Labeling of the voiceless affricate/fricative contrast and an analogous nonspeech continuum by hooded rats

Peter Howell and Philip ReedStuart Rosen

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predispositions or due to animals learning the covariance between $F1$ cutback and $F1$ onset frequency, the present experiment was conducted with synthetic continua having either a relatively low (375-Hz) or high (750-Hz) constant-frequency $F1$. Eight birds were trained to respond differentially to endpoint stimuli from three series of synthesized /Ca/'s varying in duration of $F1$ cutback. Second and third format transitions were appropriate for labial, alveolar, or velar stops. Despite the fact that there was no opportunity to use experienced covariation of $F1$ onset frequency and $F1$ cutback, quail exhibited reliably shorter "labeling" boundaries (more voiceless stops) for intermediate stimuli of the continua when $F1$ frequency was higher. Human performance with the same stimuli was like that for the birds. These results support the conclusion that the effect of $F1$ onset frequency may be adequately explained by general auditory processes. [Work supported by NIDCD/NIH Grant No. DC-00719.]

8:15

5aSP2. Perception of voicing in syllable-initial stops at different intensities: Does neural synchrony encode voice-onset? Keith R. Kluender, Andrew J. Lotto, and Rich L. Jenison (Dept. of Psychol., Univ. of Wisconsin, 1202 W. Johnson St., Madison, WI 53706)

In response to stop consonants differing in voice onset time (VOT), the dominant synchronization of mid-CF chinchilla auditory nerve fibers changes from the frequencyof $F2$ to the frequency of $F1$ at onset of voicing [D. G. Sinex and J. P. McDonald, J. Acoust. Soc. Am. **85**, 1995–2004 (1987)]. If this change in neutral synchronization is perceptually relevant for human listeners, changes in stimulus intensity and changes in the frequency difference between $F1$ and $F2$ should both affect perception of voicing. In a series of experiments, several continua of synthesized CV's varying in VOT were played to listeners at levels ranging from 40 to 80 dB SPL. The frequency difference between $F1$ and $F2$ was manipulated through the use of different places of articulation and different following vowels. Subjects labeled more CV's as voiceless as a function of increasing stimulus level and of deceasing $F1$–$F2$ frequency difference. There was also an interaction between stimulus intensity and $F1$–$F2$ frequency difference such that the effect of intensity was greater for smaller $F1$–$F2$ differences. These effects were reliable across a number of synthetic VOT series, and the effect of intensity extended to a computer edited series of hybrid CV's in which VOT was varied by cross-splicing a naturally produced /da/ and /ta/. The effect of overall stimulus intensity was not affected by amplitude of aspiration energy or by the presence or absence of release bursts. The results provide evidence for synchrony encoding of voicing for stop consonants. [Work supported by NIDCD/NIH Grant No. DC-00719.]

8:30

5aSP3. Labeling of the voiceless affricate/fricative contrast and an analogous nonspeech continuum by hooded rats. Peter Howell, Philip Reed (Dept. of Psychol., Univ. College London, London WC 1E, England), and Stuart Rosen (Univ. College London, London WC 1E, England)

The voiceless affricate/fricative contrast has played an important role in auditory theories of speech perception. This type of theory draws its support from, among others, experimental data on animals. However, nothing is known about differential responding of affricate/fricative continua by animals. Preliminary results were obtained regarding the ability of hooded rats to "label" affricate–fricative and an analogous nonspeech continua where the nonspeech continuum was created by randomly flipping the polarity of each sample in the digitized speech waveforms with a probability $\frac{1}{2}$. The rats were trained on the endpoints of a "cha"–"sha"continuum (using positive reinforcement in a two-level choice experiment) cued by covariations in rise time and frication duration (0–80 ms rise time). Differential labeling was similar to humans. The animals were switched to the nonspeech continuum without further training. Once again, performance was similar to humans. The implications for auditory theories are discussed. [Work supported by MRC and CRF.]

8:45

5aSP4. Acoustic comparisons of some Korean and English consonants. Anna Marie Schmidt (Dept. of Biocommun., Univ. of Alabama at Birmingham, UAB Station VH 503, Birmingham, AL 35294)

Presently available acoustic and perceptual data do not make it possible to evaluate the degree of phonetic similarity between vowels and consonants found in Korean and English. Recent models of second language acquisition [e.g., J. E. Flege, Q. J. Exptl. Psychol. **43A**, 701–731 (1991)] require the availability of such phonetic measures for the formulation of specific testable hypotheses. One purpose of the present study was to expand the limited data set of Korean acoustic measures. Another purpose was to formulate hypotheses about which sounds native Korean speakers will use when learning English. Acoustic measurements were performed on six Korean consonants (/t/) lax, tense, aspirated, /s/ lax, tense, and /l/) in five vowel contexts. Measurements included vowel dimensions such as duration and format structure as well as consonant dimensions such as VOT and amplitude rise time. Similar measures were performed on comparable English consonants and vowels. Observations will be made of the relative degree of phonetic similarity of the Korean stop series to the English /t/ and /d/ and of the Korean fricative series to the English interdental, alveolar, and palatal fricatives. [Work supported by NIH.]

9:00

5aSP5. Perception of Canadian French unvoiced stops. Benoît Jacques (Dept. de linguistique, Univ. du Québec à Montréal, Case postale 8888, succ. A, Montréal H3C 3P8, Canada) and Guillermo Toledo (UQAM and LIS, Conicet, Buenos Aires, Argentina)

The aim of this paper was to determine the trade-off relationship among acoustic cues, i.e., the transitions of the preceding vowel, the burst, the transitions of the following vowel, or the relevance of an acoustic cue on the perception of Canadian French unvoiced stops. To that end utterances of two segments containing VCV sequences of two different unvoiced stops and the same type of vowel were produced by a native speaker of Canadian French. Stimuli integrated by two acoustic cues of a place of articulation and a conflicting cue of another place of articulation were made up through the splicing and editing of these VCV sequences. In addition, stimuli obtained by the splicing of the second syllable in each segment were carried out in order to test the role of the transitions of the preceding vowel. Listening tests through a panel comprising of 14 French Canadian subjects were performed. Results showed that the trade-off relation of acoustic cues was the main information for the recognition of Canadian French unvoiced stops, although in a few vowel contexts, listeners might be able to identify through one acoustic cue. [Work supported by an ICCS grant to the second author.]

9:15

5aSP6. The development role of interspeaker variability in the perception of the /m/–/n/ distinction in CV syllables. Ralph N. Ohde and Katarina Haley (Div. of Hear. and Speech Sci., Box 552, Sta. 17, Vanderbilt Univ. School of Medicine, Nashville, TN 37232)

In order to determine the efficacy of a pre-identification task designed to assess the range of perceptual cues in normal speakers, adults rated CV syllables produced by children and adults consisting of either /m/ or /n/ in the context of four vowels /i æ u ɑ/. Based on the