The reliability of closure features as cues to medial stop voicing in English

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8:57

J5. The reliability of closure features as cues to medial stop voicing in English. L. Lisker (Haskins Laboratories, 270 Crown St., New Haven, CT 06510, and University of Pennsylvania, Philadelphia, PA 19104)

The evidence that closure duration is a cue to the voicing of medial stops in English trochees is as convincing as any we have for other acoustic features considered to be factors governing the linguistic interpretation of speech signals. Measurements of natural speech show /b/ closures to be regularly shorter than /p/ closures in words such as *rabid rapid*, and there are experimental data to indicate that this difference has perceptual/phonetic significance. Another closure feature, glottal pulsing, also plays a role in the /b/–/p/ distinction in medial position. New data gathered to test the reliability of these two features as cues to the intelligibility of naturally produced tokens of *rabid rapid* indicate (1) stop closure duration does not suffice to separate /b/ from /p/ across speakers, (2) the phonetic effect of manipulating silent "closure" differs greatly for different tokens of the source word produced by a single speaker, and (3) the effect of replacing buzz with silence in natural tokens of *rabid* is similarly unpredictable. Thus it appears that neither the duration nor the acoustic nature of the closure is sufficient to predict listeners' phonetic interpretations of the acoustic segment corresponding to the interval of articulatory occlusion. [Supported by NICHHD to Haskins Laboratories.]

9:00

J6. Speech perception by the chinchilla: Learning functions for pairs of synthetic stimuli from various points along a VOT continuum. J. D. Miller, B. C. Henderson, H. T. Sullivan, and G. K. Rigden (Central Institute for the Deaf, St. Louis, MO 63110)

Previous work indicates that the chinchilla hears an abrupt qualitative change in a particular region along a synthetic VOT continuum in a manner similar to human listeners. To further test this notion naive animals were trained on pairs of stimuli separated by 30 ms from three points along a |ga–ka| VOT continuum. Those animals trained on an intercategorical pair learned rapidly and reached levels of 86%–94% correct. Animals trained on intracategorical pairs learned slowly and reached levels of 52%–79% correct. Next the animals were tested for generalization with stimuli presented with VOTS at the 10-ms intervals from 0–80 ms. Overall, the results indicate there is a strong tendency for the chinchillas to exhibit a "natural boundary" in the short-voicing lag region of the synthetic VOT continuum. The endpoint stimuli, however, seem to be separable from the rest and with prolonged training chinchillas seem to be able to learn to identify in a better than chance, but less than perfect manner, any single stimulus in a set. [Work supported by NS 03856.]

9:03

J7. Effects of utterance continuity on phonetic judgements. D. R. Dechovitz and B. Rakerd (Department of Psychology, University of Connecticut, Storrs, CT 06268)

The fricative–affricate distinction is signalled by a set of diverse acoustic features. To account for the integration of these features in perception, it is presumed that we perceive the articulatory act from which their coherence is derived. In the present research, our aim is to learn more about conditions which determine whether a particular set of acoustic cues is perceived as the consequence of a fricative or affricate production. To this end, we have examined the significance of short durations of silence for distinguishing word-initial fricative from affricate following precursors which provide various degrees of utterance continuity. Results suggest that continuity of utterance affects the meaning of silence for the fricative–affricate contrast.

9:06

J8. Formant discriminating mechanism suggested by factor analysis of vowel spectra. Wm. J. Baker and A. J. Rozsypal (Department of Linguistics, The University of Alberta, Edmonton, Alberta, Canada T6G 2H1)

An objective basis for perceptual distinctions among vowels was developed by a principal factors factor analysis of the spectra of English vowels in the neutral h(V)d consonantal context, produced by eight speakers. This analysis resulted in a five-factor solution. Two factors were related to speaker distinctions. All the three vowel discriminating factor profiles show single pronounced peaks, mutually shifted in frequency. Frequency ranges of the first three vowel formants cover the lower frequency slopes of the three corresponding factor peaks. This configuration resembles, for each formant, a single tuned circuit frequency discriminator as used in demodulation of frequency-modulated signals.

9:09

J9. The influence of consonant environment upon identification of transitionless vowels. John J. Ohala, Carol J. Riordan, and Haruko Kawasaki (Phonology Laboratory, Department of Linguistics, University of California, Berkeley, CA 94720)

Recent evidence suggests that consonant environment influences listeners' identification of vowel quality in CVC syllables. The rapid formant transitions are generally held responsible for this effect. In an attempt to find out if the effect may depend on other factors besides the transitions, we had 19 subjects listen to a randomized series of C_1VC_2 stimuli constructed as follows: C_1 was [s] or [f], C_2 was [p] or [t], and V was a monophthongal [i], [u], or one of 13 vowels linearly spaced between those two vowels. The vowels were either 75 or 150 ms in duration and were completely steady-state in both F_0 and formant frequencies. Ss were required to report whether a given stimulus contained an /i/ or an /u/. Identification of these transitionless vowels was significantly affected by the consonantal environment. The results are compatible with two hypothesized perceptual effects: (1) Listeners "know" that dental environments perturb [u] towards [i] and thus will accept a more front vowel as [u] in that environment than in a labial environment, other things being equal, and (2) listeners "know" that the vowel in a dental environment which should have minimal transitions is /i/. The implications of these findings for theories of speech perception and sound change will be discussed. [Supported by NSF and NIH.]

9:12

J10. Why are nonperipheral vowels avoided? Jean-Marie Hombert (Linguistics Program, University of California, Santa Barbara, CA 93106)

At the last meeting it was shown that the perception of nonperipheral vowels was poor compared to the perception of peripheral vowels [J. M. Hombert, J. Acoust. Soc. Am. **63**, 1 (1978)]. The present study is aimed at investigating the extent to which vowels with the same height value but with very different front/back values can be confused. Speakers of three Cameroonian languages (Kom, Limbum, Moghamo) were asked to classify 53 synthetic vowel stimuli (*F1* was varied between 250 and 750 Hz and *F2* between 650 and 2350 Hz) according to their own vowel system. The results show that stimuli with drastically different *F2* values can be perceived as the same vowel. These data are consistent with our previous findings: The perceptual salience of stimuli with *F2* between 1000 and 1500 Hz is less than for stimuli with *F2* below or above these values. These data explain at least partially why peripheral vowels are preferred (more frequent) in the languages of the world. [Work supported by NSF.]