

Some Electromyographic Observations of the Speech of Persons with Impaired Hearing

We have been performing a pilot study of articulatory activity in deaf and hard of hearing speakers, as contrasted to normal. Deaf speech is known to have distorted characteristics, but the articulatory origin of these distortions is very poorly understood. A study by Calvert¹ has shown fairly conclusively that the timing of the movement of the articulators is disturbed in a complex fashion in deaf talkers. This disturbance is in part responsible for the perceptual confusability of voiced and voiceless cognates; however, poor control of phonation is also involved. All these results leave open the question of whether the pattern of articulation, as contrasted to its timing, is also abnormal in deaf talkers. An examination of spectrograms suggests that differential tongue movement, for example, may be reduced in this group.

In our study we observed the output of seven electrode positions for repeated articulations of a group of syllables. The syllables were all of the form (in broad IPA transcription) [hə'CNk], where the first variable, C, was any of the 11 consonants [p,b,w,m,f,t,s,r,l,k] and the second variable, N, was one of the three vowels [i,α,ai]. All combinations produced 33 syllable types. These types were made into 10 different lists, in which each type occurred once. The subjects for the experiment were all adult females whose speech backgrounds were some standard dialect of American English. Two had normal hearing, two were hard of hearing and two were deaf. The deaf and hard of

hearing subjects had received extensive conventional therapy in well known schools for the deaf from a very early age. All subjects knew the purpose of the experiment and were eager to cooperate. Seven electrodes were placed on each subject in locations specified by preliminary research - three on the face, one under the angle of the ramus and three on the dorsum and tip of the tongue. The subjects were then presented at a regular rate, with flash cards indicating the disyllable they were to produce. Recordings were made on magnetic tape, to be processed by the computer averaging previously described.² Simultaneous throat and air microphone recordings were made. As yet, computer printouts of the averaged data have not been obtained, so specific findings cannot be given. We have an overall impression from visual inspection of the records that the deaf and hard-of-hearing talkers show less patterned EMG activity in anticipation of voicing, at least on the tongue, than the normals. In addition, the abnormal durational relationships observed by Calvert are very obvious in the deaf speech, as well as evidences of poor control of voicing.

We have made copies of the air microphone recordings of all talkers, to be transcribed and evaluated for evidence of distortion by an outside group of trained phoneticians. We also plan to present utterances of all speakers for blind judgment by trained teachers of the deaf as "deaf" or "normal" speech.

Dorothy A. Huntington and Katherine S. Harris