Durational variability of spontaneous and read speech: Comparison between English and Japanese

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1. Introduction

Background:

- Phonetic research often relies on careful laboratory speech despite spontaneous conversational speech being the most commonly used in everyday interactions [1].
- Compared to read speech, spontaneous speech has been reported to have a higher articulation rate, lower f0 variation, and greater f0 declination, as well as more frequent hesitations, approximated articulation, shorter segment durations, and shorter prosodic units [1].
- Japanese and English have distinct phonological and temporal structures]: Stress vs. Pitch accent [2, 3].

Research objective: An exploratory analysis using durational variability measures to investigate differences between the production of spontaneous and read speech in Japanese and English.

2. Method

Data:

- **Read Speech:** Used Grenon & White's data [4]
  - **60 sentences:** 6 English speakers read 5 sentences; 6 Japanese speakers read 5 sentences.
- **Spontaneous speech:** Used Warner et al.'s data [5]: Phone conversation with someone familiar
  - **180 utterances:** 6 Japanese speakers produced 15 utterances each; 6 English speakers produced 15 utterances each.

Segmentation:

- Segmented into "vocalic" and "consonantal" intervals, each of which may include one or more segments of the same type.
  - Recording of "fixed creation" read as [fɪkst.kɹi.eɪʃən] was segmented the consonantal intervals, [f], [kstkɹ], [ʃ], and [n]; and the vocalic intervals, [I], [ieɪ], and [ə].
- Pauses and disfluencies were excluded from the intervals.
- The read speech data was segmented in a similar manner (see Grenon and White [4]).

Durational Variability Measures:

- ΔC (standard deviation of consonantal interval duration)
- %V (percentage of total utterance duration composed of vocalic intervals)
- VarcoV (coefficient of variation of vocalic intervals)
- VarcoC (coefficient of variation of consonantal intervals)
- nPVI-V (mean of the differences of successive vocalic intervals divided by their sum and multiplied by 100)
- rPVI-C (mean of the differences of successive consonantal intervals)

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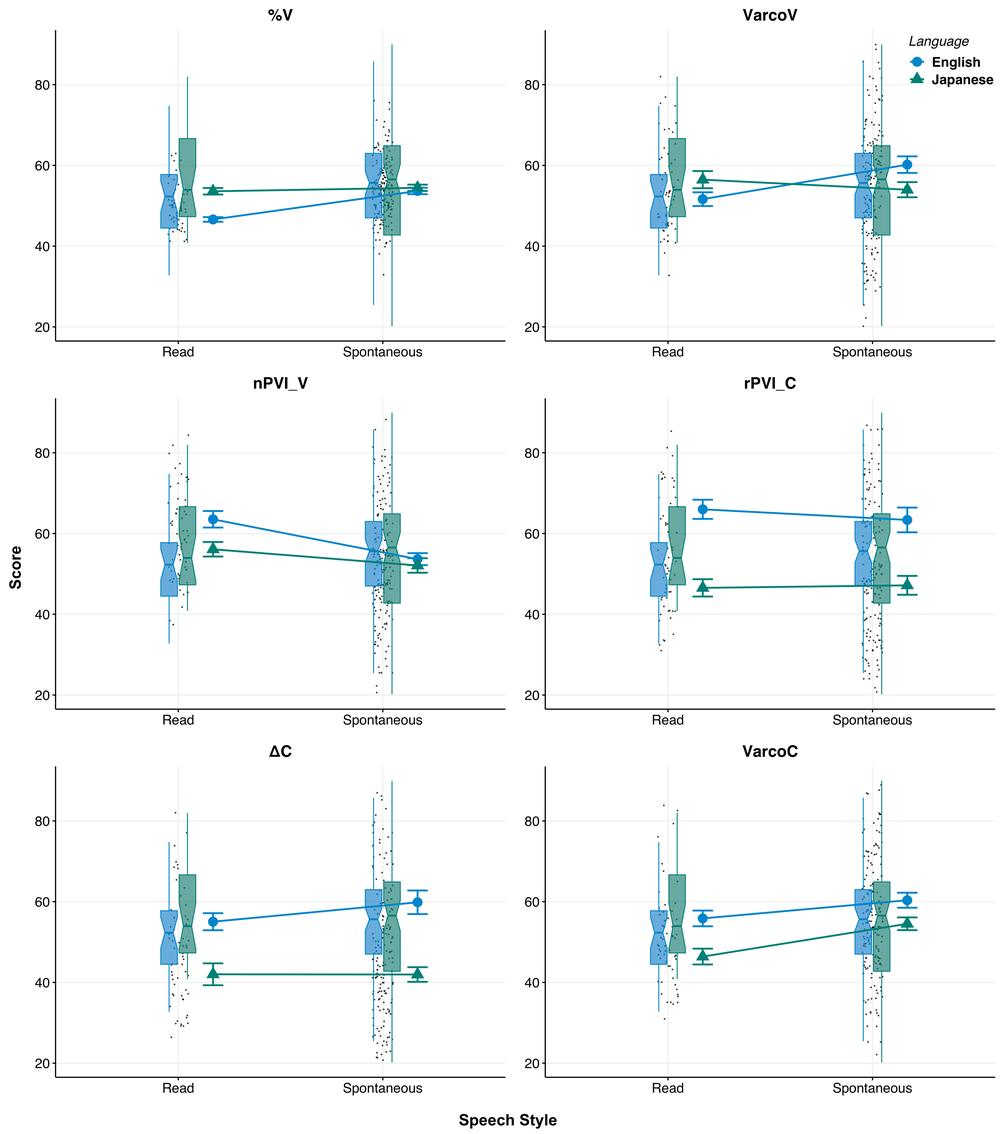

3. Results

Interaction Effects:

- The difference between spontaneous and read speech was significant only in English (higher **%V** for spontaneous speech); English and Japanese differed only in read speech for **%V**.
- Spontaneous speech showed higher **VarcoV** than read speech only in English; The languages differed only in spontaneous speech (higher **VarcoV** in English).

Main Effects of Speech Style:

- Spontaneous speech showed higher variability (**VarcoC)** than read speech.
- Read speech showed higher vowel variability (**nPVI-V**) than spontaneous speech.
- No main effect of speech style was found for **ΔC** or **rPVI-C**.

Main Effects of Language:

- Main effects of language were found for **VarcoC**, **ΔC**, and **rPVI-C**, but not for **nPVI-V**.
- **VarcoC** and **ΔC**: English showed higher variability compared to Japanese.
- **rPVI-C**: English showed higher variability than Japanese.
- **VarcoC**: variability was higher in spontaneous speech than read speech, and higher in English than in Japanese; it was the only measure that differentiated between spontaneous and read speech in Japanese.

4. Discussion

- Consonant variability (VarcoC) increased in spontaneous speech for both languages might suggest a potentially language-independent pattern of temporal variation [6]
- The different behaviours observed for vocalic variability patters highlight language-specific ways in which phonetic reduction manifests.
- **Limitations:** the use of data from different studies, potential dialectal variation within the Japanese speakers, and the limited amount of read speech data.
- **Future Research:** Use additional acoustic measures and investigating a wider range of languages is needed to better understand these patterns and the factors driving phonetic reduction.

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