

GENDER DIFFERENCES IN AUTOMATIC PHONETIC ACCOMMODATION

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1. INTRODUCTION

Automatic accommodation studies have shown that subtle acoustic features of a person's speech shift in the direction of an interlocutor during and following exposure to that person's speech (Goldinger, 1996; Namy, 2002; Nielsen, 2008; Babel, 2009). These temporary effects have been demonstrated in a variety of paradigms, and are frequently interpreted as support for exemplar-based theories. Research, however, has been inconclusive regarding the effects of socio-demographic characteristics on degree of imitation¹, and has not yet examined the importance of feature hierarchies (e.g. preferential imitation of VOT vs pitch).

Gender effects have been demonstrated in numerous studies on phonetic accommodation, yet no conclusive pattern has yet emerged. Namy et al. (2002) concluded from an immediate shadowing task that women show a higher degree of imitation, that both genders preferentially imitate men, and that women were more sensitive to the imitated acoustic qualities of other speakers' post-exposure productions. Pardo (2006), however, found that men demonstrated higher levels of accommodation in a conversational task. Babel (2009), on the other hand, found equal amounts of imitation across men and women.

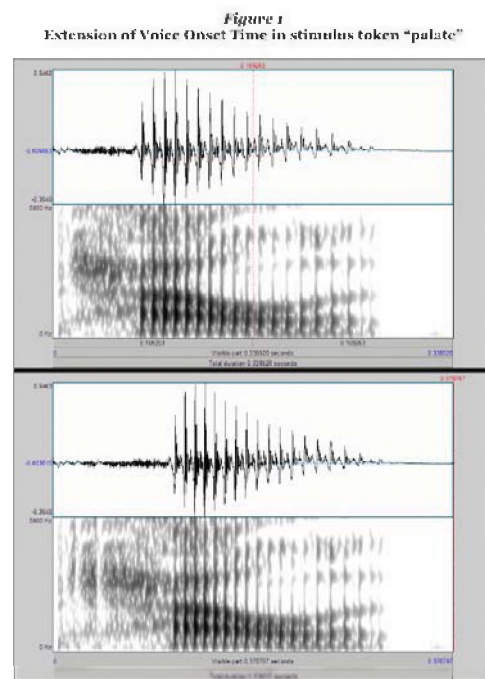
As in Pardo, in Nielsen's spontaneous imitation task with exposure phase (2008), men showed a greater degree of imitation than women. However, the female participants had longer baseline voice onset times (VOTs) than their male counterparts. Nielsen proposed two hypotheses to account for this pattern. Women may have accommodated less because the modified VOT stimuli were less salient (i.e. too close to their own baseline productions). Alternatively, perhaps this pattern is a reflection of a universal tendency to converge more towards the same gender -- as only a male model voice was presented during the experiment, female participants showed lower levels of imitation.

The present study examines the relationship of accommodation to participant and model talker gender. The experimental design allows accommodation to be indexed via multiple phonetic features, including VOT, vowel quality, and pitch.

2. METHOD

¹ The terms imitation and accommodation are used interchangeably throughout this paper.

Following Nielsen (2008), the experiment involved a blocked-shadowing task that consisted of two production phases and one exposure phase. Stimuli include a total of 187 words: 86 /p-/ initial, 20 /k-/ initial, and 82 resonant or fricative initial. All words were controlled for lexical frequency (CELEX), and were selected based on vowel, initial consonant type, or as filler. A male and female model talker were asked to produce the /p-/, resonant, and fricative-initial stimuli. A novel aspect of the experiment design was that both the male and female voices were presented during the exposure phase; however, one of the two voices had been modified. Subjects participated in one of two conditions: in one, the male model voice had been modified to extend initial /p-/ VOTs by 40 ms.; in the other, the female VOTs were modified. Example stimuli can be seen in Figure 1 below.



The original production of "palate" is shown in the upper window. The version in the bottom window has been extended by 40 msec through multiple splines of the original aspiration.

Stimuli were presented through E-prime Experimental Software 2.0 (Schneider et al., 2007). In phase one of the experiment, participants were asked to produce all 170 words as they were presented on a computer screen. In phase two, auditory stimuli (a subset of the total word list) were played in a continuous stream, exposing the participants to four repetitions of each word (two identical male tokens;

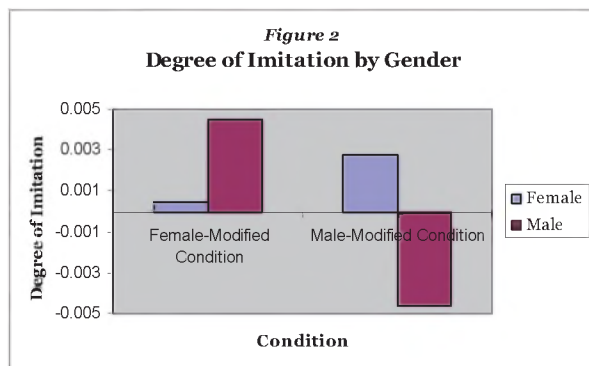
two identical female tokens). Finally, in phase three participants reproduced the entire word list. Stimuli were randomized in every phase. Follow-up questionnaires and informal interviews were conducted post-experiment to assess participants' implicit/explicit emotional stance towards the vocal stimuli.

Twelve participants in total were recorded and analyzed; four female and two male subjects participated in each condition. All sound was recorded using a head-mounted AKG C520 microphone in a sound-insulated booth at the University of British Columbia. Subjects were given ten dollars CAD for their participation.

3. RESULTS

Only VOT differences have been processed and analyzed to date. Degree of imitation was determined by calculating the mean of the difference scores for each participant's pre- and post-exposure /p-/ token productions. These imitation scores were then compared across condition and gender. As demonstrated in Figure 2, females showed a higher degree of accommodation to the male voice (Cohen's *d*: .60), and males displayed the reverse tendency (Cohen's *d*: 1.07).

Degree of imitation was also analyzed in relation to vocal preference and emotional reactivity (Nock et al., 2008). Using the same methods as above, there was an association between vocal preference and degree of imitation (Cohen's *d*: .54); however, it was less robust than the gender-imitation relationship. To determine the relationship between emotional profile and degree of imitation a Spearman correlation was calculated between the difference scores and Nock questionnaire scores, yielding a modest positive correlation ($\rho = .26$).



Males showed higher degrees of imitation to the female-modified voice, while women showed higher degrees of imitation to the male modified voice

Overall presence of imitation was calculated for each participant across conditions through a paired-samples *t*-test. A participant was considered an imitator if their post-exposure VOT duration was significantly longer than pre-exposure ($p < .05$). By this criterion,

five of the twelve participants imitated the lengthened VOT.

4. DISCUSSION

The results of this experiment suggest that imitation is influenced by gender. Specifically, speakers are more likely to imitate the acoustic characteristics of a talker of the opposite gender. We might hypothesize that this is a reflection of heightened sensitivity/attention to speakers' that are perceived as more different from the listener. Alternatively, perhaps there is an evolutionary motivation, in that listeners are more attuned to potential reproductive partners. Continuing analyses will seek to determine whether participants showed differential degrees of accommodation to vowel quality and pitch.

Overall levels of accommodation to the lengthened VOT were quite low. Though VOT is known to be highly variable, previous studies on VOT accommodation still achieved a greater than 50% rate of accommodation. It is probable that the low levels found in this study derive from the novel paradigm design. Listeners were presented with two model talkers – only one of which had lengthened VOTs. These low levels of imitation suggest that the mere presence of a novel auditory stimulus in the speech stream is insufficient to provoke automatic accommodation; rather, external factors such as gender, voice preference, and emotional stance to the speaker modulate the process.

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