Vibrotactile spatial summation: effects of vibration amplitude and static force

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11:15

AA10. Modifications to the BUDTIF procedure. R.A. Campbell (Department of Speech Communication, State University of New York at Buffalo, Buffalo, New York 14226)

During the decade that has passed since describing the *B*lock-*U*p-and-*D*own, *T*wo-*I*nterval, *F*orced-choice (BUDTIF) psychophysical procedure in this *Journal*, several modifications have resulted from actual and computer-simulated experience with the procedure and from discussions of the PEST and UDTR procedures by Taylor, Creelman, Hall, Levitt, and others. Modifications include using a level change decision rule similar to, but more efficient for small N's than, the Wald sequential rule, stopping rules based on the number of decisions and weighted number of trials at a given level, and basing threshold estimates on the mean of revisited levels weighted by the number of trials in the run and restricted to only five levels near the most frequently revisited one. These changes have reduced the effect of starting level on the variance of repeated estimates and the bias in the area of greatest interest for psychoacoustics, that is, stopping rules that yield threshold estimates in less than 100 trials, with the target performance lying at or near the midpoint of the psychometric function. Based on computer simulations, the tendency for the threshold estimate to be biased toward the starting level and for the variance to be related to the absolute difference between the starting and "true" threshold level has been markedly reduced. For example, when starting over a range of 16 logit units, an average of 68 trials per threshold, the starting level effect was less than 0.2 logit unit with the standard deviation being 0.67 unit: This seems to compare favorably with a standard deviation of 0.76 at 68 trials obtained with simulated PEST runs reported by Hall with the starting level always +4 units. The modifications and simulated results will be reported in greater detail.

11:30

AA11. Earphone calibration based on the threshold of the stapedius reflex. A.Yonovitz, I. Campbell, and C. Robinson (The University of Texas, Health Science Center at Houston, Speech and Hearing Institute, 1343 Moursund, Houston, Texas 77025)

The MX 41/AR cushion mounted on the TDH-39 earphone has been the standard receiver arrangement for both laboratory and clinical work in audition. In certain applications, however, the substitution of circumaural earphones or earphone cushions may provide better attenuation of ambient environment noise or greater comfort to the wearer. Various psychoacoustic techniques requiring voluntary judgments by a subject have been devised for the calibration of nonstandard earphones. In this study ten subjects tracked auditory thresholds using five different earphone arrangements at eight frequencies (500—4000 Hz). These earphones included a TDH-39 earphone mounted with an MX 41/AR cushion, "doughnut" cushion (NAF)48490-1), Zwislocki (CZW-6) cushion, Tracor "Otocup," and a Sansui circumaural earphone. Following this procedure, the threshold of the stapedium reflex was also obtained on the same subject under each earphone. The data were analyzed using multivariate statistical techniques and indicate the stapedius reflex threshold is highly useful in calibrating nonstandard earphones.

11:45

AA12. Vibrotactile spatial summation: effects of vibration amplitude and static force. Barry G. Green and James C. Craig (Department of Psychology, Indiana University, Bloomington, Indiana 47401)

Vibrotactile spatial summation was investigated at suprathreshold amplitudes using a matching task. Previous work [R.T. Verrillo, J. Acoust. Soc. Am. 35, 1962—1966 (1963)] at threshold amplitudes has shown that spatial summation occurred only at frequencies greater than 60 Hz. Three frequencies, 25, 40, and 160 Hz, were tested at several intensity levels above threshold. The change in perceived magnitude between two contactor sizes (static pressure on the contactors held constant) was measured to determine if summation would occur at vibration frequencies below 60 Hz. The results showed that spatial summation occurred at 25 and 40 Hz in amounts which varied directly with vibration amplitude. At 160 Hz, spatial summation was present but independent of amplitude. The data are consistent with the hypothesis that spatial summation is mediated by deep-lying receptors which are more sensitive to high frequencies but which can be stimulated by strong, low-frequency signals. A second experiment investigated an earlier finding by Craig and Sherrick [Percept. Psychophys. 6, 97—101 (1969)] that static force rather than static pressure, penetration, or contactor area was the mechanical coupling factor most responsible for spatial summation effects. Changes in sensory magnitude comparable to those found in the first experiment were found in the second experiment when static force rather than contactor area was varied. The results suggest that changes in static force which accompanied changes in contactor area in the first experiment may have been responsible for the summation effect. [This research was supported by an NIH grant.]

FRIDAY, 8 NOVEMBER 1974 REGENCY ROOM, 2:00 P.M.

Session BB. Physical Acoustics II

Uno Ingard, Chairman

Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

Contributed Papers

2:00

BB1. Acoustical characteristics of a side branch resonator in a duct with flow. Vijay K. Singhal (Department of Aeronautics and Astronautics and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139) and Uno Ingard (Departments of Physics and of Aeronautics and Astronautics and Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139)

The acoustical characteristics of a single side branch resonator in a duct with flow have been studied. These studies