Session J. Speech Communication II and Bioresponse to Vibration I: Special Focus on Speech Perception Using Tactile Aids

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Chairman's Introduction—1:00

Invited Papers

1:05

J1. Evaluations of single-channel and multichannel tactile aids for the hearing impaired. Janet M. Weisenberger (Central Institute for the Deaf, 818 S. Euclid, Saint Louis, MO 63110)

A number of single-channel and multichannel tactile devices for hearing-impaired persons have been evaluated in our laboratory over the last several years. Both commercially available and experimental devices have been tested, including the Tactaid I, II, and V, Minifonator, Minivib, Queen's University tactile vocoder (both laboratory and wearable versions), and Tacticon TC-1600. Normal-hearing and hearing-impaired adults, and hearing-impaired children, have participated in a variety of training tasks, employing both record-ed and live-voice stimuli. These tasks include simple detection of sound, environmental sound identification, syllable rhythm and stress categorization, phoneme identification, word identification, phrase and sentence identification, connected discourse tracking, and a question-and-answer "conversation" task. In the present paper, the results from these evaluations are considered as a whole, to permit generalizations about the kinds of information that can be provided by single-channel, dual-channel, and multichannel devices, with and without the addition of lipreading. In addition, results are discussed in terms of the development of "optimal" training procedures for the use of tactile aids. [Work supported by NSF and NIH.]

1:35

J2. Speech perception through the sense of touch by profoundly deaf adults and children. Michael P. Lynch, Rebecca E. Eilers, and D. K. Oller (Departments of Psychology and Pediatrics, University of Miami, Mailman Center for Child Development, P. O. Box 016820, Miami, FL 33101)

Eight congenitally, profoundly deaf children and two deaf adults received unimodal vocabulary recogni-tion training with either a multichannel electrotactile aid or a two-channel vibrotactile aid. The children learned to recognize vocabularies of 15–20 words with 70%–80% accuracy. The adults learned a 50-word list. Following this training, subjects' identification of familiar and novel words was assessed using the tactile devices and aided audition. Vocabulary recognition was tested in each of three conditions: (1) with aided audition, (2) with dual or multichannel aid, and (3) with both tactual and auditory aids. Results indicate that auditory and tactual cues were successfully integrated by both children and adults to yield significantly better performance in combined than in single modality conditions. An additional study of the narrative tracking performance of one of the deaf adults revealed a similar synergistic interplay of taction, audition, and lipread-ing. [Work supported by Rita and Jerome Cohen, Renata Mahan, and Austin and Marta Weeks.]

2:05

J3. Lipreading with single-channel vibrotactile presentation of voice fundamental frequency. Lynne E. Bernstein, Silvio P. Eberhardt (Speech Processing Laboratory, Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD 21218), and Marilyn E. Demorest (Department of Psychology, University of Maryland Baltimore County, Catonsville, MD 21228)

A study evaluated several transformations of voice fundamental frequency ($F0$) for use by a single-channel vibrotactile device to supplement lipreading. The experimental procedure involved lipreading stimuli from a corpus of over 1500 sentences stored on a video laserdisk [L. E. Bernstein and S. P. Eberhardt, 1986, Johns Hopkins Lipreading Corpus]. There were five experimental conditions. Three transformations of voice $F0$ were tested: two transformed $F0$ to a pulse rate code, the third employed two sine waves that were amplitude modulated as a function of $F0$. Condition 4 provided both $F0$ and a second stimulator indicating high-frequen-cy speech energy. Condition 5 was visual alone. Subjects were 15 normal-hearing adults in a multiple single-subject design with alternating baseline and test sessions. Analyses of covariance for words correct, words per stimulus sentence, and syllables per sentence showed that all subjects improved in lipreading. Subjects who received a single vibrator for voice $F0$ lipread more successfully than subjects who did not receive the vibrotac-tile supplement or who received the dual tactile stimulation.