

# Investigating the comprehension and perception of reduced speech with pupillary response

## Introduction

Examine spoken word processing (as measured by pupil dilation) of words containing reduced and unreduced consonants

- Is the processing load indexed by pupil dilation sensitive to differences in reduction?
- Do the results correspond to previous results (e.g., Tucker, 2011)?
- When (if at all) do these differences emerge in time?
- Do dilation and time course reveal differences between /d/ and /g/ due to flapping, not previously observed in behavioral results?
- Will the behavioral results support the pupil dilation results?

## Method

### Stimuli

- Naturally produced disyllabic words (n = 80) containing word-medial /d/ and /g/ (Tucker, 2011)
  - 40 /d/ (e.g., 'ready' /ɹɛɹi/)
  - 40 /g/ (e.g., 'baggy' /bægi/)

### Task

- Listen-and-repeat (similar to Zekveld et al., 2010)
  - Auditory stimulus followed by 2,500ms pause
  - A 500ms pure tone beep prompted participant to repeat the stimulus

### Participants

- 39 Western Canadian English speakers

### Data

- Gaze and pupil size data via Eyelink II eye-tracker (250 Hz)
- Response latency and spoken responses recorded via head-mounted microphone

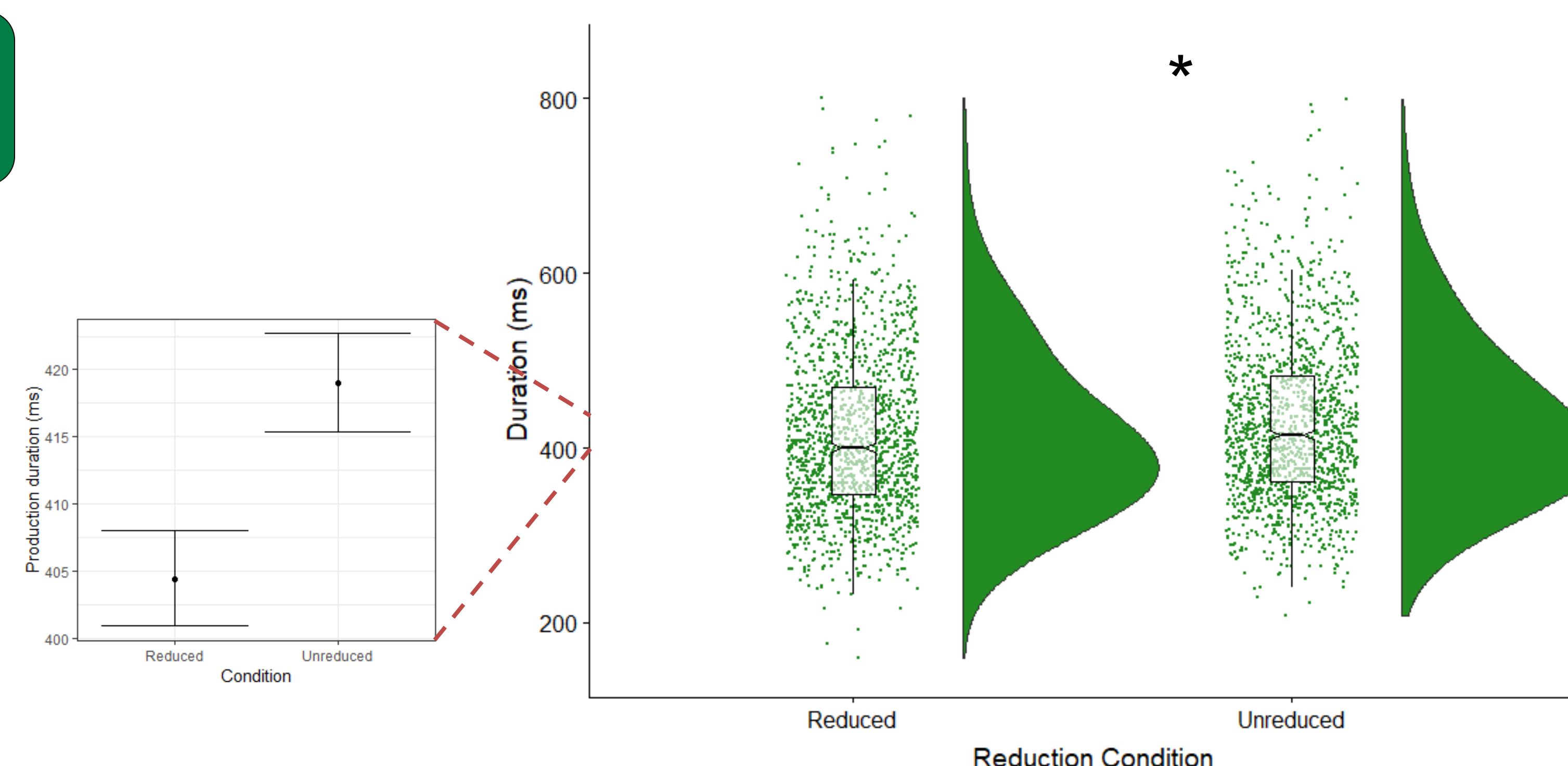


Figure 1 Participant production duration (ms) split by Condition (reduced vs. unreduced).

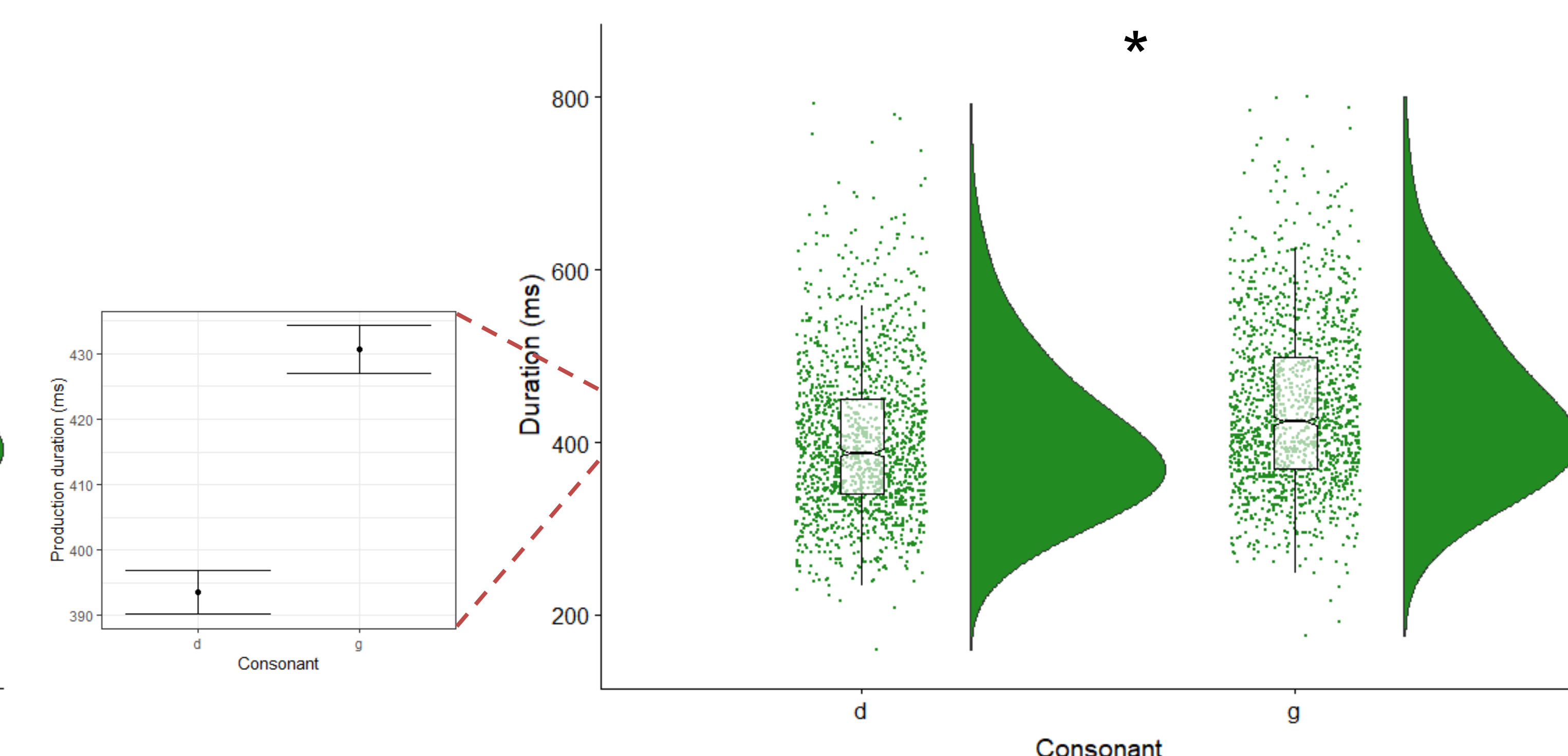


Figure 2 Participant production duration (ms) split by Consonant (/d/ vs. /g/).

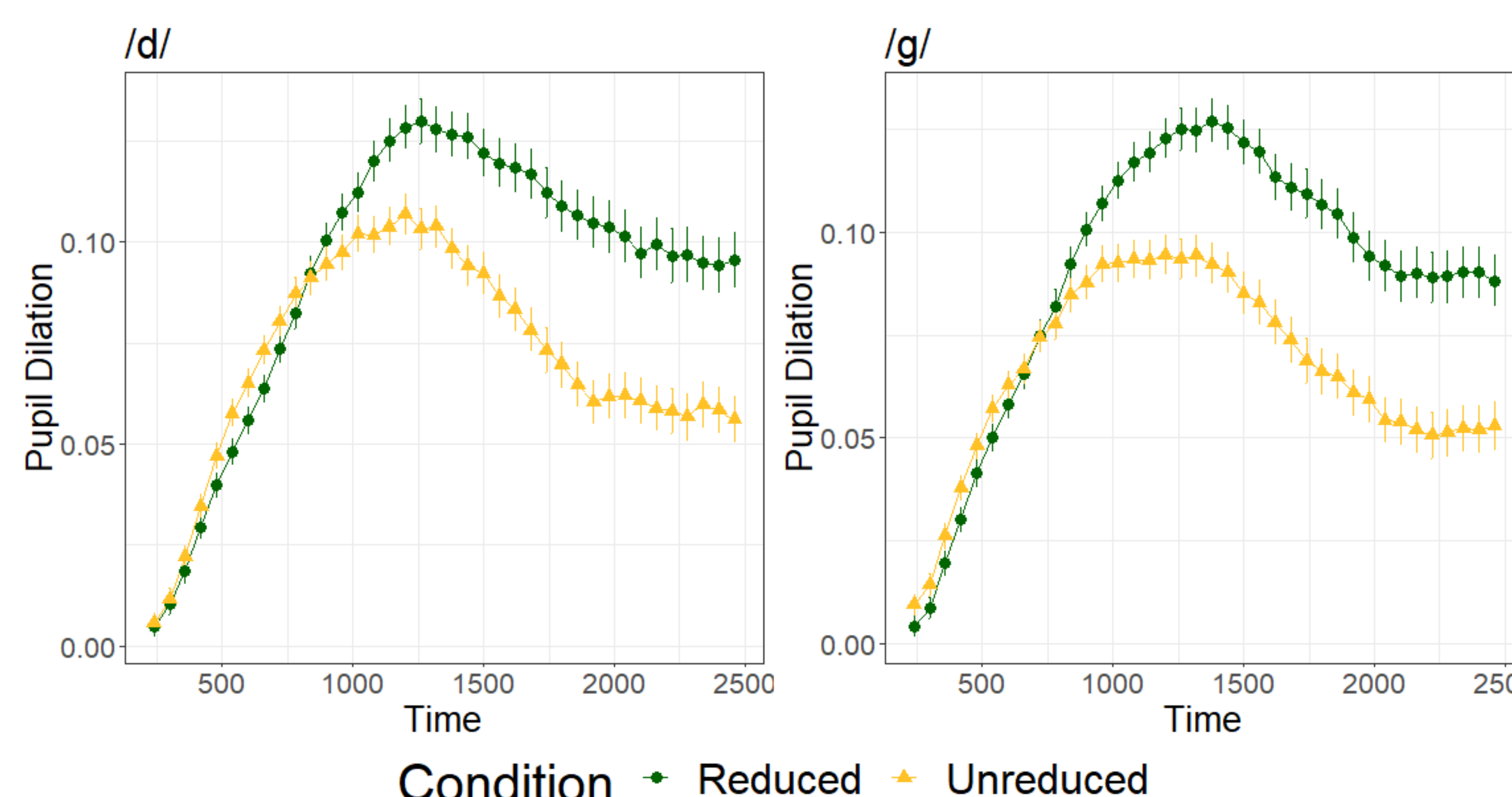


Figure 3 Grand average pupil dilation over time

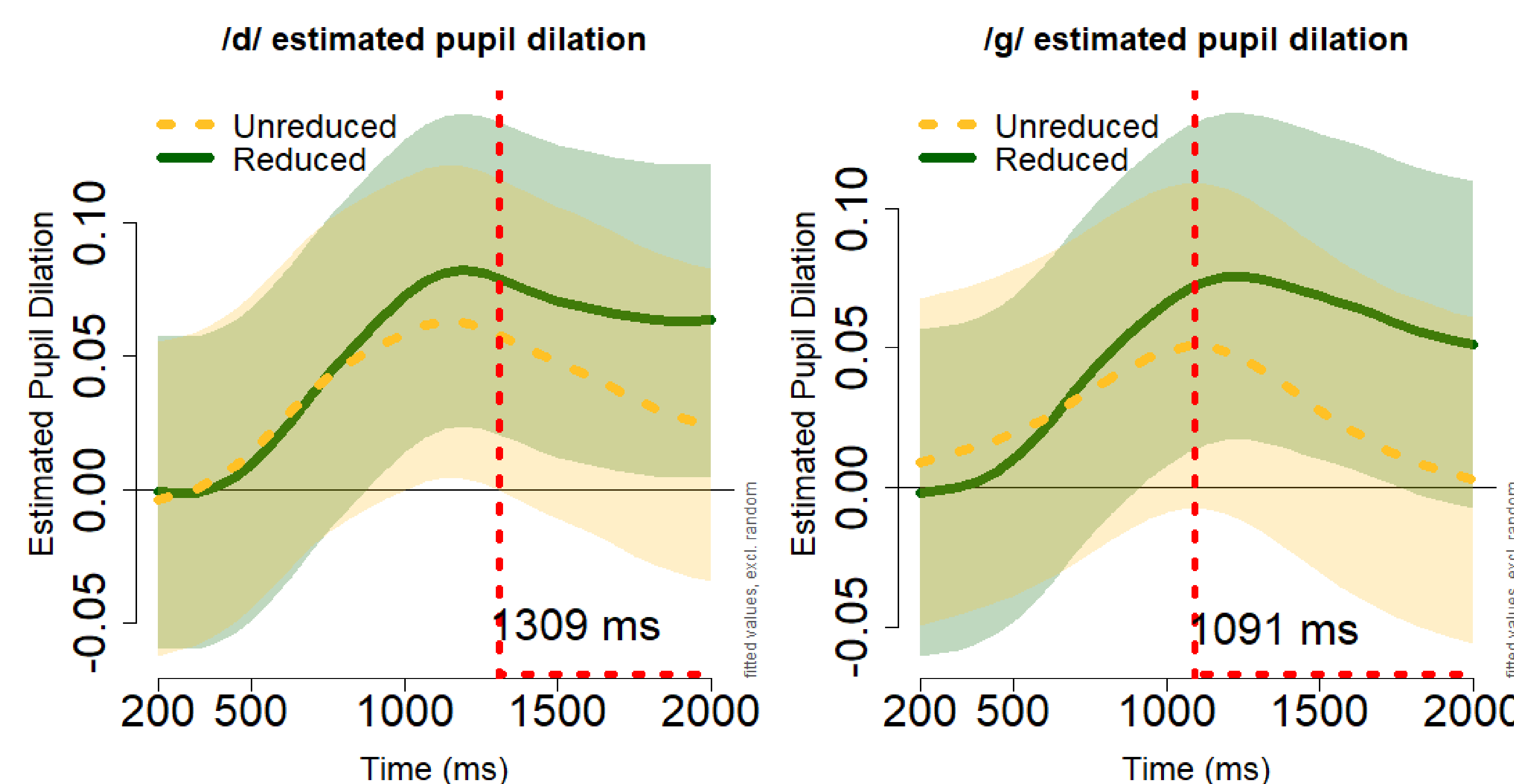


Figure 4 Model estimated pupil dilation. Red dashed line indicates where the comparisons of reduced to unreduced stimuli are significantly different.

## Results & Discussion

### Dilation

- Results indicate that reduced forms (of both /d/ and /g/) elicit greater pupillary response (Figures 3 & 4)
- This mirrors reaction time results obtained by Tucker (2011), indicating an increased processing load is incurred for reduced forms

### Timing

- Difference between reduced and unreduced forms arises after 1000 ms (about 500ms after average word offset, Figure 4)
- Persists through the remainder of the trial

### Phoneme

- No (or very little) difference found between /d/ and /g/ within reduced or unreduced forms (similar to Tucker, 2011)

### Productions

- Production duration differences (Figure 1) also mirrors results from Tucker (2011)
- Phoneme difference not previously identified (Figure 2)

### REFERENCES:

- Tucker, B. V. (2011). The effect of reduction on the processing of flaps and /g/ in isolated words. *Journal of Phonetics*, 39(3), 312--318.
- Zekveld, A. A., Kramer, S. E., & Festen, J. M. (2010). Pupil Response as an Indication of Effortful Listening: The Influence of Sentence Intelligibility. *Ear and Hearing*, 31(4), 480--490.

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