The perception of auditory patterns as a function of incidental visual stimulation¹

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Abstract

Twenty-four subjects received four series of constant-intensity tones presented at equal intervals. Brief increases in ambient illumination, varying in intensity, were synchronized with the presentation of the tones. Although only a few subjects reported being aware of the illumination shifts, seven-eighths of the subjects tested described auditory rhythms directly related to the patterning of illumination changes.

Problem

The most impressive characteristic of experience is that it is organized. Numerous theories of perception have been elaborated to account for this fact. However, while the function of autochthonous brain factors has been postulated, the major number of demonstrations and experiments illustrate the dependence of perceptual organization upon the organization of the focal stimulus that gives rise to it.

But as Hebb (1955) has insisted, the higher-order nervous system seeks out stimulation for both development and function and it organizes it as competently as it can. The studies of sensory isolation from Hebb's (cf. e. g. Bexton et al., 1954) and other laboratories support this view. The present experiment took its start from a statement by Allport (1955, p. 62): "If we have a series of regular taps, all equal in intensity, a rhythm possessing strong and weak beats subjectively imposes itself on them." Its purpose was to examine the possibility that the organization imposed upon a series of focal stimuli may reflect the structure of background stimulation. Its strategy involved presenting the subject with series of constant-interval, constant-intensity tones accompanied by synchronized but varying shifts in the level of ambient illumination in the test room. Ss were asked to report what they heard. On the assumption of sensory interaction, it was expected that S would tap out rhythmic sets with the emphasized tone coinciding with the greater increases in illumination intensity.

Method

Ss were 24 undergraduates naive as to the purpose of the experiment. Tones were generated by a Hewlett Packard Audio-oscillator, Model 200AB, and delivered through Willson Sound Barrier high-fidelity earphones. Hunter interval timers, Model 111 C, were used to program the stimulus series. Shifts in ambient illumination were produced by the flashing of either a 2.5- or 15-w incandescent lamp behind S to produce a localized but diffuse change. Flashes were also programmed by means of Hunter timers.

Each subject received four 2-min. series of short

tones. Each tone, soft but clearly audible, was presented for 0.2 sec. and followed the preceding tone by 0.4 sec. Intensity was a constant 40 db SPL at the ear. The ambient illumination of the test room was low (0.4-ft candles on the wall faced by the subject). The shifts in level were localized about the subject and were synchronized to the presentation of the tones. During each series, the 15-w flash occurred on every second, third, fourth, or fifth presentation. All others were 2.5-w flashes. The orders of presentation of the second, third, and fourth-flash series were counter-balanced over the 24 Ss. The fifth-flash series was always presented last, because it was assumed that it could be the most difficult for the subject to integrate.

Ss were tested individually. Each was seated in a comfortable chair and told that he would hear a series of short tones through the headphones. He was asked to signal when he heard the tones and then to communicate what he heard by tapping with his finger on the arm of the chair, indicating any differences in loudness by the force of his tap. Nothing was said about rhythms or about shifts in illumination level. After all four series had been presented, S was questioned about what he had heard: Were there recognizable rhythms? If so, what were they? Were there any differences in loudness and/or pitch? If so, what were they? Were there any changes in the illumination of the room? If so, what were they?

Results and Discussion

As expected, 21 of the 24 Ss reported rhythmic sets of two, three, or four tones with the onset of the pattern coinciding with the 15-w flash (χ^2 for each series with $df = 1$ was 13.50). Only two of these, however, admitted any awareness of the changing illumination level. Eighteen indicated that the first tone of each set was louder than the remaining tones, estimates varying from 50% to 250% louder. Three also reported a change in pitch, the first or emphasized tone of each set appearing higher.

The fifth-flash series appears to have been a more ambiguous condition. Only 14 of the 24 described a five-tone pattern. Of the remaining ten, however, six reported some sort of organization. (χ^2 for 20 confirmations and $df = 1$ was 10.67). Four identified a four-tone pattern with the emphasis shifting successively from the first to the second, to the third, to the fourth member of the set. Two reported a three-tone pattern followed by a two-tone pattern. Three of the four who perceived no pattern with the fifth-flash series also failed to note any organization in any of the other series used.

It is clear from these data that the structure of contextual stimulation may influence the perception of focal stimuli. The enhancement of loudness with the simultaneous presentation of the 15-w flash is consistent with an earlier study by Child & Wendt (1938) and a recent report of heteromodal anchor effects by Behar & Bevan (1960).

References

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Note

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Comment

Bitterman's reaction (*Psychon. Sci.*, 1964, 1, 94) to my comment (*Psychon. Sci.*, 1964, 1, 40) on the Longo, Klempay and Bitterman article (*Psychon. Sci.*, 1964, 1, 19-20) indicates that I failed to make clear both my reason for writing the comment and the essential message in the comment, itself. Hence this brief addendum.

In spite of what Bitterman seems to perceive as my primary concern, I was *not* worried about "the discrepancy between the pigeon results and the eyelid results" pertaining to the CS-UCS interval and said absolutely *nothing* that reasonably leads to such a conclusion. Facts are facts and, for sometime, it has been perfectly clear to me that no single function of this type applies generally to all species or to all response systems.

What I was concerned about is the idea that the pro-

cedural distinction between classical and instrumental conditioning is enough to identify a distinction at the level of process. The definition of classical conditioning solely in terms of non-contingent pairings of CS and UCS is like the definition of "fish" solely in terms of aquatic habitat. All I was trying to do in my comment was to prevent the premature exclusion of other distinguishing criteria that may make a whale of a difference.

Presently I believe there is evidence to justify the conclusion that classical conditioning applies only to elicited, involuntary behavior. As Bitterman points out, the independent definition of what is voluntary and what is involuntary is extremely difficult. But difficult is not impossible, and the fact that ordinary people sometimes talk this way does not seem to be a crushing argument against the use of this terminology.

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