IRis

Northeastern University

Psychology Faculty Publications

Department of Psychology

October 01, 1964

Note on the variability hypothesis in category scaling

B. A. Schneider
University of Michigan - Ann Arbor

H. L. Lane
University of Michigan - Ann Arbor

Recommended Citation

Schneider, B. A. and Lane, H. L., "Note on the variability hypothesis in category scaling" (1964). *Psychology Faculty Publications.* Paper 12. http://hdl.handle.net/2047/d20000859

This work is available open access, hosted by Northeastern University.

The findings of Geisler, van Bergeijk, and Frishkopf indicate separate origin for the simple and complex units in the bullfrog.[3]

Acknowledgment: This work was supported in part by the U. S. Army, U. S. Navy, and U. S. Air Force under contract DA36-039-AMC-03200(E); and in part by the National Institutes of Health, U. S. Department of Health, Education, and Welfare (grant MH-04737-04); the National Science Foundation (grant GP-2495); and the National Aeronautics and Space Administration (grant NsG-496).

[1] L. S. Frishkopf and M. H. Goldstein, Jr., "Responses to Acoustic Stimuli from Single Units in the Eighth Nerve of the Bullfrog," J. Acoust. Soc. Am. 35, 1219–1228 (1963).
[2] The best frequency of a unit is defined to be that frequency for which the unit's threshold to a 0.5-sec tone burst is a minimum.
[3] C. G. Geisler, W. A. van Bergeijk, and L. S. Frishkopf, "The Inner Ear of the Bullfrog," J. Morphol. 114, 43–59 (1964).

Note on the Variability Hypothesis in Category Scaling

B. A. Schneider and H. L. Lane

Behavior Analysis Laboratory, The University of Michigan, Ann Arbor, Michigan

(Received 3 July 1964)

The "variability hypothesis" attributes the nonlinear relation between category and magnitude scales to the growth of variability along the psychological continuum. The findings of some earlier research seemed to contradict the hypothesis. Now, an alternative interpretation of these findings is presented.

In a recent report of research on "Ratio Scales, Category Scales, and Variability in the Production of Loudness and Softness,"[1] we showed that the curvatures of the category scales for loudness and softness differ when these scales are plotted against their corresponding magnitude scales, although the variability observed in the magnitude productions of loudness and softness did not differ. These findings were viewed as conflicting with the "variability hypothesis," which attributes the nonlinear relation between category and magnitude scales to the growth of variability as we progress upward along the psychological continuum.

S. S. Stevens has called our attention to an alternative interpretation of these findings that does not contradict the variability hypothesis. The findings that the variability of loudness and softness productions does not differ is in accord with the following assumption: an observer's estimate of the loudness or of the softness of a sound is controlled, in either case, by the sound's loudness; he merely makes a reciprocal transformation on the numbers assigned to the apparent magnitude before reporting "softness." The difference in concavity between the category scales for loudness and softness (relative to their respective magnitude scales) then becomes the result of an arbitrary transformation on the psychological scale of loudness. From this point of view, softness is just one of several possible transformations that an observer could be asked to make on the scale of loudness. An analogous interpretation applies to the relations between scales[2] for shortness and longness, smallness and largeness, dimness and brightness. In general, the differing concavities of the psychological scales associated with inverse pairs of attributes would be excluded from the domain of the variability hypothesis.

[1] B. Schneider and H. Lane, "Ratio Scales, Category Scales, and Variability in the Production of Loudness and Softness," J. Acoust. Soc. Am. 35, 1953–1961 (1963).
[2] S. S. Stevens and M. Guirao, "Subjective Scaling of Length and Area and the Matching of Length to Loudness and Brightness," J. Exptl. Psychol. 66, 177 (1963).

Time Requirements for the Tonal Function

Paul C. Boomsliter

Department of Speech, State University of New York at Albany, New York

Warren Creel

Experimental Surgery Laboratory, Albany Medical College, Albany, New York

Samuel R. Powers, Jr.

Department of Surgery, Albany Medical College, Albany, New York

(Received 1 December 1963)

Use of short pure-tone bursts to test perception of tone rather than click in cases of disturbed blood supply to the brain stem in humans has shown that the threshold of tonal processing provides an approach to measurement of neural processes in pitch perception.

Schouten, Ritsma, and Cardozo have recently presented findings that "strongly point towards a pitch-extracting mechanism different from and subsequent to the basilar membrane and operating in the time domain."[1] Our own experiments with musical tunings in melody,[2] autocorrelative hypotheses of pitch perception, such as Licklider's,[3] and all residue concepts assume a neural process operating in time to produce the sensation of pitch.

Opportunity to test these concepts was offered by a group of surgical patients with vertebral-artery insufficiency.[4] In these patients, stenotic lesions appear to reduce the blood supply to the brain stem, including the nerve centers for hearing, and to the cochlea.

Presenting symptoms in this syndrome include true rotary vertigo, and frequently tinnitus. Many patients complain of difficulty in hearing, especially under noisy conditions. Of these, some show hearing loss by conventional audiogram; some do not. In most instances, audiologic study has not adequately confirmed the subjective hearing complaint, nor the reported improvement following corrective surgery.

The tone–click phenomenon in short tones, which has been investigated for normals by several experimenters, and in some detail by Doughty and Garner,[5] was chosen as a possible technique for testing the time factor in these cases of perceptive confusion. Normal listeners will hear a 10-msec spurt of a 1000-cps frequency as a short tone, but if the duration is reduced they reach a point where the stimulus is heard as a click, without tonal quality. In the present study, we have found some abnormal subjects requiring 200 or 300 msec to achieve a sensation of tone, reporting shorter durations as click, and two subjects who required a full second. One of the latter commented on a duration of 800 msec, "It's not a tone, but too long for a click; it sounds like static."

So far in the pilot study, the Boomsliter–Creel test has been used on 41 candidates for surgery; on 25 we have pre- and post-operative scores. In all, to date, 205 tests have been made on 114 subjects.

Our present apparatus uses a standard Maico audiometer as

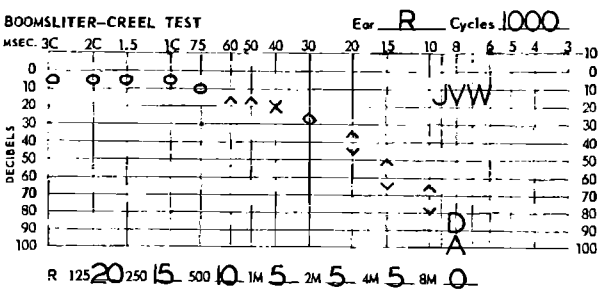

Fig. 1. JVW, normal. *Ordinate:* Decibel values represent audiometer readings. *Abscissa:* Duration in msec. Circles represent tonal sensation to extinction. Arrows pointing up indicate threshold of tonal sensation in descending sequence, with click at lesser intensities; arrows pointing down similarly indicate threshold of tonal sensation in ascending sequence. D and A indicate no achievement of tonal sensation at that duration of stimulus—only clicks were heard. The subject's standard audiometric score appears at the bottom of the Figure.

ed 22 Feb 2011 to 129.10.104.144. Redistribution subject to ASA license or copyright; see http://asadl.org/journals/doc/ASALIB-home/info