The perception of voice-initiating gestures

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While a large number of studies have looked at the variation in production which may give rise to sound change, fewer studies have looked at how this variation is perceived and (re)interpreted by listeners. Moreover, most studies have focused on coarticulatory, aerodynamic, inertial or rate-induced variation that, because is automatic and predictable, could lead listeners to expect the resulting effects and correct for them (or fail to do so). This talk focuses on the perception of variation resulting from implementational features, that is, features directed at achieving a certain goal; specifically, the use of nasal leak directed at achieving vocal fold vibration. Such implementational effects differ from regular phonetic variation in two important respects. First, they are features *targeted* by the speaker (rather than mechanical) as part of the 'constellation of gestures' directed to achieve a certain acoustic effect (Browman and Goldstein 1989) – in this case, voicing during a stop. Second, they are *not* fully *predictable* as they vary from speaker to speaker and segment to segment of the stop category, although they appear to be used rather consistently.

I will report the results of a perceptual study designed to examine whether English and Spanish listeners can detect the nasal leak that may accompany utterance-initial voiced stops in Spanish and French (Solé 2010, Solé and Sprouse 2010), and reinterpret it as a nasal segment. Such reinterpretation would account for a number of sound patterns, e.g. prenasalized voiced stops, emergence of non-etymological nasals adjacent to voiced but not voiceless stops, preservation of voicing exclusively after nasals (see Solé 2009 for a review).

Oral pressure, nasal airflow, oral flow and audio were recorded for utterance-initial /b/ /d/, /p/, /t/ produced by 10 Spanish speakers (five males and five females) and 5 French speakers (three females and two males) ten to thirteen times each. The perception stimuli were selected as follows. The tokens showing maximum and minimum delayed velic raising (i.e., velum leak) for each segment (/b d p t/) were selected for the high and low 'delayed velum raising' conditions. Maximum velum leak was taken to occur when delayed nasal closure exceeded 50ms, and minimum when it was below 20ms. Tokens showing a 'nasal burst' accompanying voicing initiation were also selected for the perceptual test. The tokens showing the largest and smaller (in magnitude) nasal burst for each segment were selected for the high and low 'nasal burst' condition.

The initial /C_{stop}VC/ portion was excised from the original sentences and a vowel was added at the beginning of the sequence, such that the perceptual stimuli had a /VC_{stop}VC/ structure. The initial vowel was included to place the segment of interest in intervocalic position where both /C_{stop}/ and /NC_{stop}/ may occur. In order to provide listeners with a reference token of the /NC/ identification response (and not to bias them against this response), one token each of the sequences /VmbV/, /VndV/, VmpV/, /VntV/ was added. All stimuli were normalized for intensity. The perception test consisted of 112 randomized stimuli. E-Prime was used to test 20 Spanish and 20 English listeners who were asked to identify the stimuli as /VCV/ or /VNCV/.

Preliminary results show a significantly higher number of /NC/ identification for the maximum 'delayed velum raising' and maximum 'nasal burst' condition. The results for

the English speakers are currently being analyzed, but preliminary analysis suggests that English speakers show significantly higher /NC/ identification responses that Spanish speakers, in line with their being less familiar with the occurrence of nasal leak in voiced stops, and therefore failing to correct for it. The results suggest that listeners may detect the nasal murmur and fail to relate it to the initiation of voicing, interpreting a nasal segment. Thus a gesture that was directed to facilitate voicing initiation may be interpreted as a new target goal. It is speculated that implementational features, because they are not predictable, may be more difficult to attribute to the source (the implementation of voicing) and more likely to be interpreted as a target feature in itself and reproduced as such.

References

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