# 5aSC02. Palatalization of /d/ across word boundaries in UK English

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## 1. When does /d/ become [dʒ] in UK English?

✧ In many spoken varieties of English, coronal stop /d/ optionally palatalizes to [dʒ] before /j/, including across word boundaries:

| | |
|---|---|
| *did you* | [ˈdɪdju] or [ˈdɪdʒu] |
| *would you* | [ˈwʊdju] or [ˈwʊdʒu] |

✧ Previous studies of word-boundary palatalization in UK English find:
  ✧ coronal fricatives /s,z/ palatalize in predictable contexts and at increased speaking rates, implying palatalization results from coarticulatory gestural overlap and speech planning constraints (Cassidy & Renwick 2015, Dunagan & Renwick 2021).
  ✧ coronal stop /t/ palatalizes in formal contexts at slower speech rates, indicating it is a categorical stylistic variant (Brailey-Jones et al. 2022)
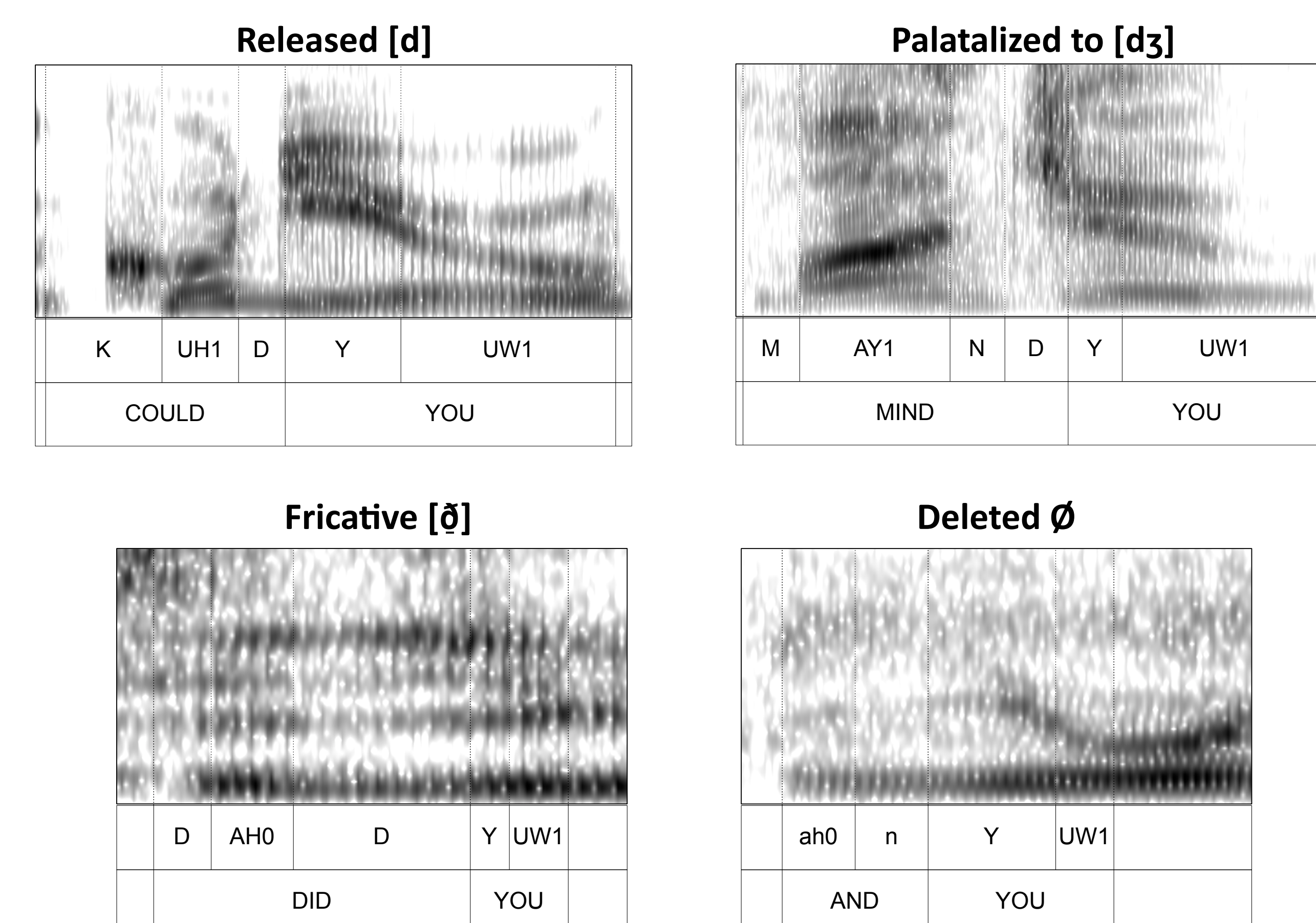
**Research questions:**
✧ How frequently does [dʒ] appear as a variant of /d/ in UK English?
✧ Is its realization conditioned by speech production constraints, frequency effects, or speech style and dialect factors?

## 2. /d/ + /ju/ in the Audio British National Corpus

✧ Tokens of /d#j/ gathered from the Audio BNC (Coleman et al. 2012)
✧ Forced alignment transcriptions were searched for word-final /d/ preceding *you* (excluding contractions), among word pairs attested 15+ times in the Audio BNC (12513 tokens total; 5764 tokens discarded due to misaligned audio, multiple speakers, noise, etc.)
✧ Tokens were impressionistically coded into 4 /d/ realizations (see **Table**)
✧ Lexical frequencies calculated over the >5 million words in Audio BNC
✧ Speaker demographics gathered from BNC metadata (Evert 2022), but speaker gender labeled manually per token (Male, Female, Child)
✧ Acoustic durations measured in Praat: Word 1, Word 2 (*you*), pause between W1 and W2, mean phone duration (W1 dur/phone count)
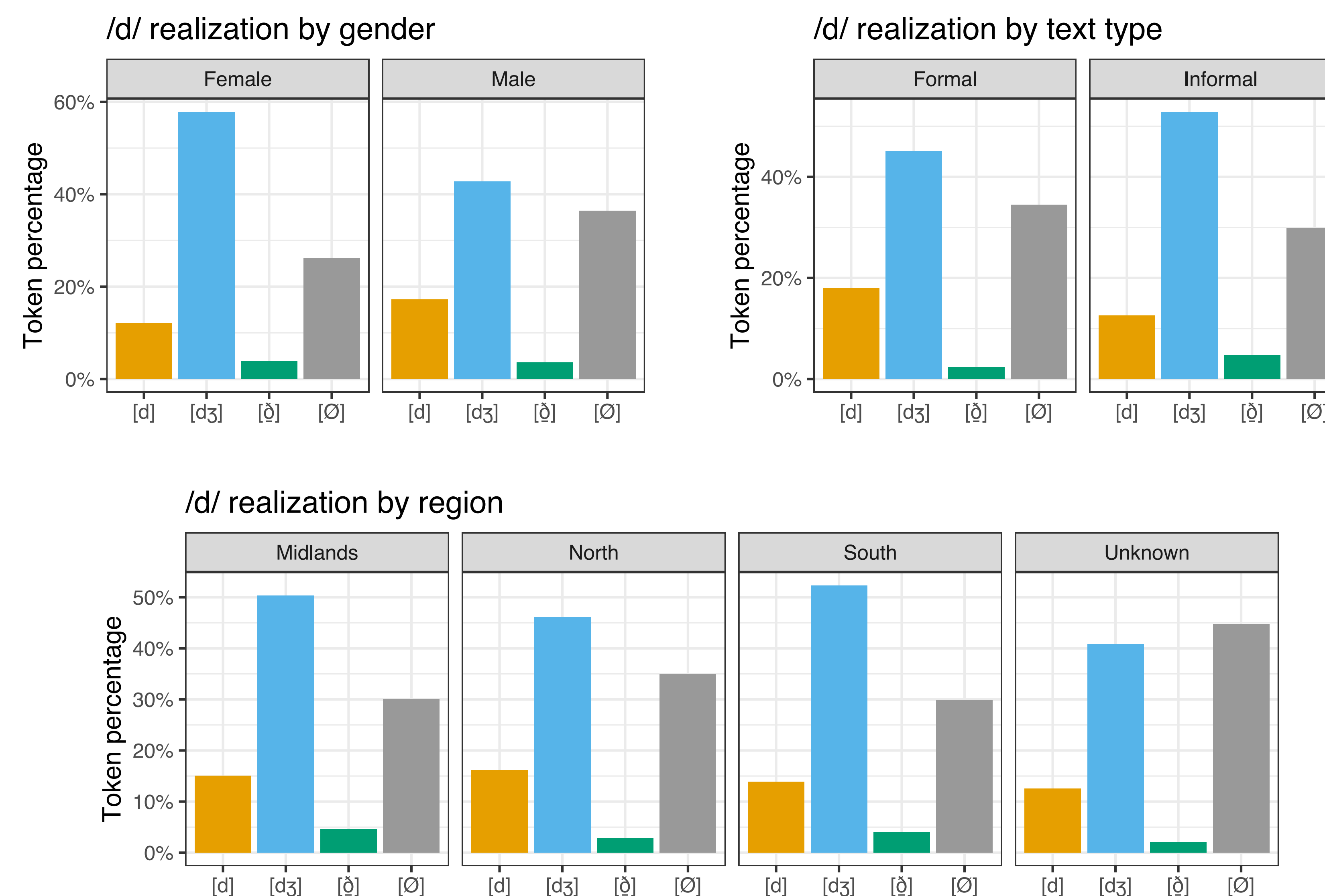
### Realizations of /d#j/ tokens by adult speakers, Audio BNC

| Realization | Released as [d] | Palatalized to [dʒ] | Fricative [ð̞] | Deleted Ø | Total |
|---|---|---|---|---|---|
| **Tokens** | 968 | 3206 | 242 | 2067 | 6483 |


Released [d] — K UH1 D Y UW1 / COULD YOU


Palatalized to [dʒ] — M AY1 N D Y UW1 / MIND YOU


Fricative [ð̞] — D AH0 ˈD Y UW1 / DID YOU


Deleted Ø — ah0 n Y UW1 / AND YOU

## 3. Distribution of /d/ variants

### Demographic and Contextual Factors


/d/ realization by gender


/d/ realization by text type


/d/ realization by region

### Effects of duration and usage frequency


/d/ vs. mean phone duration


/d/ realization vs. pause duration


/d/ realization vs. "you" duration


Palatalization vs. P(W2|W1)
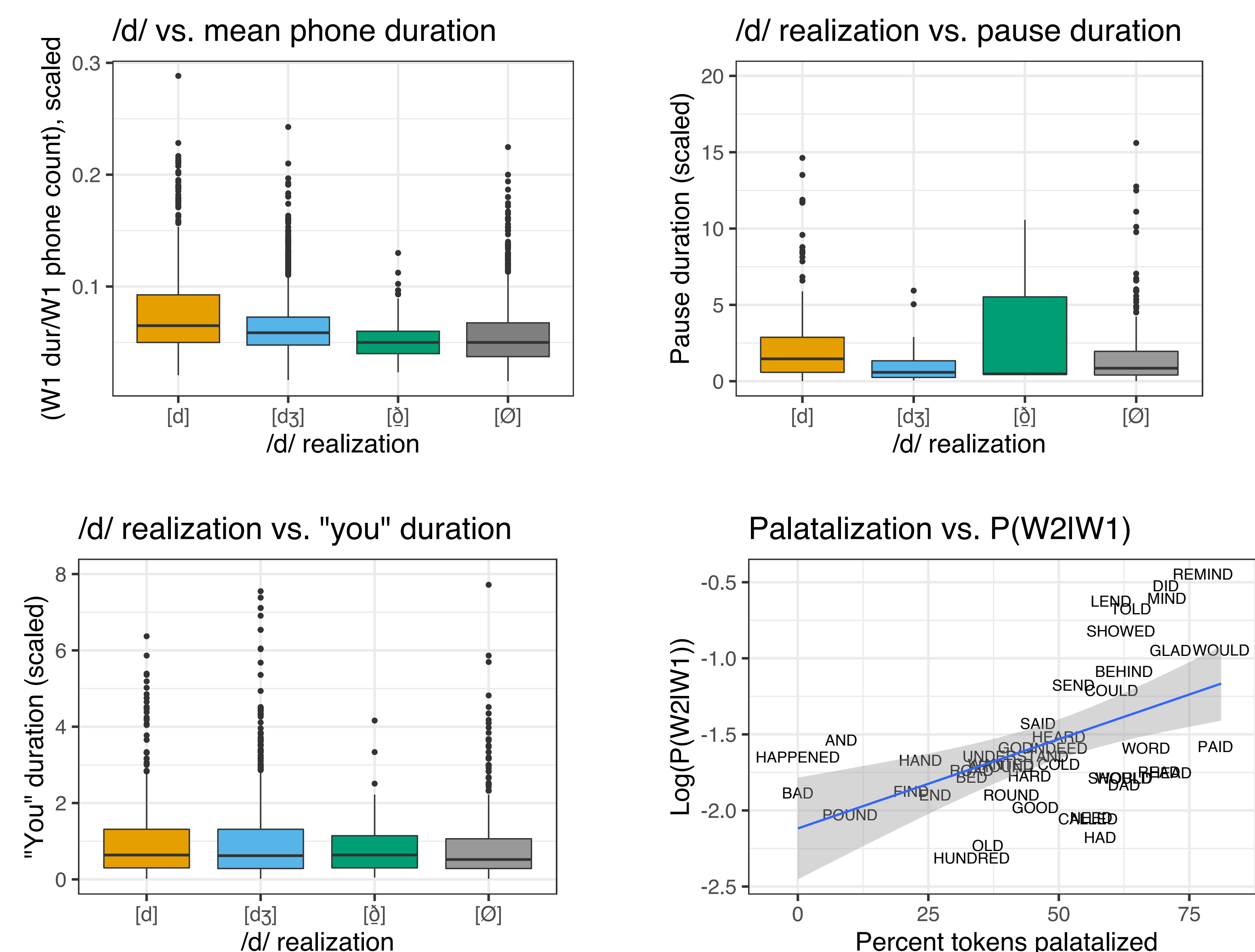
## 4. Multinomial regression modeling of /d/ realization

✧ `mgcv::gam([…], family = multinom(K=3))` used to run a multinomial logistic regression with random effects (Wood 2017)
✧ Model specification; formula repeated for each level of `/d/ realization`:

```
(/d/ realization ~                    Dependent variable; ref = [d]
gender + formality + region           Demographic factors
+ speech_rate + pause_dur + you_dur   Durational predictors
+ LogP(W2|W1) + (1|word pair) + (1|BNC Code))   Frequency and random effects[1]
```

✧ [1]Individual speaker IDs are not uniformly available for the Audio BNC, but a "code" is attached to each recording. Models including random slopes did not converge.
✧ Multinomial regression estimates shown below (see **Table**) in log odds. Positive estimate indicates increased likelihood of each non-canonical /d/ variant; negative estimate indicates decreased likelihood. * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$.

### Multinomial regression estimates for non-canonical /d/ variants

| Predictor | Palatalized to [dʒ] | Fricative [ð̞] | Deleted Ø |
|---|---|---|---|
| Gender = M | −0.64*** | −0.13 | 0.07 |
| Text type = Informal | 0.24* | 0.74*** | 0.56*** |
| Region = North | −0.19 | −0.58* | 0.11 |
| Region = South | 0.01 | −0.34 | 0.02 |
| Region = Unknown | 0.45 | −0.07 | 0.45 |
| Speech Rate | 0.08 | −0.56*** | −0.78*** |
| LogP(W2|W1) | 0.87*** | 2.20** | −0.34 |
| Pause dur | −1.87*** | −0.49* | 0.02 |
| *you* dur | −0.07* | −0.17 | 0.11* |

## 5. Summary of findings

✧ Palatalization of /d/ to **[dʒ] is very frequent** across word boundaries (49% overall), especially compared to /t/ palatalization rates in the same corpus (15% overall; Brailey-Jones et al. 2022)
✧ Realization of /d/ as **[dʒ]** affected by gender, speech planning, style, frequency (see **Table**)

### Summary of significant increases/decreases in /d/ variant selection

| Effect Type | Factor | [dʒ] | [ð̞] | Ø |
|---|---|---|---|---|
| Social | Male (vs. female) | (−) | | |
| | North (vs. Midlands) | | (−) | |
| Speech Planning or Style | Informal speech | (+) | (+) | (+) |
| | Faster speech | | (+) | (+) |
| | *you* duration | (−) | (+) | |
| | Pause duration | (−) | (−) | |
| Frequency | LogP(W2|W1) | (+) | (+) | |

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