Hear no evil or speak no evil:
Lengthening of phonological competitors
Speakers’ choices are dynamic

• Context modulates speakers’ choices
  • Phonetics
  • Lexical form (chimp, chimpanzee) (Mahowald et al., 2014; Cohen Priva, 2017; Jaeger, Furth, & Hilliard, 2012)
  • Referring expressions (cat, kitten) (Roelofs, 1992)
  • Argument order (dative alternation) (Ferreira, 1996)
  • Syntactic reduction (Ferreira & Dell, 2000)
  • Prosody
Prosody is dynamic

- Conceptual, phonological, and discourse factors
  - Word frequency (Gahl, 2008)
  - Linguistic predictability (Bell et al., 2009)
- **Duration**
  - Reduction (Galati & Brennan, 2010; Jacobs, Yiu, Watson, & Dell, 2015)
  - Lengthening (Watson, Buxó-Lugo, & Simmons, 2015; Gahl, 2008)

Note: Cats not scaled according to observed effect sizes
Why is prosody dynamic?

• **Incidental:** Facilitation or interference affect the planning process (Kahn & Arnold, 2012; Sevald & Dell, 1994; Yiu & Watson, 2015)

• **Intentional:** Speakers tailor their speech to the context to efficiently transfer information or confusability (Buz, Jaeger, & Tanenhaus, 2016; Buxó-Lugo, Toscano, & Watson, in press)
Incidental lengthening

• Easy things are shorter
  • Referents that are repeated (Kahn, Arnold, & Pacani, 2012)
  • Repetition is easy
    • Word repetition, even for new referents (Lam & Watson, 2014)
    • pi/pie (Jacobs et al., 2015)
  • Words that are more accessible tend to be reduced
Incidental lengthening

- Words that are harder are longer
  - Uncommon, unpredictable words
  - Phonologically similar words (phonological competitors) create interference (Sevald & Dell, 1994; Yiu & Watson, 2016)
  - Semantically similar words (Fink, Goldrick, & Oppenheim, 2018)
- Slowing down may “buy time” for successful production
Strategic accounts

• **Informativity** (Aylett & Turk, 2004; Cohen Priva, 2008; Seyfarth, 2016)

• **Perspective-taking or audience design**
  - Speakers recognize confusability and/or information content of their names for referents and adjust
  - Speakers change productions based on interlocutor behavior (Buz, Jaeger, & Tanenhaus, 2016)
Both accounts of lengthening

• Mostly predict the same behavior
• Listeners confused ≈ producers experience interference
• Third account: Auditory memory component
Role of memory for what has been said

• Someone producing a word **aloud** matters for reduction
  • Bard et al., (2000)
  • Kahn & Arnold (2015)
  • Jacobs, Yiu, Watson and Dell (2015)

• Speakers have a memory for what has been named (Galati & Brennan, 2010; Jacobs, Yiu, Watson, & Dell, 2015)
What makes speakers lengthen phonological competitors?

• Incidental
  • Lengthen because they experience interference?

• Strategic
  • Lengthen because words are confusable to listeners?

• Memory
  • Lengthen because speakers remember competitors that have been said aloud?
Event description task

Participant says: The **hand** shrinks
Event description task

Participant says: The **hat** flashes
Conditions

(0) No cohort present
Conditions

(1) Cohort present but unnamed
Conditions

(2) Cohort prime, speaker hears
(3) Cohort prime, speaker names
Conditions

(0) No cohort present

(1) Cohort present but unnamed

(2) Cohort prime, speaker hears

(3) Cohort prime, speaker names
Predictions: Incidental

(0) No cohort present

(1) Cohort present but unnamed

(2) Cohort prime, speaker hears

(3) Cohort prime, speaker names
Predictions: Strategic

1. No cohort present
2. Cohort present but unnamed
3. Cohort prime, speaker hears
4. Cohort prime, speaker names
Predictions: Memory

(0) No cohort present

(1) Cohort present but unnamed

(2) Cohort prime, speaker hears

(3) Cohort prime, speaker names
Experiment 1 results
Experiment 1 results

Target word durations (ms)

- Cohort absent
- Cohort present but unnamed
- Cohort heard first
- Cohort named
Experiment 1 results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Target word durations (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort absent</td>
<td>450</td>
</tr>
<tr>
<td>Cohort present but unnamed</td>
<td>475</td>
</tr>
<tr>
<td>Cohort heard first</td>
<td>475</td>
</tr>
<tr>
<td>Cohort named</td>
<td>500</td>
</tr>
</tbody>
</table>
Experiment 1 summary

• Speakers only significantly lengthened targets (e.g. hat) after a competitor had been named out loud (e.g. hand)
  • Not just whenever there were similar-sounding referents
  • Even when another person had said the word
• Speakers may not have even known competitor was there
  • bat...flying bat (Ferreira & Griffin, 2001)
  • butterfly...small one (Brown-Schmidt & Konopka, 2006)
Experiment 2

• Prior to start of animations, participants mouth in inner speech every item in the display clockwise from top left (e.g. Oppenheim & Dell, 2008)
Experiment 2 results

Target word durations (ms)

- Cohort absent
- Cohort present but unnamed
- Cohort heard first
- Cohort named

Condition
Experiment 2 results

Target word durations (ms)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Target word durations (ms)</th>
</tr>
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<tbody>
<tr>
<td>Cohort absent</td>
<td>400 ± 10</td>
</tr>
<tr>
<td>Cohort present but unnamed</td>
<td>425 ± 15</td>
</tr>
<tr>
<td>Cohort heard first</td>
<td>450 ± 20</td>
</tr>
<tr>
<td>Cohort named</td>
<td>475 ± 30</td>
</tr>
</tbody>
</table>

Legend:
- Cohort absent
- Cohort present but unnamed
- Cohort heard first
- Cohort named
Experiment 2 summary

• As in Experiment 1, speakers only consistently lengthened when a competitor’s prime was named out loud
  • Not just whenever there were similar-sounding referents
  • Even when another person had said the word
• Despite retrieving the words’ phonological forms
Problems for production interference accounts

- Lengthening of words speakers heard first
- Modifications to production-specific theories
Problems for strategic accounts

• Existence of similar-sounding referents in the environment does not always lead to lengthening
  • Task demands/strategizing? (Buz, Jaeger, & Tanenhaus, 2016)
  • Discourse status of referents
    • The world is not enough
    • Audience design by proxy? (Jacobs et al., 2015)
An auditory memory account of lengthening

• So what “counts”?

• Speakers can use their own memory as a guide about whether to lengthen words (Jacobs et al., 2015)

• We need models that can remember what’s been said
Thanks!
Experiment 1 + 2 results

<table>
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</tr>
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</tr>
<tr>
<td>Cohort present but unnamed</td>
<td>400</td>
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<tr>
<td>Cohort heard first</td>
<td>450</td>
</tr>
<tr>
<td>Cohort named</td>
<td>500</td>
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Experiment 1

Experiment 2