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A constant rate effect in Manchester /t/-glottalling: high-frequency words are ahead of, but change at the same rate as, low-frequency words

The impact of lexical token frequency on phonetic implementation has been argued to support Exemplar Theory in the following way (Bybee 2002; Pierrehumbert 2001, 2002):

(a) Synchronically, high-frequency lexical items exhibit more coarticulation and reduction than low-frequency items (e.g. Dinkin 2008, Gahl 2008, Myers & Li 2009, among many others).
(b) This is because, in diachronic processes of lenition, frequent words change at a faster rate than infrequent ones.
(c) In turn, this is because high-frequency items suffer greater exposure to phonetic biases in production and perception than low-frequency items, and the effects of this difference are directly registered in phonetically detailed lexical representations.

This argument suffers from several problems. Hypothesis (b) has not been corroborated by actual diachronic observations in real or apparent time. Indeed, (a) does not logically entail (b): as acknowledged by Hay *et al.* (2015), frequent items can be ahead of infrequent ones, and yet change at the same rate. In such a scenario, the impact of frequency gives rise to a **constant rate effect** (CRE) in the sense of Kroch (1989): when modelled as logistic functions, the curves of change for high- and low-frequency items exhibit different intercepts but equal slopes. The existence of CREs in phonology was established by Fruehwald *et al.* (2013). Without drawing an explicit connection with Kroch's concept, Zellou & Tamminga (2014) report an instance of gradient coarticulatory change affecting high- and low-frequency items at the same rate. As regards (c), the empirical predictions of Exemplar Theory remain unclear. Sóskuthy (2014) shows that, in the absence of *ad hoc* stipulations, the inertia of a large exemplar cloud will cancel out the effects of greater exposure to phonetic bias. In addition, Hay *et al.* (2015) propose an exemplar-based account for a sound change apparently led by **low-frequency** words.

In this paper, we challenge (b) with evidence from a CRE in /t/-glottalling in Manchester English. As expected, token frequency has a strong effect on /t/-glottalling, but during the 20th century the proportion of glottal realizations increases at the same rate in high- and low-frequency wordforms. Our data come from a sociolinguistically stratified sample of 49 speakers born between 1926 and 1985, and raised in Manchester from age 3 or younger. 8,255 tokens of /t/ in word-medial and word-final positions were auditorily coded as glottal, i.e. [ʔ], or nonglottal. Each wordform was assigned a frequency score on a Zipf scale based on the SUBTLEX-UK corpus (van Heuven *et al.* 2014). Figure 1 shows that the curves of change in apparent time for high- and low-frequency items are parallel. Figure 2 shows that, when compared to the overall rate of /t/-glottalling, the average glottalling rate of the highest-frequency words fails to increase with time, and that of the lowest-frequency words fails to decrease. A generalized mixed-effects logistic regression model with frequency (as a continuous variable), birthyear, social class, and following segment as fixed effects provides the best fit for the data; speaker and word were included as random effects. Crucially, a birthyear:frequency interaction proves not to be significant, and adding it does not improve on the model without the interaction (by ANOVA comparison). We conclude that the impact of token frequency on the rise of /t/-glottalling in Manchester English produced a CRE, with all wordforms changing at the same rate.

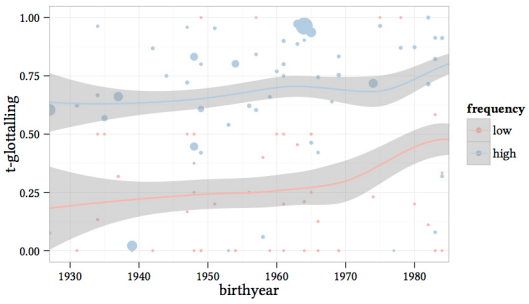

Figure 1

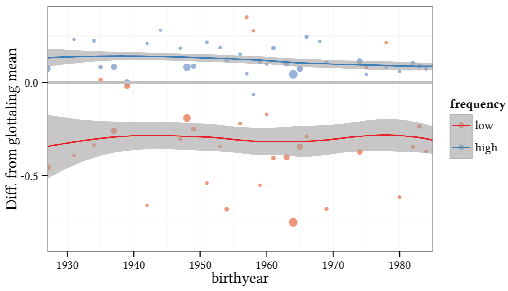

Figure 2

The absence of evidence for (b) suggests that alternatives to (c) should be considered. Frequency-driven CREs are consistent with modified versions of classical modular architectures in which neogrammarian innovation is effected through change in phonetic implementation rules referring to phonological categories in surface representations, whilst the impact of token frequency is produced by orthogonal mechanisms.

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