Whole word form
  - e.g., /bid/

Sublexical Representations

- Influenced by phonotactic probability
  - 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

Lexical Representations

- Influenced by neighborhood density
  - Number of similar sounding words
  - High density disadvantage in recognition
  - High density advantage in production and serial recall

Word Learning in Children

- Examined correlated phonotactic probability and neighborhood density
- High probability/high density advantage
- Attributable to sublexical or lexical influences on word learning?

Do both sublexical and lexical representations influence word learning?

Study 1: Adult Word Learning

- 32 monolingual English-speaking adults
- 16 nonwords varying in phonotactic probability and neighborhood density
- Paired with unusual objects
- Repeated exposure-test paradigm

Results

- Main effect of phonotactic probability
  - High probability disadvantage
- Main effect of neighborhood density
  - High density advantage
- No significant interactions

Study 2: Toddler Word Learning

- Database of words known by 16- to 30-month-olds
- 680 word checklist
- Parent indicates which words child produces
- Norms from 1,800 children

Stimuli

- Restrict to nouns
- Sublexical measures:
  - Positional segment frequency
  - Biphone frequency
- Lexical measures:
  - Neighborhood density
  - Word length
  - Word frequency
  - Neighborhood frequency

Stimuli

- Semantic measures

- Nelson, McEvoy, & Schreiber (1998) discrete association norms
  - *Semantic set size*: number of neighbors
  - *Connectivity*: number of connections among neighbors
  - *Probability resonance*: number of bidirectional connections
  - *Resonance strength*: strength of the bidirectional connections

Factor Analysis

- Four factors:
  - Sublexical: positional segment & biphone frequency
  - Lexical: neighborhood density & word length
  - Semantic 1: set size & connectivity
  - Semantic 2: probability resonance & resonance strength

Regression Results

- All factors significant predictors
  - Sublexical: High probability disadvantage
  - Lexical: High density/short word advantage
  - Semantic 1: High set size/connectivity advantage
  - Semantic 2: High resonance/strength advantage

Regression Results

- Interactions
  - Sublexical x Age: No interaction
  - Lexical x Age: Lexical effect decreases as age increases
  - Semantic 1 x Age: Semantic effect increases as age increases
  - Semantic 2 x Age: Semantic effect increases as age increases

Sublexical Effects on Word Learning

- High probability disadvantage constant across age
- Sublexical representations may aid in triggering word learning
- Low probability = unique

Lexical Effects on Word Learning

- High density advantage that diminishes across age
- Existing lexical representations may stabilize new representations
- Change in emphasis on form vs. meaning with development?
- Influence of amount of similarity?

Semantic Effects in Word Learning

- High set size advantage that increases across age
- Existing semantic representations may stabilize new representations
- Change in emphasis on form vs. meaning with development?
- Influence of amount of similarity?

Word Learning Conclusions

- Role of sublexical representations is unique
- Influence of lexical and semantic representations is similar
- Developmental changes in lexical and semantic influences warrant further investigation

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