

4aSC36. The organization of bilingual perceptual consonant space: English/Spanish bilingual perception of Malayalam nasal consonants. Jenna Silver and James Harnsberger (Inst. for Adv. Study of the Commun. Proc., Univ. of Florida, Gainesville, FL 32611)

This study examines the capacity of English/Spanish bilinguals to discriminate between consonants that exist in only one of their respective phonetic inventories. Two non-native nasal consonant contrasts were tested: dental versus alveolar and the palatal versus velar, both found in Malayalam. The dental and palatal nasals appear in Spanish, while the alveolar and velar nasals occur in English. Poorer performance in discrimination was interpreted as indicative of a common nasal category subsuming the Spanish dental and English alveolar nasals; better performance was taken as evidence of the maintenance of separate categories from both languages. Two other tests were administered to aid in the interpretation of the discrimination test scores: forced-choice identification and perceptual similarity ratings. The findings of this research will be used to characterize the perceptual consonant space in terms of continuum between two possible bilingual systems: one that collapses similar categories across languages or one that maintains two distinct phonological systems that can be accessed simultaneously. It is believed that bilinguals will be able to discriminate between these contrasts more consistently than their monolingual peers; however, there is no prediction about performance relative to the monolingual group from Malayalam.

4aSC37. Agreement and reliability using reference-matching paradigm in perceptual voice quality rating in Chinese and English. Mandy Ho and Edwin Yiu (Voice Res. Lab., Div. of Speech & Hearing Sci., Univ. of Hong Kong, 5/F Prince Philip Dental Hospital, Hong Kong)

Perceptual voice judgment is commonly used in clinical voice quality evaluation. The use of a referencematching paradigm in perceptual ratings has been shown to improve both agreement and reliability (Yiu *et al.*, in press). This study set out to investigate the agreement and reliability in rating Chinese and English dysphonic stimuli using the reference-matching paradigm. Experiment 1 aimed to synthesize Chinese and English dysphonic stimuli with different breathy and rough severity levels using the HLSyn Speech Synthesizer. Seven representative anchors (references) for each of the rough and breathy series in Chinese and English were chosen by three judges to be used in experiment 2. Acoustic analysis of the anchor series indicated they were of increasing severity. Experiment 2 recruited ten native Chinese and ten native English subjects to rate the quality of Chinese and English dysphonic voice samples using the synthesized anchor as references. Results showed that listeners achieved nearly 90% agreement in rating the Chinese stimuli and 80% agreement in rating the English stimuli regardless of their language background. The study showed that the reference-matching paradigm was a reliable method in rating dysphonic stimuli across listeners with different language backgrounds.

4aSC38. Learning to perceive non-native speech sounds: The role of test stimulus variability. McNeel Jantzen and Betty Tuller (Ctr. for Complex Systems and Brain Sci., Florida Atlantic Univ., 777 Glades Rd., Boca Raton, FL 33431)

Natural speech stimuli used in studies of phonological learning usually include several in talkers and phonetic environments because variability aids learning [e.g., Lively, Logan, and Pisoni, *J. Acoust. Soc. Am.* (1993)]. The present study investigated whether nonphonetic variability in the synthetic test set has a similar effect. First, a perceptual mapping procedure was performed using a synthetic continuum that ranged from the Malayalam voiced, unaspirated, dental stop consonant to the American English alveolar [d], with three *F0* contours (low, mid, and high). Subjects identified the stimuli (2AFC) and judged their goodness as exemplars of each category. Subjects then received 15 sessions (one/day) of 2AFC training with feedback using natural stimuli produced by native Malayalam speakers, and performed difference ratings on a subset of pairs from the syn-

thetic stimuli. The perceptual mapping procedure was repeated at 1 and 14 days post-training and results compared with a parallel experiment that included only the midlevel *F0* contour in the synthetic test set. [Work supported by NSF.]

4aSC39. Influence of the prosody of spoken language on recognition and memory for vocal quality. Sumi Shigeno (Aoyama Gakuin Univ., 4-4-25 Shibuya, Shibuya-ku, Tokyo, 150-8366 Japan)

This study examined whether recognition and memory for vocal quality of a speaker who speaks either a native language or non-native language should be influenced by the prosody of the language that the speaker utters. Voices of 12 speakers were recorded. They were six Japanese people and six Americans and Britons. All speakers uttered short sentences in their respective native languages (i.e., Japanese for Japanese speakers and English for Americans and Britons) and in a non-native language (i.e., English for Japanese speakers and Japanese for Americans and Britons). Ten Japanese participants rated the vocal quality of speakers in the first session. After 1 week the same experiment was again conducted in the second session. Results showed that the performance of identification of speakers as Japanese or as non-Japanese was comparatively accurate even though the ratings on the speakers' voices were varied as the language spoken by the speakers. Ratings of the voices were compared further between two sessions and little difference was found, irrespective of a 1-week blank. Results suggest that the memory for vocal quality is robust, but that the recognition of vocal quality is dependent on the prosody of the language spoken by speakers.

4aSC40. Brain activity during auditory processing affected by expectation of speech versus nonspeech. Yukiko Nota (ATR CIS BAIC, 2-2-2 Hikoridai, Keihanna Sci. City, Kyoto 619-0288, Japan, ynota@atr.jp)

fMRI was used to clarify whether there is any differential brain activity invoked by expectation for speech versus nonspeech sounds. Auditory stimuli were created by acoustically morphing between either sustained vowels or tones, respectively, and a buzz sound. The two sets of interpolation were performed in nine nonlinear steps; the stimuli retained for perceptual experiments were only the three most vowel-like, the three most tone-like, and the three most buzz-like tokens morphed from the vowels. In the "speech expectation" session, subjects were instructed to discriminate the vowel-like and buzz-like stimuli; in the "nonspeech expectation" session, subjects were instructed to discriminate the tone-like and buzz-like stimuli without knowing that the buzz stimuli had been morphed from the vowels. Thus the buzz-like stimuli in both experiments were the same, but the subjects' expectations were different because they were told to expect either speech (vowel-like) or nonspeech (tone-like) stimuli. Comparison of brain activation during processing of the buzz-like stimuli under these two conditions revealed that BA40 and thalamus were more activated in speech expectation, while right BA20 was more activated in nonspeech expectation. These results suggest that subjects' speech/nonspeech expectation for sound stimuli influences brain activity for actual auditory processing. [Work supported by MEXT.]

4aSC41. Representations involved in short-term versus long-term word learning by preschool children with and without phonological disorders. Holly Storkel, Jill Hoover, and Junko Maekawa (Dept. of Speech-Lang.-Hearing, Univ. of Kansas, 1000 Sunnyside Ave., 3001 Dole Ctr., Lawrence, KS 66045-7555, hstorkel@ku.edu)

This study explores whether sublexical (i.e., individual sound) and/or lexical (i.e., whole-word) representations contribute to word learning and whether these contributions change across short-term versus long-term learning. Sublexical representations were indexed by phonotactic probability, the likelihood of occurrence of a sound sequence, whereas lexical representations were indexed by neighborhood density, the number of