Results & discussion

WHAT'S, UHH, COMING NEXT? EFFECTS OF SPEECH DISFLUENCY ON EVENT-RELATED POTENTIALS DURING SENTENCE PROCESSING

Meredith Brown, Nathanial Delaney-Busch, Barbara Storch, Edward W. Wotok, Gina R. Kuperberg

Background

- Speakers tend to be disfluent before saying something difficult, so disfluencies tend to precede unpredictable words, making disfluency a potentially useful pragmatic cue to "expect the unexpected".
- Evidence that listeners are sensitive to the association between disfluency & unpredictable words:
  - from ERPs: smaller N400 effect following disfluency than following a fluent context
  - from eye-tracking: more fixations to unpredictable or difficult-to-name objects following disfluency
- From memory tasks: a preceding disfluency boosts word memory, especially for unpredictable words.

- But this evidence is mixed:
  - During discourse processing, disfluency boosts memory equally for predictable and unpredictable words
  - Distribution of disfluencies may not be systematic enough to consistently modulate predictions across a variety of contexts
  - and may instead, more generally orient attention toward upcoming words
- The processing effects of disfluency are also not automatic or obligatory. When listeners are explicitly informed that a speaker is likely to have difficulty producing fluent speech, they are much less likely to preferentially fixate unpredictable or difficult-to-name objects in response to disfluency.
- Less clear whether and how listeners can adjust their use of disfluencies during processing based on implicit information about the distribution of disfluencies with respect to unpredictable vs. predictable words over the course of an experiment.

Design

- Procedure:
  - Fillers intermixed with critical items, with items pseudorandomized such that unpredictable critical words appearing twice in the same list appeared first in the high-constraint context (and with at least 20 items separating)
  - Unique pseudorandomized list for each participant
  - Stimuli presented over head phones
  - Task: answering occasional yes/no questions about filler items
- ERP's measured with 29 active tin electrodes & sampled at 200 Hz
- Participants: 48 native English speakers, age 18-35, 31 female
- Surprised memory post-test (~41 out of 48) to assess whether disfluency affects incidental memory for critical words in each participant group (limited to expected words due to details of how the ERP experiment lists were constructed)

- Conclusions:
  - ERP and memory effects show that listeners are sensitive to distributional associations between disfluency & unpredictable words.
  - Disfluency amplifies N400 effects when disfluency is typically distributed (reliable group), suggesting that disfluency is generally orienting attention toward what the speaker is saying (in this experiment)
  - Disfluency attenuates N400 effects when disfluency is atypically distributed (unreliable group), suggesting that unreliable associations between disfluency & unpredictable words disrupt attention-orienting effects of disfluency
  - Abnormal distributions of disfluencies also result in reduced memory for expected words preceded by disfluency over the course of the experiment (relative to the reliable group)
  - First demonstration, to our knowledge, that listeners flexibly adapt how they process disfluency based on implicit or explicit distributional information.
  - Possible that disfluencies are systematically distributed enough to reliably modulate the content of predictions as well as to cue attention toward upcoming material only in contexts where potential alternative outcomes are limited & listeners are considerably different in terms of their predictability/taxonomical units of naming.