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Towards a reassessment of the gemination of [ɹ] in British and American English?

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BACKGROUND

GEMINATION IN ENGLISH

Previous studies have shown that English may have "morphological geminates" across morpheme or word boundaries (e.g. *right time, unnecessary*).

Gemination may be seen as a process of phonetic doubling or – more appropriately for English – of phonetic length (Kaye 2005).

Previous studies have shown that English does have consonantal gemination in semantically compositional prefixed words, although it may vary depending on speech rate, the productivity of the prefix, the presence of stress on the following syllable and the nature of the following segments (Bauer 2003; Cruttenden 2014: 248; Ben Hedia & Plag 2017; Kaye 2005; Oh & Redford 2012; Videau 2013).

These studies have focused on prefixed words with the possible gemination of [l, n, m] (e.g. *illegal, immoral, unnamed*).

THE CASE OF [ɹ]

None of the previous studies has focused on the gemination of [ɹ].

Dabouis (2016) has found that pronunciation dictionaries report a difference between RP and GA regarding the possibility of [ɹ]-gemination: it would be possible to have geminated [ɹ]s in GA, but not in RP in words such as *irrational* or *irremovable*.

This difference is found in Wells (2008) and Upton & Kretzschmar (2017) and American dictionaries confirm the possibility of having geminated [ɹ]s in GA, although they may differ on the words for which this is possible (Kenyon & Knott 1953, Merriam-Webster online).

Dabouis proposed that this difference might be attributed to rhoticity: the absence of geminated [ɹ]s in RP could have to do with the ban on coda [ɹ], under the assumption that a geminated [ɹ] is actually a sequence of two /r/s (coda + onset).

There is phonotactic evidence supporting this claim: "degeminated" pronunciations often have light stressed initial pretonic syllables which are otherwise very rare (e.g. *dissatisfy* [ˌdɪsˈsætɪsfaɪ] ~ [(ˌ)dɪ-, -əs-]; irrational [ɪˈræʃənəl] ~ [ˌɪ-]).

AIMS

- Check whether or not the difference between British English and American English can be confirmed using speech data.
- If attested, evaluate whether the gemination of [ɹ] depends on the same variables as those found for other consonants.
- Try to determine whether or not we can assume that speakers have two underlying /r/s, even if these are not systematically realised.

METHODOLOGY

MATERIALS

We selected 19 words in <irr-> varying in frequency, semantic transparency, presence or absence of stress on the second syllable and attestedness of the base.

The words are as follows: *irradiate, irradiated, irradiation, irrational, irredentist, irrefutable, irregardless, irregular, irrelevance, irrelevant, irreplaceable, irresponsibility, irresponsible, irreverence, irrevocably, irrigation, irritate, irritation, irruption*.

THE TWO STUDIES

Youglish-based study

Automatic extraction of the 16 words in Youglish.

A maximum of 25 occurrences per gender per variety were selected.

Data analysis is not finished:

- 3 words were analysed by two authors
- The remaining 13 words have only been analysed once at this stage

	UK	US	
Males	154	276	*430*
Females	90	203	*293*
	244	*479*	*723*

Pilot production study

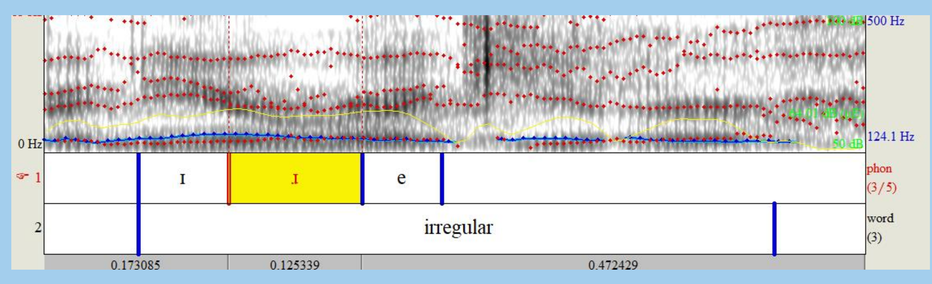
- The informants read a wordlist so that we determine whether they are rhotic or not
- They read a list of sentences containing the 19 words and taken from The Corpus of Contemporary American English (COCAE)
- They read a list of the same 19 words very slowly, separating out the syllables → /r/ attached to one or two syllables?
  - Various speech styles

	US	UK
Males	2	0
Females	2	3

DATA ANALYSIS AND CODING

The data was analysed spectrographically in Praat (Boersma & Weenik 2014) in order to perform two measurements: the length of [ɹ] and that of the whole word.

Each occurrence was analysed by two of the authors.



In both studies, the following variables were coded:

- R-LENGTH: Length of [ɹ] in seconds
- SPEECHRATE: Ratio of the number of segments in the word and its length in seconds
- LOGFREQUENCY: log-transformed (as $\log_e(x+1)$) frequencies taken from SUBTLEX-UK and US and COCAE
- RELATIVEFREQUENCY: ratio of the frequency of the base and that of the derivative
- SECONDSYLLABLE: STRESSED or UNSTRESSED
- GENDER: MALE or FEMALE
- SEMANTICTRANSPARENCY: the words were coded as TRANSPARENT or OPAQUE

The two varieties of English are analysed separately.

PRELIMINARY RESULTS

Youglish-based study

Statistical analysis

Linear regression was conducted on each variety.

Four variables were found to be significant predictors of [ɹ] length in both varieties. [ɹ]s were found to be shorter if:

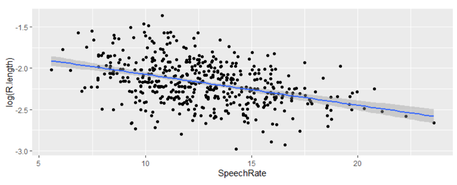
- SPEECHRATE is higher
- LOG-FREQUENCY is higher
- SECONDSYLLABLE is UNSTRESSED
- GENDER is FEMALE

SEMANTICTRANSPARENCY was found to be a significant predictor only in US English.

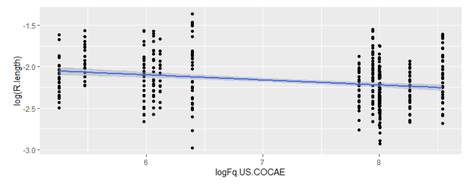
So as to simplify the comparison between the two varieties and the presentation, we analysed them together (new variable: ENGVAR) and log COCAE frequencies were used for both of them.

	Estimate	Std. Error	*t* value	p-value
Intercept	-1.318537	0.079005	-16.689	< 2e-16 ***
SPEECHRATE	-0.040526	0.002775	-14.602	< 2e-16 ***
GENDER-MALE	0.074621	0.016793	4.444	1.02e-05 ***
SECONDSYLLABLE-UNSTRESSED	-0.153315	0.016286	-9.414	< 2e-16 ***
ENGVAR-US	0.158208	0.017705	8.936	< 2e-16 ***
LOGFQ.US.COCAE	-0.065188	0.008005	-8.143	1.70e-15 ***

1



2



Overall results

[ɹ] duration increases with:

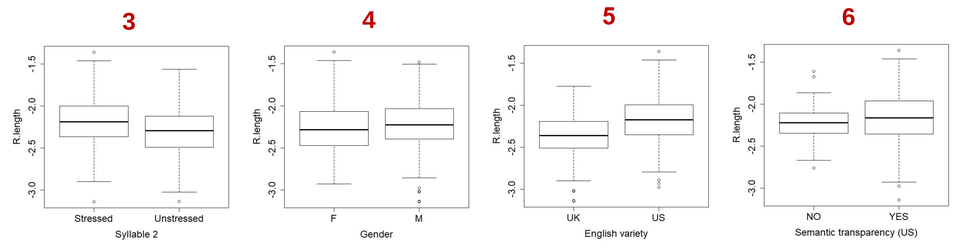
- lower speech rates (1)
- lower word frequency (2)
- a stressed second syllable (3)
- male speakers (4)

US vs. UK

US English has longer [ɹ]s than UK English (5)

- In this variety, [ɹ] is longer in semantically transparent items than in opaque ones (6)

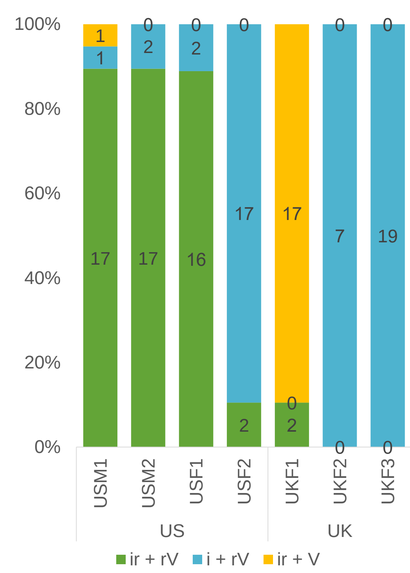
3 4 5 6



Can we say that US English geminates and UK English does not?

- Outside of semantic transparency, the same variables are significant predictors of [ɹ] length in both varieties
- Semantic transparency is only relevant in US English
  - This could be due to the rhotic status of this variety.

Syllabification task



With two /r/s
USM1, USM2, USF1: dominant
USF2, UKF1: marginal
UKF2, UKF3: nonexistent

/r/ attached to the base word
USF2, UKF2, UKF3: dominant
USM1, USM2, USF1: marginal
UKF1: nonexistent

/r/ attached to the prefix
UKF1: dominant
- Doesn't reflect the morphology of the word – base word not 'identified' as such e.g. [ɹ ˈɛl əv ənts]

Others: nonexistent

The ir + rV division seems completely independent of whether the status of the construction is transparent or not (cf. *irregular* vs. *irritate*).

The syllable division may be an indication that 3 out of 4 of our American informants have phonological representations with two /r/s.

Reservation: it could be due to the 'spelling pronunciation' tradition in US English

Beyond the case of /r/, our informants display variability as to the segmentation of other consonants.
e.g. [ɹ ˈɛl əv ənts] vs. [ɪ ˈɹɛ lə vənts]

Conclusion and perspectives

The analysis of the data needs to be refined but so far our results confirm the existence of a difference between British English and American English

In both varieties, we find effects of absolute frequency, stress in the second syllable and gender

The effects of semantic transparency support the segmentability hypothesis (Hay 2001). In previous studies, this hypothesis has not systematically been supported (see Plag & Ben Hedia 2018)

Follow-up

- Possible study of <rr> in words with no morphological structure (e.g. *ferry, arrow*)
- Similar syllabification study with other cases of CC
- Inclusion of the duration of [ɪ] to determine whether the length of underlying /r/s might lead to longer surface [ɪ]s

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