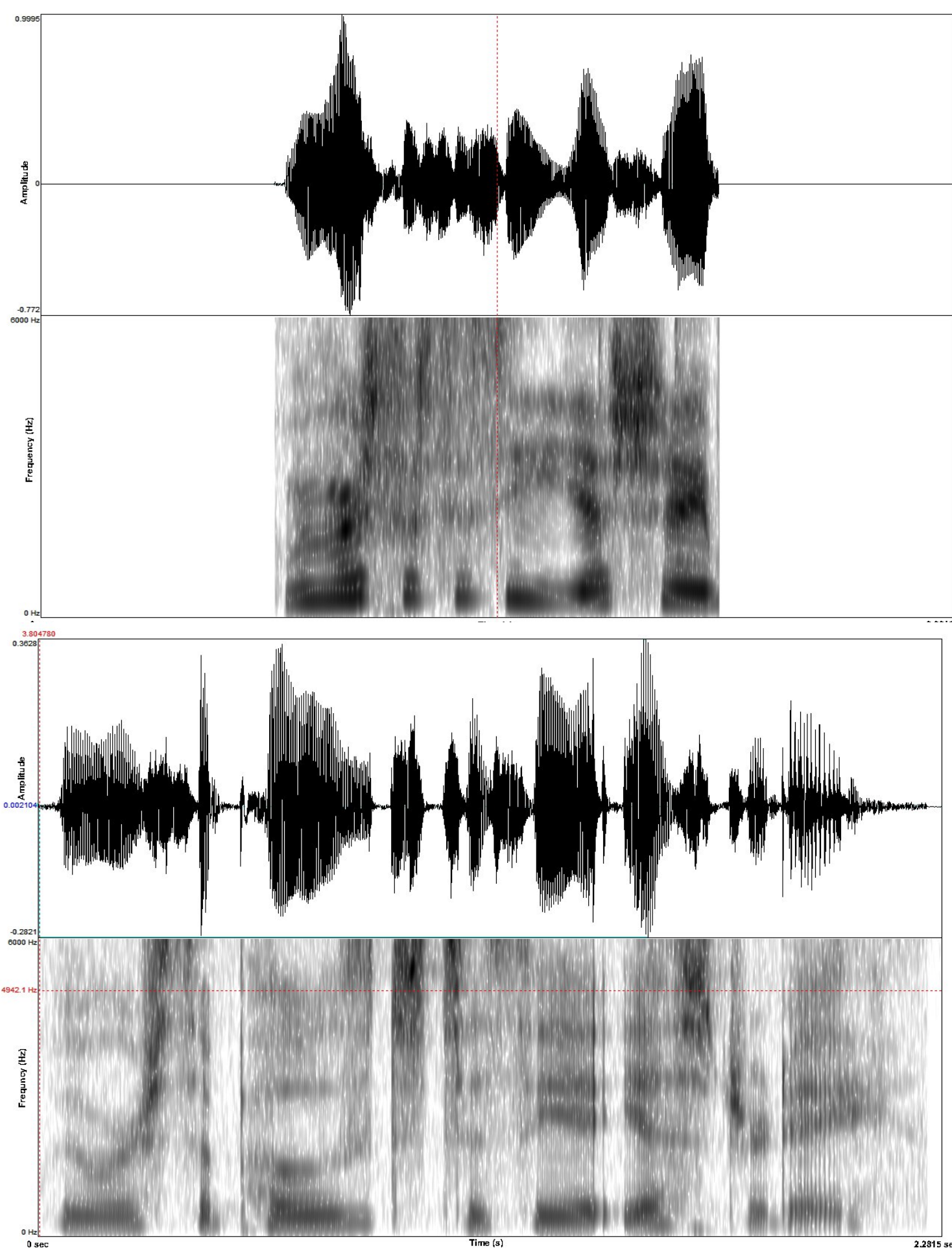


# Phonetic variability of nasals and voiced stops in Japanese

## 1. Introduction

- Spoken language is highly variable largely due to phonetic reduction.
- Reduction results in forms with fewer segments, shorter durations, and more assimilation.
- E.g., “We were supposed to see it yesterday” (Tucker, 2007)



- Reduced forms are common across languages including Japanese (Arai, 2011).
- The way speakers reduce segments varies across speech styles and phonemes (Mukai & Tucker, 2017).

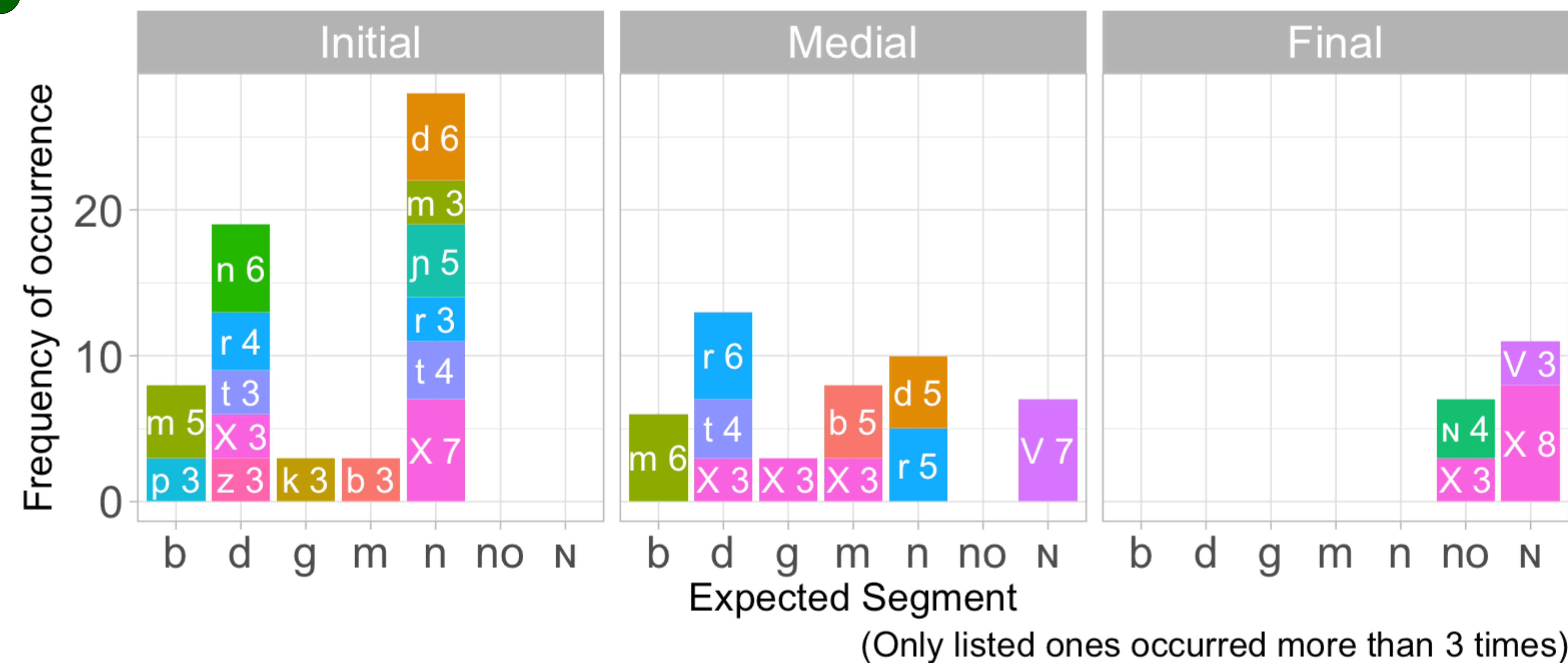
### Research aim

- Investigate phonetic variability of nasals and voiced stops and their frequency of occurrence in Japanese.

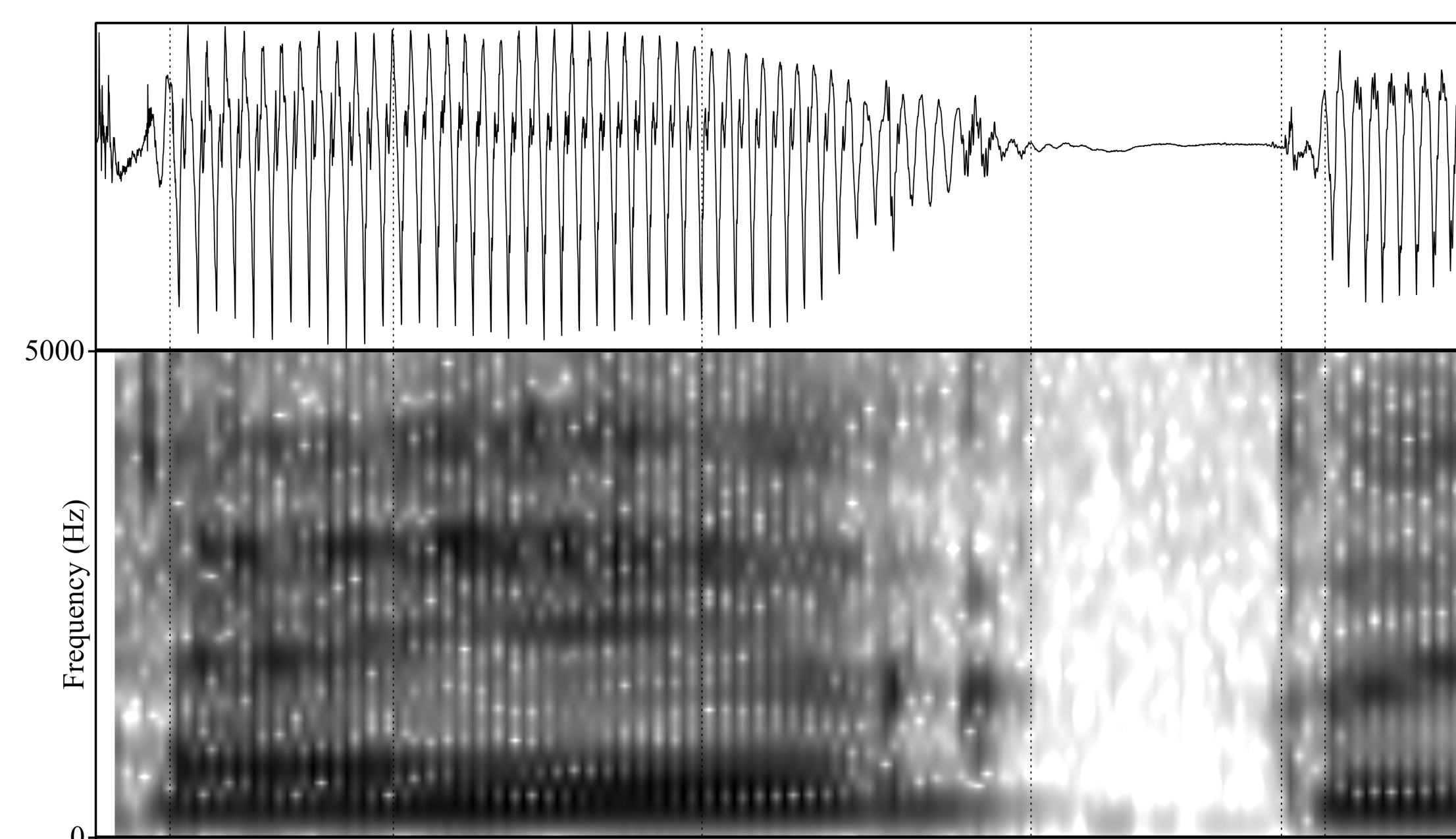
## 2. Method

- A subset of Corpus of Spontaneous Japanese (Maekawa, 2007)
  - Approximately 44 hours of speech (500,000 words)
  - Predefined segmental boundaries in the corpus
- Four types of speech:
  - (1) Dialogue (2) Simulated Public (3) Academic Presentation (4) Read
- Reduced word forms were extracted using the special transcription tag (W) applied to phonological variations of lexical entries that are either sporadic or caused by variable articulation.

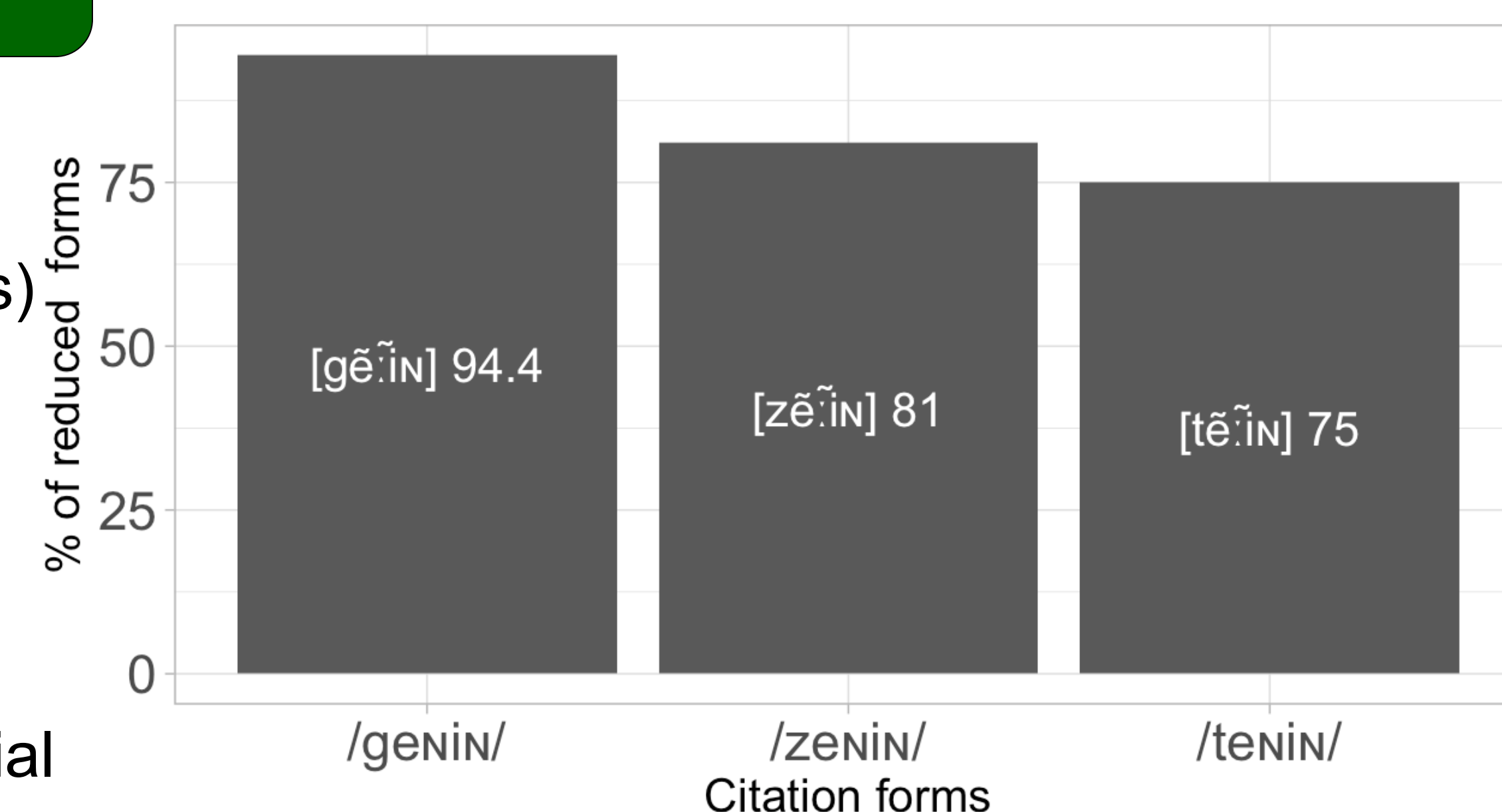
**Figure.1: Number of voiced stops and nasals realized different phonemes (IPA and numbers on the bars indicate realized phonemes and their frequency of occurrence)**



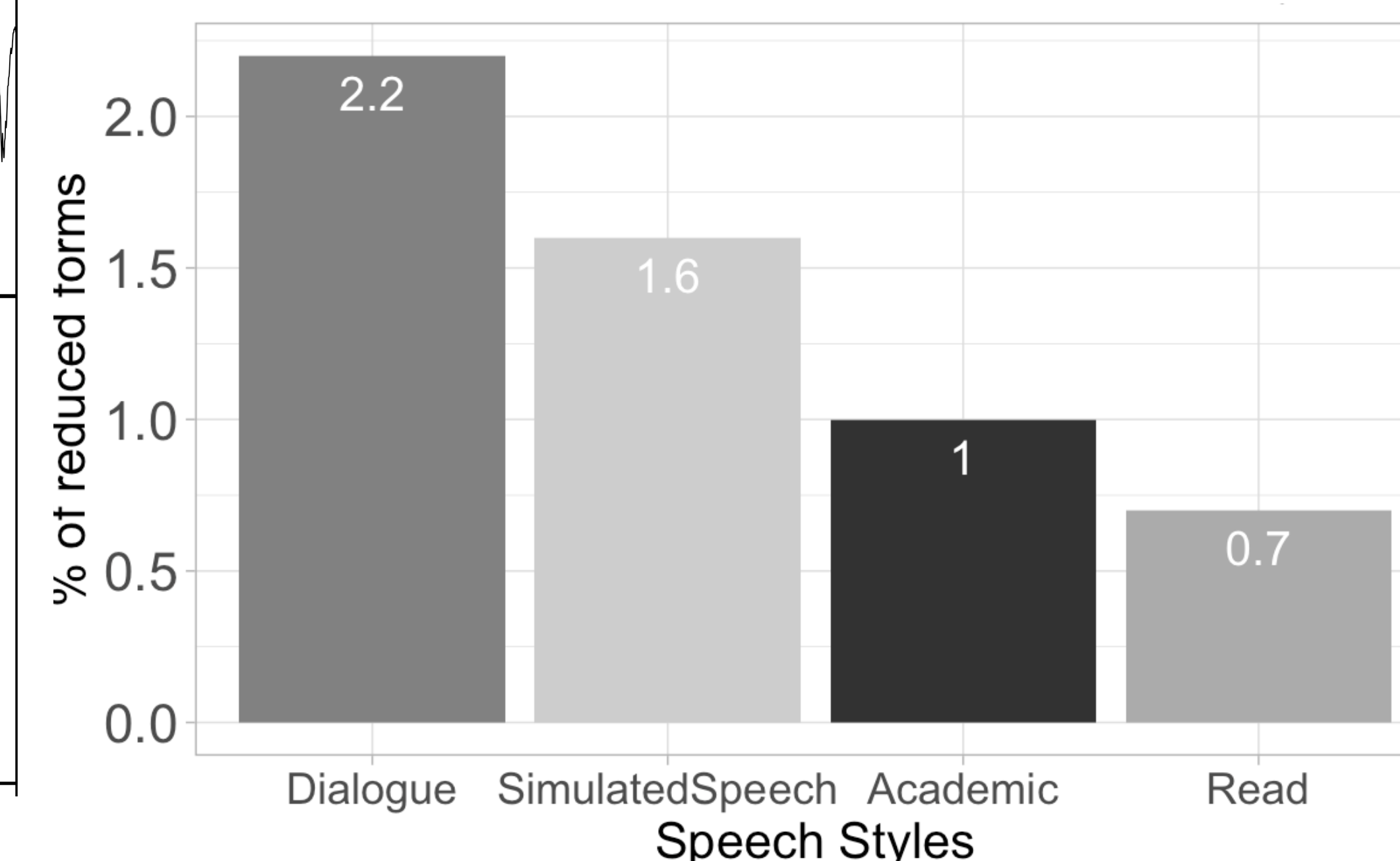
**Figure.2: /daigaku/ → [daiaku] “university”**



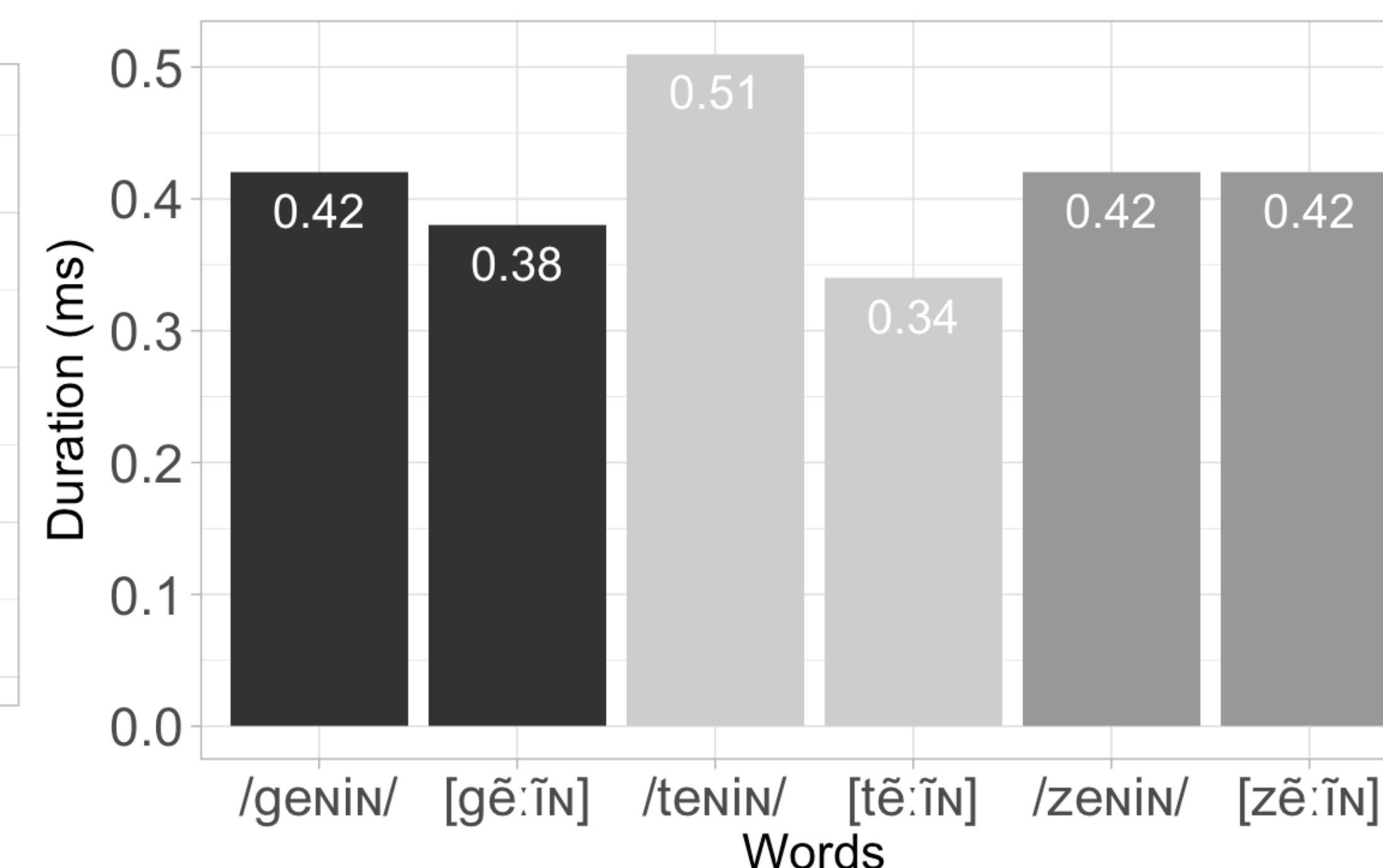
**Figure.3: Three forms highly likely to reduce (Proportion of reduced forms for each word)**



**Figure.4: Proportion of reduced forms across speech styles**



**Figure.5: Mean duration of reduced and citation forms**



## 3. Results

- 1521 tokens; 239 types; 135 words of reduced forms (Figure. 1)
  - /d/ → [n] in /donna/ “what”
  - /g/ → [ø] in /daigaku/ “university” (Figure. 2)
  - /b/ → [m] in /boku wa/ “I am”
  - /N/ → [ø] in /genin/ “reason” (Figure. 3)
- The highest proportion of reduced forms found in Dialogue (Figure.4)
- 3 forms highly likely to reduce (Figure.3 and Figure.5)

## 4. Discussion

- Reduction of word-medial uvular nasals before a vowel is likely lexicalized (Figure.3 and Figure.5)
- Alveolar nasals seem to reduce frequently, especially word-initially (Figure.1)
- High variability and complex pattern of reduction across phonemes (Figure.1)
- Less frequent reduction compared to English
  - 8.5% in Japanese (all reduced forms) but in English 25% (Dilts, 2011)
- This research expands the results of Mukai and Tucker (2017)

### Future research

- The effect of reduction on the processing of voiced stops and nasals in Japanese

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