The time-course of recognition of reduced Japanese words: Evidence from pupillometry with a Go-NoGo task
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1. Introduction

Background:
• Variability in spoken language, especially in casual speech, largely due to phonetic reduction [1]
• Incomplete articulation and deletion of speech sounds and segments in reduced forms [2]:
  e.g., /daigaku/ → [daiɣakɯ] → [daiakɯ] [3]
• Inhibitory effect in the recognition of spoken language [4]
• Fewer studies have investigated the inhibitory effect over time

Research objective:
• Compare the time-course of the recognition of reduced and citation forms of Japanese words as indicated by pupil dilation

Pupillometry:
• Reflects the allocations of cognitive resources imposed by different variables in speech comprehension in the absence of voluntary and conscious processes [5]
• Harder to process, greater the pupil dilates

2. Method

Fig. 1: Acoustic properties of reduced and citation forms of Japanese words, all of which contain word-medial nasals or voiced stops

Participants: 38 Japanese speakers (female, n = 16)
Stimuli: 226 four-mora Japanese words (452 total items: 226 reduced and 226 citation forms)
{V, CV} - {V, CV, N, H} - {V, CV, N, H} - {V, CV, N, H}
Go-NoGo task: Participants respond to pure tones (non-target) by pressing a button and do not respond to Japanese words (target), while fixating on a cross on the computer screen
Preprocessing pupil size data: Remove and interpolate blinks and their artifacts; downsample and smooth the data; calculate the baseline pupil size for each trial

Fig. 2: The aggregated raw pupil dilation over time and schematic outline of a single experimental trial

3. Results & Discussion

Take-home message:
1. The effect of reduction comes as early as 200 ms after the onset of the stimulus; greater pupil dilation for reduced forms; the trend of pupil dilation over time differs between the two forms (Fig. 3)
2. Both forms seem to show a similar frequency effect, but the effect seems to appear later in reduced forms (Fig. 4)
3. No effect of reduction for very low frequency words (Fig. 4)
4. The U-shaped frequency effect [4] (Fig. 4)

References: