PHONOTACTICS & WORD LEARNING IN PRESCHOOLERS WHO WERE LATE TALKERS

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Disclosure Statement

I have no financial or nonfinancial interest in any organization whose products or services are described, reviewed, evaluated or compared in the presentation.
Learning Outcomes

At the end of this presentation, attendees will be able to:

1. Define late talker and late bloomer
2. Define phonotactic probability
3. Describe how phonotactic probability influences word learning in 3 year olds who were late talkers
Characteristics of late talkers
Late talkers

- 15% of the toddler population

- At 24 months
  - <50 words
  - no two-word combinations

- Normal
  - Cognition
  - Hearing
  - Vision
  - Physical development
  - Social-emotional development

(Rescorla, 1989)
Late talkers

- **Phonological characteristics**
  - **Delays**
    - Fewer consonants correct
    - Less complex syllable structures
    - Smaller phonemic inventories
  - **Deviant patterns**
    - Inconsistent sound patterns
    - Atypical errors

(Rescorla, 1989; Paul & Jennings, 1992; Carson, Klee, Carson, & Hime, 2003; Rescorla & Ratner, 1996)
Longitudinal outcomes

- Two general patterns
  - Late bloomers
  - Truly delayed
    - (i.e., Specific Language Impairment SLI)

(e.g., Thal, Tobias, & Morrison, 1991)
Longitudinal outcomes

- Late bloomers
  - Catch up by 3-5 years, but have different
    - Reading skills
    - Vocabulary
    - Verbal memory
    - Grammar
  - differences observed through adolescence

(Rescorla, 2009)
Longitudinal outcomes

- Truly delayed late talker
  - Language delays continue throughout elementary school
    - Usually diagnosed with SLI
    - Deficits in
      - Syntax
      - Morphology
      - Semantics
      - Phonology
Longitudinal outcomes

- Phonology in children with SLI
  - Differences in phonological organization skills
    - Perception tasks
    - Production tasks

(e.g., Benasich & Tallal, 2001; Mills & Neville, 1997; Trehub & Henderson, 1996; Leonard, Schwartz, Swanson, & Frome Loeb, 1987; Aguilar-Mediavilla, Sanz-Torrent, & Serra-Raventos, 2002; Paul & Shriberg, 1982)
Word learning
Word learning:

- Typically developing children
  - are efficient word learners
    - require few exposures; fast mapping (Carey, 1978)

- demonstrate phonological organization
  - use their existing phonology to help them learn new words

(Leonard, Schwartz, Swanson, & Frome Loeb, 1987)
Word learning

- Typically developing children (cont.)
  - Recognize regularities
  - Phonotactic probability
    - The likelihood of occurrence of sound sequences

<table>
<thead>
<tr>
<th>High PP</th>
<th>Low PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cat</td>
<td>Juice</td>
</tr>
</tbody>
</table>
Word learning

- Phonotactic probability influences word learning in typically developing:
  - Toddlers (MacRoy-Higgins, Schwartz, Shafer & Marton, 2009)
  - School aged children (Munson, Edwards, & Beckman, 2005)

- High phonotactic probability words are:
  - Learned more quickly
  - Produced more accurately
Word learning

- Toddlers who are **late talkers**
  - not efficient word learners (Ellis Weismer & Evans, 2002)
  - do not take advantage of phonological regularities
    - do not show an advantage for high probability words (MacRoy-Higgins et al., 2009)
Word learning

- Children with SLI
  - Show difficulties with word learning throughout childhood
    - Do not take advantage of existing phonologies when learning new words

(Leonard, Schwartz, Swanson, & Frome Loeb, 1987)
Use novel word learning task to determine if 3 year olds who were late talkers show similar phonological organization as their typically developing peers.

It is possible that late talkers who catch up demonstrate phonological organization that is similar to their peers, which facilitates language growth.
1. Do 3-year-olds who were late talkers show differences in word learning as compared with controls?

2. Does phonotactic probability influence word learning in 3-year-olds who were late talkers?
Predictions

1. Typically developing 3-year-olds will perform better than 3-year-olds who were late talkers.
2. Typically developing 3-year-olds will show an advantage for high phonotactic probability words.
3. 3-year-olds who were late talkers may not show an advantage for high phonotactic probability words.
Methodology: Overview

- 3-years-olds who were late talkers at age 2

- Fast mapping of nonsense words to novel objects
  - High phonotactic probability
  - Low phonotactic probability

- Examine word learning through
  - Identification
  - Production
Participants

History of Late Talker (HLT)
- N = 10
  - 2 female
  - 36-40 months of age

Typical Language Developing (TLD)
- N = 11
  - 2 female
  - Matched to HLT
    - Age
    - Gender
    - SES (middle to upper class)
    - Cognition
Participants: HLT

- Delayed lexical development as toddlers (21-26 months)
  - <15\textsuperscript{th} percentile on CDI-2
  - < 1 SD on PLS-4 (EC)
- Average performance
  - Receptive language PLS-4 (AC)
  - Cognition (Bayley-3)
Standardized testing: age 3

- Preschool Language Scale- 4\textsuperscript{th} edition (PLS-4)
- Peabody Picture Vocabulary Test – 4\textsuperscript{th} edition (PPVT-4)
- Expressive Vocabulary Test- 2\textsuperscript{nd} edition (EVT-2)
- Goldman Fristoe Test of Articulation -2\textsuperscript{nd} edition (GFTA-2)
- Test of Early Preschool Literacy (TOEPL)
  - Print awareness
  - Phonological awareness
## Participant information

<table>
<thead>
<tr>
<th>Group</th>
<th>PLS-4 AC SS</th>
<th>PLS-4 EC SS</th>
<th>PPVT-4</th>
<th>EVT-2</th>
<th>GFTA-2</th>
<th>TOPEL PRINT</th>
<th>TOPEL PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLD</td>
<td>110</td>
<td>114</td>
<td>108</td>
<td>115</td>
<td>117</td>
<td>118</td>
<td>95</td>
</tr>
<tr>
<td>HLT</td>
<td>96</td>
<td>100</td>
<td>96</td>
<td>100</td>
<td>104</td>
<td>103</td>
<td>79</td>
</tr>
</tbody>
</table>
Stimuli (CVC)

High phonotactic probability

/mɛp/

/kɔz/

Low phonotactic probability

/vug/

/gɔb/
Procedures

- Fast mapping

- Novel words presented (randomly) 5 times each in the sentence-final position

  (e.g., “Look this is a…”)


Procedures

- Comprehension/production testing
  - Comprehension
    - Point to the…
  - Production
    - What’s this?

- Fast mapping and comprehension/production testing completed twice
  - Time 1
  - Time 2
Scoring

- Comprehension; objects presented in field of 4
  - Scored as correct $= 1$; incorrect $= 0$

- Production
  - Scored as correct $= 1$; incorrect $= 0$
Results
Comprehension: *point to the* …

- Independent variables
  - Phonotactic probability (high vs. low)
  - Time (1 vs. 2)
- Dependent variable
  - # correct responses
Comprehension

Average number of correct responses (4 trials total)

TLD

HLT
Comprehension

TLD average number of correct responses (2 trials total)
Comprehension

**HLT** average number of correct responses (2 trials total)

![Graph showing comprehension scores over time for high and low groups.](image-url)
## Comprehension: summary

<table>
<thead>
<tr>
<th>TLD participants</th>
<th>HLT participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performed above chance</td>
<td>Performed at chance</td>
</tr>
<tr>
<td>Performed better at T2 than T1</td>
<td>No difference between T1 and T2</td>
</tr>
<tr>
<td>No difference between high and low probability words</td>
<td>No difference between high and low probability words</td>
</tr>
</tbody>
</table>
Production: *what’s this?*

- Independent variables
  - Phonotactic probability (high vs. low)
  - Time (1 vs. 2)
- Dependent variable
  - # correct responses
Production

**TLD average productions (2 trials total)**

- **Time 1**: High (0.75) vs. Low (0.25)
- **Time 2**: High (0.80) vs. Low (0.80)
Production

HLT average productions (out of 2 trials)

Time 1

Time 2

High

Low
Production: summary

- **TLD participants**
  - T1: early advantage for high probability words
  - T2: improvement in low probability words

- **HLT participants**
  - T1: no difference between high and low probability words
  - T2: improvement in high probability words
Discussion
Discussion

1. Do 3-year-olds who were late talkers show differences in word learning as compared with controls?

✓ Yes
  ✓ Comprehension
  ✓ Production
Discussion

- **Comprehension**
  - HLT group performing at chance
  - May require more exposures to comprehend new words

- **Production**
  - HLT group produced fewer new words
  - Despite average score on EVT-2, HLT are not as efficient in word learning as TLD
Discussion

- Does **phonotactic probability** influence word learning in 3-year-olds who were late talkers?

  ✓ Yes
  ✓ Production

  NOT observed in comprehension
Discussion

- TLD 3 year olds
  - showed early preference for high pp words
    - Reflects phonological organization
  - low pp words improved with more exposure
Discussion

- HLT 3 year olds
  - No difference in T1 for high versus low pp
    - do not initially take advantage of phonological regularities
  - T2 showed preference for high pp words
    - similar to TLD T1
    - required more exposure
Discussion

- Do 3 year olds who were late talkers learn new words at the same rate as TLD 3 year olds?
  - No
    - Comprehension
    - Production
Discussion: rate of word learning

- HLT
  - may require more exposures to establish lexical items in receptive vocabulary
  - do not take advantage of phonological regularities when first exposed to new words
Conclusions

- HLT group (late bloomers) performed similarly to
  - TLD children
    - show preference for high probability words (with more exposure)
  - children with SLI
    - difficulties learning new words
      - comprehension
      - production

(Alt & Plante, 2006; Gray, 2004)
Late bloomers do not qualify for speech-language intervention

- Linguistically, they are not the same as TLD children
- Show continued differences in
  - Lexical acquisition
  - Phonology
    - Phonological awareness
Late bloomers would benefit from language intervention
- are at risk for lasting language difficulties
- may require more input (perception and production) to efficiently acquire new lexical items
Questions?

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References


