

clarification may be a function of the child's language stage. We would therefore not expect reduction in palatalization, which primarily affects front vowels, until a later stage of the child's language development.

**2pSC10. Voice onset time in infant-directed speech at 7.5 and 11 months.**

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Studies have reported differences between infant-directed speech (IDS) and adult-directed speech (ADS), suggesting that mothers adjust speech to their infants in ways that may help children better parse the incoming acoustic signal. One aspect of IDS that has been examined is voice onset time (VOT). Results have been inconsistent, revealing longer VOT in IDS [Englund (2005); Malsheon (1980)], shorter VOT in IDS [Sundberg & Lacerda (1999)], or no difference in VOT between ADS and IDS [Baran *et al.* (1977)]. Characteristics of IDS may also depend on the language maturity of the child and, therefore, clarity of speech may vary across stages of development [Englund & Behne (2006)] as well as vary among mothers. The present study examines 15 mothers' VOT in IDS to children at 7.5 months old and again at 11 months as compared to their VOT in ADS. Words with initial stop consonants that occurred in both IDS and ADS conditions are analyzed using PRAAT. Variability was observed among mothers and age effects: preliminary data suggest that VOT in IDS at 11 months is better differentiated than at 7.5 months. [Work supported by NSF BCS0745412.]

**2pSC11. Mandarin and English initial stops produced by Mandarin-English bilinguals.**

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This study investigates the relationship between the way Mandarin-English bilinguals and native speakers of English pronounce English initial stop consonants, and between the way Mandarin-English bilinguals pronounce Mandarin and English stops, with respect to voice onset time. Twelve Mandarin subjects who had learned English as their second language and were studying at a US university were asked to read randomized lists of 72 Mandarin characters and of 72 English words; twelve English subjects read only the list of English words. The syllable structure of each Mandarin character and of each English word in this study was CV. The Mandarin consonants were initial aspirated and unaspirated /p, t, k/; the English consonants were initial /p, t, k/ and /b, d, g/. The vowels used in both lists were high vowels. Significant differences are found between the Mandarin-speaking subjects' articulation of all the Mandarin stops and their minimally paired English equivalents produced by the English-speaking subjects. Significant differences are found between Mandarin and English speakers' articulation of the same English stops, except for that of /t/. When comparing the Mandarin-speakers' articulation of Mandarin stops and their minimally paired English counterparts, a significant difference is found only between English and Mandarin aspirated /p/.

**2pSC12. Phonetic adaptation in non-native speech: Insights from a distributional analysis of long-lag voice onset time.**

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Speakers encountering long-lag voice onset time (VOT) for the first time in their L2 produce VOTs between their L1 and L2 values. Native-like long-lag productions are conditioned by speaker competency factors such as age of acquisition and experience, showing significant production differences between late bilinguals, early bilinguals, and native L2 speakers. Thus far, analyses have focused on average VOTs across speaker groups. This project investigates the full distributional properties of VOT in bilinguals (e.g., variation and skewness) in addition to averages, providing a more informative picture of bilingual acquisition. VOT production data were collected from French-English bilinguals (age of English onset 0–15 years) and submitted to a distribution-based analysis. Results show that while speaker groups differ predictably in mean VOT, the analysis discovers subgroups based on common production behaviors, eliminating the gross categorizations of early and late bilinguals and moving toward gradual, predictable shapes of VOT that are correlated with English schooling, time in an

English-speaking country, and age of acquisition. Ultimately, these results may fill in some missing blanks between perception and production, suggesting, for example, that differences in perceived accent and comprehensibility diverge due to degree of overlap with native L2 VOTs.

**2pSC13. A Bayesian model of voice-onset time production.**

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Talkers performed a listen-and-repeat task to investigate temporal detail in voice-onset time (VOT) productions of American English word-initial stop consonants. Experimental factors included linguistic context (isolation, carrier phrase, unfamiliar phrase, and familiar phrase), usage frequency (high and low), lexical status (word and non-word), training (baseline and posttraining), and posttraining generalization (test words and novel words). For each context, frequency, and lexical status, baseline VOT production estimates were collected, then a naive training regimen conducted, then post-training estimates of both test words and novel words were obtained. Testing novel words explored whether the effect, if obtained, generalized throughout the lexicon. A Bayesian linear model (analogous to analysis of variance) was used to model VOT means as a function of these factors. Posterior distributions of modeled VOT means were compared across six talkers, with a focus on probing the relationships between lexical frequency and status, linguistic context, and training. Preliminary results suggest that a number of these experimental factors influence fine-grained control of VOT production. As expected from speech production data obtained from multiple talkers and thousands of productions, the overall model fit was imperfect, but the results indicate that a Bayesian model can be productively deployed for data exploration into temporal aspects of speech production.

**2pSC14. Priming at the level of phonetic detail: Evidence from voice onset time (VOT).**

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Priming studies have shown effects on the production of target words when the target and prime are identical and when the target and prime share some but not all phonological features. Variation at the level of phonetic detail has also been found to affect production in word shadowing tasks where speakers produce longer VOTs when the VOT of the sample word is artificially lengthened. In this study, we examine the effect of naturally produced, yet systematic within-category variability in the VOT of the prime on the production of a target word for visually presented words. Primes either contained a voiceless stop with a long VOT ("keen") or a short VOT ("pan"). The target words contained a voiceless alveolar stop followed by five vowels which varied in height and backness (e.g., "tune" and "ten"). Results showed that the same target word was produced with longer VOTs when the prime contained a naturally long VOT than when the prime contained a naturally short VOT. These results suggest that speakers are sensitive to natural within-category variability, and that this sensitivity affects production across different segments.

**2pSC15. Why are Korean tense stops mastered early: Evidence from production and perception.**

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Transcription-based studies have found that Korean-acquiring children master tense stops earliest among the three different types of homorganic stops (tense vs lax vs aspirated) despite its phonologically marked status. Tense stops in Korean have a short-lag VOT, so this finding is consistent with previous cross-linguistic research on order of acquisition of stop phonation types. However, Korean tense, lax, and aspirated stops are also differentiated by the fundamental frequency and the voice quality at the vocalic onset in addition to VOT. This study examined how correctly these multiple acoustic cues (VOT, f0, and H1-H2) predict the mastery pattern of Korean stops. The effect of these acoustic parameters on 20 Korean adult listeners' assessments of children's (aged 2–6) productions of /tʰ/, /t/, and /th/ was analyzed. Listeners were asked to label the stimuli as one of three stop cat-

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