

### **Imitation as a mechanism for the spread of sound change**

Strong evidence suggests that exposure to a speech stimulus causes an observer to display characteristics of the stimulus in their own productions (Babel, 2010; Babel & Bulatov, 2011; Goldinger, 1997, 1998; Goldinger & Azuma, 2004; Honorof et al. 2011; Namy et al., 2002; Nielsen, 2011; Shockley et al., 2004). This phenomenon, called imitation, has been suggested to be both the seed for sound change (Garrett & Johnson, to appear) and the mechanism by which it is spread (Delvaux & Soquet, 2007; Garrett & Johnson, to appear; Pardo, 2006; Trudgill, 2004, 2008). Under such a view, imitative behaviour spreads sound change throughout a population as listeners/talkers accommodate to each others' speech patterns and the imperfect transmission of these accommodations acts as the seeding mechanism. Moreover, the mechanisms that support imitative behaviour may be developed through socioculturally embedded sensorimotor learning in infancy (Ray & Heyes, 2011) and therefore may be quite active in shaping the acquisition process.

Of special interest then is what constrains imitation. Current work has demonstrated that imitation is moderated by social factors (Dijksterhuis & Bargh, 2001; Babel, 2010, in press), language-internal phonological factors (Nielsen, 2011), and dialect (Babel, in press), yet the picture is far from complete. Specifically, because the imitation view of sound change relies crucially on individual behaviour and does not assume that all interlocutors will equally imitate all voices, understanding the properties of a voice that lead to imitation is of great importance. For example, given that sound change is often described as being led by young females (Labov, 2001), we might expect that the voices of young females are imitated more than other voices. A competing prediction comes from Goldinger (1997), who predicted that in an episodic perceptual system, rare or atypical tokens will receive higher levels of activation. He goes on to demonstrate that in spontaneous phonetic imitation, lower frequency words with fewer echoes will exhibit stronger effects of imitation (Goldinger, 1997, 1998). Unique or atypical voices should also trigger a similar response, resulting in more imitation of atypical voice profiles.

In this paper we seek to determine whether a particular voice profile is imitated more than others. To this end 30 male and 30 female native American English-speaking voices producing 15 low frequency monosyllabic words containing /i a u/ were presented to independent groups of California-based listeners (n=30) who rated vocal attractiveness and voice typicality for each talker. The most attractive, unattractive, typical, and atypical voices for each gender (a total of 8 voices) were selected for use as model talkers in an auditory naming task to elicit spontaneous phonetic imitation. In the auditory naming task, participants (n=16) produced baseline tokens of the 15 monosyllabic words and then shadowed the productions of the 8 model talkers. The task was blocked by model talker; the order of the model talkers was random, as was the word list. Imitation will be measured both acoustically (Babel, 2010) and perceptually through an AXB similarity task (Goldinger, 1998). Acoustic analysis of imitation is ongoing and currently 35 listeners (of a final total of 120 listeners) have completed the AXB task. In this task listeners judge whether shadowers' baseline productions or shadowed productions sound more like the token the model talker under whose condition the shadowed token had been uttered. Each listener evaluated two shadowers' productions in response all 8 model talkers to control of listener-specific perceptual sensitivity. A repeated-measures ANOVA with Model and Vowel repeated across listeners demonstrated main effects of Model [ $F(7, 238) = 2.13, p < 0.05$ ] and Vowel [ $F(2, 68) = 12.68, p < 0.001$ ], as well as a significant interaction between the two [ $F(14, 476) = 2.1, p < 0.05$ ]. While all Models were imitated at above chance levels, listeners perceived the most imitation in shadowed tokens of Least Typical Male model. Note, however, that among the four female model talkers, the Most Attractive female received the most imitation. These results suggest that typicality and attractiveness may play different roles in the spontaneous imitation of male and female voices. The vowel effect found that words with /u/ were imitated most, followed by words with /a/. We discuss our results with respect to the role of imitation in sound change with an emphasis on preferential imitation of particular vowels and talker types.