Diachronic change in /r/-sandhi? A real-time study at community and individual levels

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ABSTRACT

This study deals with the possible diachronic change in the use of /r/-sandhi in a variety of non-rhotic English (RP). A real-time study analyzed potential linking /r/ productions in a group of speakers belonging to different generational cohorts as well as in the speech of an individual (Queen Elizabeth II) over the course of various decades. The results indicate some incipient change (decrease) in the use of linking /r/ at both community and individual levels. Data on intrusive /r/ were limited but point in the direction of speaker-specific patterns of use that may or may not conform to community-level trends.

Keywords: /r/-sandhi; linking /r/; intrusive /r/; sound change; real-time approach.

1. INTRODUCTION

/r/-sandhi refers to the pronunciation of a rhotic consonant between two adjacent heterosyllabic vowels in non-rhotic English, as in *here it is* [ˈhɪər‿ɪt ɪz] (cf. [hɪə] elsewhere). This type of /r/-sandhi is commonly referred to as 'linking' /r/, although the former also encompasses 'intrusive' /r/, a non-etymological r-sound as in *Asia(r) and Africa* [ˈeɪʒər‿ənd ˈæfrɪkə]. The main difference between both types of /r/-sandhi is purely orthographic and etymological since they have the same distribution patterns, phonological context – i.e. after [-high] vowels – and hiatus-breaking function [17].

Research on /r/-sandhi has revealed that the latter is highly variable and conditioned by various prosodic-phonetic, structural and usage-based factors [e.g. 6, 8, 12, 14, 18, 19, 21]. Yet, while high variability exists at a synchronic level, little evidence is available on its diachronic stability. Some studies have looked at possible effects of age in various non-rhotic accents. Foulkes [7], for example, found that older Newcastle speakers produced more linking /r/ than younger ones, suggesting a sound change in progress. In contrast, he found no effect of age in Derby. Hay and Sudbury [14] found no influence of date of birth on linking /r/ rates in New Zealand English; and Cox et al. [6] found no main effect either on linking /r/ rates in Australian English, yet they found an interesting interaction between age and stress, with younger speakers producing less linking /r/ than older ones in unstressed-stressed contexts.

The diachronic evidence on the stability of /r/-sandhi relies mostly on *apparent time*, which assumes that there is little or no change in a person's accent after reaching adulthood. In *apparent-time* studies, potential variation is observed across age groups in a synchronic sample of speakers. However, *real-time* studies allow for variation to be observed via longitudinal studies [23]. Such studies shed light on actual patterns of usage at different periods of time in comparatively similar groups. Moreover, they can also shed light on potential changes in individuals across time. In fact, usage-based models of phonology [e.g. 4] predict that an adult's accent may show some adaptation in the direction of community changes; and some evidence suggests that speakers' linguistic behaviour changes throughout their lifespan [e.g. 3, 23], often shifting towards linguistic changes within a community.

2. A REAL-TIME STUDY OF /R/-SANDHI

The current study addresses the diachronic stability in /r/-sandhi usage at both community and individual levels from a real-time perspective. It addresses the following research question: is there any evidence of diachronic change in the use of /r/-sandhi at community and/or individual levels?

The phenomenon of /r/-sandhi was studied in Received Pronunciation (RP), a standard variety of English in England associated with the speech of the middle and upper classes and regionally non-specific, although most speakers are found in south-east England [26]. RP speakers can be considered as part of a speech community insofar as such communities do not have to be geographically contiguous yet involve a shared dimension of experience related to their members' linguistic uses and attitudes to language [24]. RP was chosen for two main reasons. Firstly, it counts a large historical record given its traditionally ubiquitous presence in British broadcasting; and secondly, there is some anecdotal evidence pointing to fluctuation in the use of /r/-sandhi in this accent. In the mid-1950s, for example, Jones [15] noted that while linking /r/ had been "quite regular" (p. 112) up to then, many

English speakers did not use it at all. Lewis [16] thought that such speakers were a minority in the 1970s and Allerton [1] pointed out a tendency for linking /r/ to be used less in news reading than in older RP speakers' informal speech, suggesting a stylistic variable but also a generational trend. Yet Bauer [2] found linking /r/ at a rate of 82.7% in reading style in the mid-1980s and no evidence of a diachronic shift in progress between older (born before 1940) and younger speakers. However, 20-30 years later, linking /r/ rates were around 60-65% in news reading [8, 19, 18, 21]. On the other hand, intrusive /r/ usage would seem to be on the increase. Lewis [16] noted a potential increase in its use in the twentieth century. In an analysis of recordings between 1949 and 1966, Bauer [2] found that RP speakers born after 1940 tended to use intrusive /r/ more than older ones, although only two contexts were analyzed. Moreover, intrusive /r/ rates range from 20% to 40% in more recent studies using broadcast data [8, 18, 19, 21].

3. METHOD

3.1. Materials

Two different ad hoc corpora were compiled with materials from online sources. The community-level corpus included 72 speakers (36 males, 36 females), aged 25-55. These were public figures or newsreaders, their year of birth ranged from 1879 to 1990, and the spoken data from 1929 to 2017. Since the time span is long (89 yrs.), the speakers were grouped around the concept of demographic generation/cohort, that is, people born within a given period of time who experience the same significant events. The cohorts identified were WW1 (1879-1900), WW2 (1901-1925), Silent (1926-1945), Baby boomers (1946-1960), X (1961-1980), and Millennials (1981-2000). Each cohort contained six males and six females. The texts were scripted, represent a non-spontaneous style (e.g. speeches, news reading, etc.), and amount to ca. 58,000 words.

The individual-level corpus contained data from Queen Elizabeth II (1926-), henceforth QEII. She was chosen as her accent has shifted from a more aristocratic form of RP towards a more mainstream variety over the years [11, 22]. In fact, Harrington and colleagues [e.g. 9, 10, 11] studied vowel changes in QEII's Christmas broadcasts from the years 1952-1960 and 1995-2002. This revealed that some vowel changes in RP (e.g. final prevocalic /ɪ/-tensing) had also taken place over a 50-year period in QEII's speech. The current study also used QEII's Christmas broadcasts as they represent an exceptionally regular, almost uninterrupted (since 1952, except for 1969), and almost complete (in spoken version) dataset, with some added advantages: QEII's performance is genuine (she speaks as the Queen), stylistically and communicatively stable (formal, annual message to her subjects) and represents non-pathological adult speech: QEII was an adult (26 yrs.) in her first message and the effect of aging on her voice quality is obvious in more recent decades but otherwise irrelevant. Compared with Harrington's studies, the current one substantially enlarged the time span from 15 to 65 years (Dec. 1952-Dec. 2017). The whole corpus amounts to ca. 37,000 words.

3.2. Procedure

The procedure consisted of the identification of potential cases, their subsequent acoustic analysis, and the categorical decision as to the presence or absence of /r/-sandhi based on the acoustic evidence.

As a preliminary step, word-external spelling-based /r/-sandhi sites (e.g. <-r/-re> for linking /r/; <a/-aw> for intrusive /r/) were identified semiautomatically in a written version of the texts, obtained with the speech-to-text software *VoiceBase* (www.voicebase.com) and/or online transcripts.

The spelling-based /r/-sandhi contexts were then analyzed acoustically, ruling out cases with a perceptible pause since the latter prevents /r/-sandhi. The final number of potential linking /r/ cases was 720 in the community-level corpus and 751 in the individual corpus. Recordings from the early twentieth century are often short and many cases per speaker difficult to obtain. Yet 10 potential linking /r/ cases were gathered per speaker from the same year. Conversely, the number of linking /r/ cases in QEII's speech depended on the message, ranging from 2 to 33 cases per year. Intrusive /r/ cases, which are relatively rare, were identified in the corpus obtained once all linking /r/ cases had been identified, with 57 potential cases in the community-level corpus and 53 in QEII.

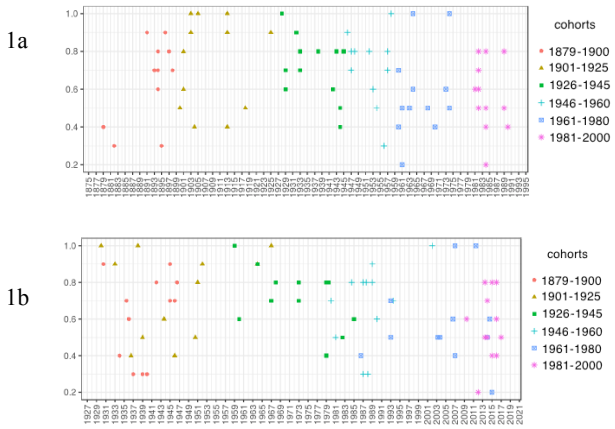
The acoustic analysis led to a categorical decision as to the presence or absence of /r/-sandhi, which displays graded features and variability. Moreover, there are differences between /r/-sandhi and canonical /r/ [20, 25]. Most studies, however, treat /r/-sandhi as a binary variable: presence of constricted /r/ vs. no/vocalized /r/. Following Pavlík [21], a categorical decision was adopted based on spectral characteristics (spectrogram), f_0 changes (pitch), and energy envelope (intensity), inspected with PRAAT. Criteria for the presence of postalveolar approximants – the most common realization – included lowered F2 and F3 formants, the regular structure of voicing pulses, and the

relatively stable pitch and intensity contours. As for cases of lack of /r/, the most common realization is glottalization rather than pure hiatus [18]. Thus, typical acoustic cues for glottal stops (e.g. stop gap, absence of f_0, sudden energy change) and/or creaky voice (lowered f_0, decreased acoustic intensity, irregularly spaced glottal pulses) were considered.

4. RESULTS AND DISCUSSION

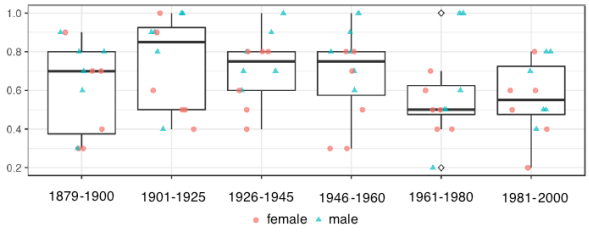
The analysis of the community-level corpus yields a rate of 65% (n= 468) for linking /r/ vs. 35% (n= 252) for its absence. QEII's corpus had a rate of 75.9% (n= 570) for linking /r/ vs. 24.1% (n= 181) without it. The analysis below relies mostly on year of production (YOP) at community and individual levels, year of birth (YOB) at community level, and related means. Considering these variables, we can observe high variability in the production of linking /r/ at community level (Fig. 1).

Fig. 1: Linking /r/ at community level: YOB (1a) and YOP (1b). Each dot represents an individual.



Moreover, a Kruskal–Wallis test showed no statistically significant differences in the mean rate of production across cohorts (P= 0.22), although males seem to produce more linking /r/ (Fig. 2).

Fig. 2: Mean rate of linking /r/ across cohorts.



The same applies when the data are specifically analyzed by gender group (Fig. 3).

Next, an adjusted linear regression (ALR) also showed that YOP is not a good predictor of linking /r/ (R^2 = 0.21) yet the graphic shows some decrease over time (Fig. 4).

Fig. 3: Mean rate of linking /r/ by gender groups.

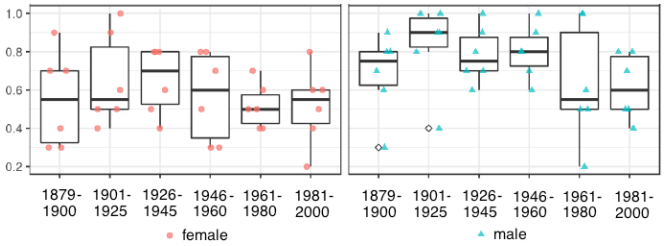
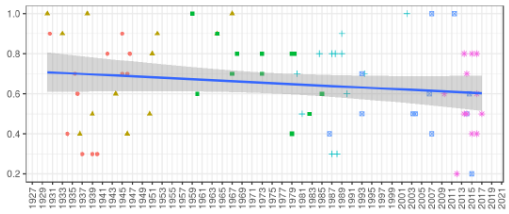
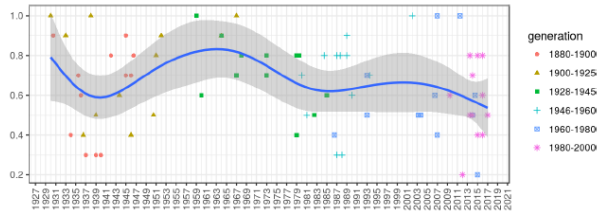


Fig. 4: Mean rate of linking /r/ per year (ALR).



Finally, a GAM model was applied using the variables mean year, mean date of birth, and mean rate of linking /r/. This analysis shows that mean rate of linking /r/ per YOP shows some statistical significance (p= 0.045), with a (fluctuating) decrease in the use of linking /r/ across time, although such variation is conditioned by the high variability in the data and no major conclusions can be drawn (Fig. 5).

Fig. 5: Mean rate of linking /r/ per YOP (GAM).

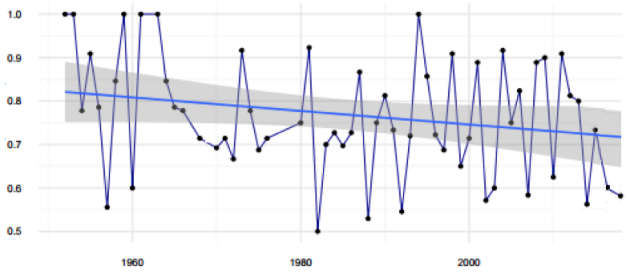


As for QEII's data, a logistic regression was carried out considering 26 linguistic and phonetic variables as well as YOP. This revealed that only 13 variables had a p-value ≤ 0.1 and only seven had a p-value ≤ 0.05, although YOP was none of them (p-value = 0.13). Following the logistic regression, a random forest classifier was carried out, with data randomly split into training (80%) and testing (20%) at each interaction. A total number of 500 trees were calculated, with 5 randomly selected split variables at each node. Finally, given that the p-value of the YOP variable was near 0.1 in the logistic regression and its Gini value was very high in the random forest, the YOP variable was added to the best model previously determined by the glmulti algorithm in a second logistic regression derived from the random forest analysis. This added little variation in the degree of overall model fit with respect to the model without the YOP variable: the chi-square goodness-of-fit p-value was 0 and the coefficients of determination were not particularly low (Hosmer-Lemeshow R^2 = 0.33; Cox & Snell R^2

= 0.30; Nagelkerke R^2 = 0.46). We then calculated the odds ratios together with their confidence intervals, although YOP does not have an effect on the use of linking /r/ in the model.

In order to further explore the YOP variable and linking /r/ rates, a linear regression test was carried out next (Fig. 6).

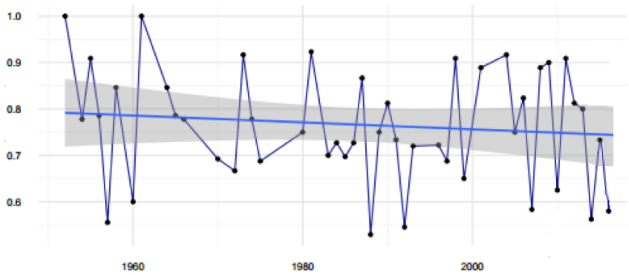
Fig. 6: QEII's mean linking /r/ rate per YOP: all years.



Mean rates of linking /r/ per YOP in Figure 6 suggest some decrease in the use of linking /r/ over the years. However, the results reveal that YOP is not a good predictor of linking /r/ (R^2 = 0.05), given that R^2 values close to zero suggest that the model explains none of the variability.

The lack of a strong YOP effect in QEII's speech may be obscured by the small number of potential linking /r/ cases in some years. Thus, given that the range of cases is 2-33, a second linear regression was conducted excluding the years with fewer than 8 (first quartile) potential cases (Fig 7). The results reveal that YOP is still not a predictor of linking /r/ production (R^2 = 0.01).

Fig. 7: QEII's mean rate of linking /r/: selected years.



Comparing the community-level results with those of the idiolectal corpus (QEII), there seems to be some tendency over the years to produce less linking /r/ in both corpora. This could point to an incipient sound change in progress at both community and individual levels. Yet the tendency is not strong and statistically non-significant in most cases, suggesting that prosodic-phonetic factors, linguistic and usage-based factors may condition, instead, the high variability observed in the data [see e.g. 18, 21]. As for QEII's overall linking /r/ rate, it seems to be typical of her gender and cohort (Silent). In contrast, QEII's intrusive /r/ usage might seem to set her speech apart from her own cohort and later ones. Although the data are rather limited to draw any conclusions, intrusive /r/ was found at a rate of 21.1% (12/57 cases) in the community-level corpus. Interestingly, it was rare in the two cohorts born before 1926 (i.e. WW1 and WW2), occurring at a rate of 5.9% in these cohorts (1/17). Yet intrusive /r/ is more common in later generations with a 26.7% rate among Silent (4/15), Baby Boomers (3/8), and X (3/9) members, with a slight decrease to 12.5% among Millennials (1/8). QEII has a rate of 0% intrusive /r/ in her corpus. The formal register of the broadcasts cannot explain by itself the absence of intrusive /r/ since the community-level corpus can also be described as formal speech. In any case, the formal nature of the two corpora may explain why intrusive /r/ rates are so low. Future studies should, determine whether register/style conditions intrusive /r/ production. Intrusive /r/ rates, for example, could be higher in spontaneous speech since the speakers may be less speech-conscious.

Other than speech register/style, gender could explain inter-speaker variation. Most previous studies on /r/-sandhi in RP [8, 19, 21] have found no general gender effect and the data from the community-level corpus are too few to draw any conclusions on the use of intrusive /r/ by gender, although males produced 7 out of the 12 cases. Yet the three speakers in Hannisdal's study [8] that avoided intrusive /r/ altogether were female, which is consistent with the fact that female speakers tend to use a higher proportion of prestige forms and fewer stigmatized forms than men, particularly in formal speech [5]. Being a female speaker and certainly very speech-conscious during her Christmas broadcasts may explain why QEII avoids intrusive /r/ use altogether since the latter has traditionally carried some degree of stigmatization [26].

5. CONCLUSION

The current real-time study has revealed some evidence on what could be considered to be an incipient sound change in the use of /r/-sandhi in RP, with a decrease in the use of linking /r/ and a slight increase of intrusive /r/ over time. The study has also shown that a given individual can show changes over time, either conforming to community-level patterns (e.g. QEII's linking /r/) or diverging from it (QEII's intrusive /r/). Yet the data analyzed show great variability and no definite conclusions can be drawn until further studies with more speakers and cases per year are conducted. The study of spontaneous style/register should also shed light on the use /r/-sandhi over time.

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