A. STUDIES OF THE INTENSITY DIFFERENCE-LIMEN OF VIBRATORY STIMULI

The present investigation of intensity DL for vibratory stimuli applied to the fingertips represents one of a set of basic studies needed for optimum coding of tactile stimuli.

The discriminability of stimuli localization to one or more fingers, including adaption and masking effects, also enters the list of tactile sensory dimensions which will be taken into account in our specific project of tactile coding of speech for deaf people.(1)

Bone conduction receivers fed from a signal source of 100-350 c/s frequency were used as stimulators on the left hand forefinger. The signal source was derived from a tape-recording of tone pulses the time envelope of which is shown in Fig. IV-1. The first or second half of each tone pulse was randomly varied in signal amplitude by 0, 2, 4, or 6 dB relative to the other half of the pulse. These double pulses of total duration 1.5 sec were presented at a rate of 7.5 sec. In some tests the playback speed of the tape-recorder was doubled and in others halved for studying the effects of a shortening and a lengthening of the test stimuli. The subjects, 5 males and 2 females, were asked to judge pulses as homogeneous or varying in amplitude. The subjects' hearing was effectively reduced by ear defenders. A typical response distribution is shown in Fig. IV-2 and a summary of corresponding DL-values is provided in Fig. IV-3.

The results from ca. 150 curves indicate that for this special test procedure the intensity DL for 50% probability of correct response is of the order of 2-3.5 dB and that the DL for a response at the 75% level is of the order of 3-4.5 dB. Changes in stimuli frequency in the range of 100-350 c/s or in sensation level (ca. 15, 22, and 30 dB above threshold) or in stimuli duration (double pulse lengths of 0.75, 1.5, and 3.0 sec) did not affect the DL-values to a significant degree. Some subjects showed a tendency of increasing DL-values for the shortest stimulus duration.

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Stimulus sequence
(tape speed 7.57 sec)

Fig. IV-1 Amplitude-time envelope of two successive vibration stimuli.

Subject B.R.
100 c/s 23 dB rel. mean threshold

Fig. IV-2 Number of correct responses from one of the subjects as a function of the intensity step in dB within a double pulse of frequency 100 c/s. Circles and crosses pertain to test series in which the first or the second part of the pulse respectively was adopted as a fixed intensity reference of 23 dB sensation level.
Fig. IV-3 Distribution of the specific intensity difference limen for double pulse vibration stimuli of total duration 1.5 sec and 0.75 sec. at the 50% and the 75% level of correct identification. Seven subjects.

These subjects did not take part in the whole test.