How does disfluency affect listeners?

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27 March 2009

Disfluencies

- interrupt the flow of speech without adding propositional content to an utterance   (Fox Tree, 1995, p.709)

- filled pauses   *go **er** right until you get to the end*
- silent pauses   *go ... right until you get to the end*
- repetitions   *go **go** right until you get to the end*
- prolongations   *go to **theee** right until you get to the end*
- error repairs   *go left ... **right** until you get to the end*

When are speakers disfluent?

Filled pause *er* is more likely to precede:

- uncertain answers to general knowledge qu's(Smith & Clark, 1993)
- content words   (Maclay & Osgood, 1959)
- unpredictable lexical items   (Beattie & Butterworth, 1979)
- low-frequency colour names   (Levelt, 1983)
- new clauses   (Ford, 1982; Hawkins, 1971)
- humanities lecturers!   (Schachter et al., 1994)
- sober speakers   (Christenfeld & Creager, 1996)

- What are the effects on listeners?

What are the effects of disfluency on listeners?

Filled pause *er* can:

- decrease confidence in a speaker's knowledge
                                            (Brennan & Williams, 1995)
- speed up response times to identify targets
                                            (Brennan & Schober, 2001; Fox Tree, 1995)
- alter interpretations of ambiguous sentences
                                            (Bailey & Ferreira, 2003)
- alter predictions about the upcoming mention of an object from a constrained set of referents
                                            (Arnold et al, 2004; 2007)

Aim of our research

- establish the effects that disfluencies have on listeners' language comprehension

- use on-line methods
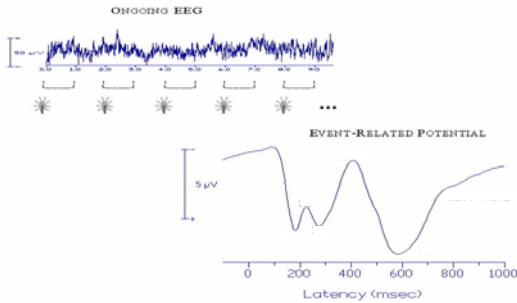
- participants don't have to "do" anything

    Event-Related Potential (ERP) studies

What are ERPs?

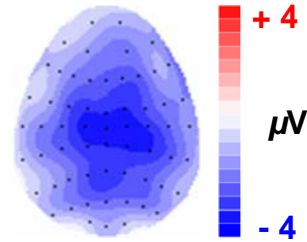- EEGs = electrical brain activity recorded at the scalp (µV)

What are ERRs?

ONGOING EEG

EVENT-RELATED POTENTIAL

- **ERPs =** EEGs time-locked to events of interest (e.g., word onset), averaged over multiple events

ERP scalp map

+ 4

µV

- 4

- **N400 effect:**
  - o relative *negativity* for semantically unpredictable compared to predictable words
  - o centro-parietally distributed, maximal 400ms after word onset
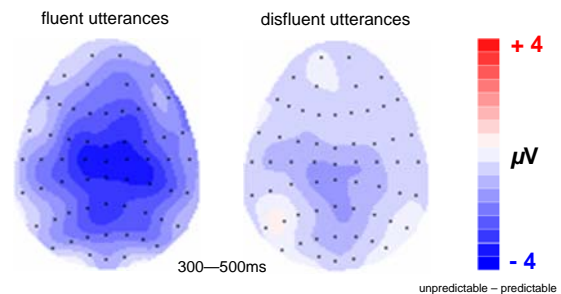 - o reflects ease of processing the meanings of words

Does an *er* affect the ease of processing the meaning of subsequent words?

- auditory ERP experiment

  Everyone's got bad habits and mine is biting my *er* **nails**
  Everyone's got bad habits and mine is biting my *er* tongue

- 50% of materials disfluent
- instructions: "listen for understanding"
- ERPs formed to utterance-final words

Effects on ease of processing

fluent utterances   disfluent utterances

+ 4

µV

- 4

300—500ms

unpredictable – predictable

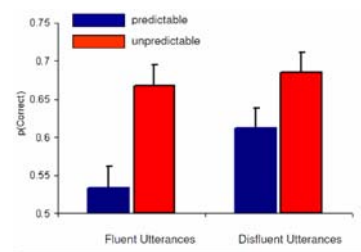- how?.... decrease in predictions?

Corley, MacGregor & Donaldson (2008). *Cognition*

Do *ers* have longer-term effects?

- evidence from memory?
- surprise recognition for utterance-final (**old**) words
  - o predictable/unpredictable
  - o from fluent/disfluent contexts
- interspersed with (completely) **new** words

music

Recognition of utterance final words

- how?... decrease in predictions?
  … increase in attention?

Corley, MacGregor & Donaldson (2008). *Cognition*

Isolating attention

- If disfluency affects attention, effects should be observed *outside* the linguistic system
- **P300 effect**:
  - relative *positivity* for unexpected events, centrally distributed, maximal 300ms after event onset
  - indexes attentional orientation to novel stimuli
- P300 commonly observed for 'oddball' stimuli

  ⬤⬤⬤▲⬤⬤⬤⬤▲

- often preceded by a **Mismatch Negativity** (MMN)
- MMN and P300 *weakened in presence of directed attention*
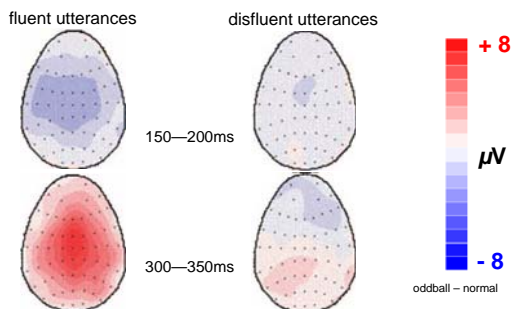
  (Alho, 1995)

Do *ers* direct attention to subsequent words?

- uses materials ending in predictable words

  > Everyone's got bad habits and mine is biting my *er* **nails**
  > That drink is too hot: I've just burnt my *er* **tongue**

- 50% of materials disfluent
- final words acoustically manipulated to create 'oddballs' (ratio 1:4)
- instructions: "listen for understanding"
- ERPs formed to utterance-final words

Effects on attention

fluent utterances   disfluent utterances

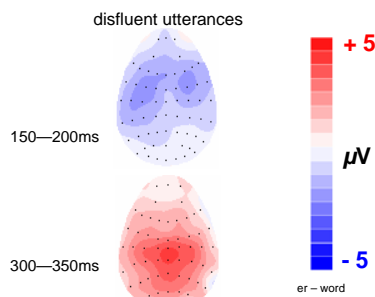150—200ms

300—350ms

+ 8

µV

- 8

oddball – normal

- how? ... attention already heightened
  ... *ers* capture attention?

  Collard, Corley, MacGregor & Donaldson (2008).
  J. of Exp. Psychology: Learning, Memory & Cognition

Do *ers* capture attention?

> Everyone's got bad habits and mine is biting my **nails**
> That drink is too hot: I've just burnt my *er* **nails**

- ERPs formed to *ers* and to words

Effects on attention

disfluent utterances

150—200ms

300—350ms

+ 5

µV

- 5

er – word

Implications

- our findings demonstrate clear effects of *er* on listeners

- nature of the disfluent signal
  - are the effects due to time delay?
  - what are the effects of other disfluencies?

- relationship between attentional and linguistic effects

- effects dependent on the disfluency rate

Conclusions

- disfluencies affect listeners in multiple ways

- *er* affects listeners' online language comprehension
  - predictions may be altered
  - attention is heightened

- words heard after an *er* are more likely to be remembered

- *er* is not necessarily 'bad' for listeners

Thanks to

Martin Corley, *Edinburgh Disfluency Group, University of Edinburgh*

Phil Collard, *University of Glasgow*

David Donaldson, *Psychological Imaging Lab, University of Stirling*

Thank you!