Effect of extended observation on reversible perspective duration

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The duration of each occasion of the two perspectives of a rotating reversible figure was recorded over the course of 20 reversals. During the latter half of the testing session the duration of the initial percept (P1) showed wide fluctuations, while that of the alternative phase (P2) remained relatively constant. It is suggested that the decline in reversal rate reported by some previous workers may be due to similar fluctuations in perspective duration.

The rate of apparent change of reversible figures usually follows an increasing, negatively accelerated curve which reaches an asymptote after about 2 min of continuous observation. However, some workers have found that when observation is continued for a longer period, the curve begins to decline, e.g., Bruner, Postman, & Mosteller (1950). By recording the perspective duration of the two phases over successive occasions, Price (1967a, b) found that the reversal curve for two- and three-dimensional figures, respectively, consisted of two distinct components. The duration of the initial percept (P1) declined at a negatively accelerated rate, while that of the alternative phase (P2) remained constant over occasions. The characteristic shape of the reversal rate curve can therefore be attributed to the decreasing duration of the P1 phase. The P2 duration simply adds a constant to the rate. These findings indicate that the perspective duration measure would be the most appropriate for an investigation of the asymptotic level of reversal rate.

The precise determination of an asymptote is always difficult with empirical data. However, in previous experiments, the duration of the P1 phase has become fairly stable by the time 10 reversals were recorded. The mean P1 duration at that stage was about 5 sec, with the P2 phase constant at about 3 sec duration. Although similar results have been obtained in studies involving 10, 15, and 20 reversals, in each case only the last 10 were recorded under conditions of continuous observation. The remaining reversals were observed under spaced viewing conditions. An extension of the period of continuous observation should provide a more reliable indication of the asymptotic level of P1 duration.

APPARATUS

The Howard cube apparatus used in this experiment is described in detail by Price

(1967b). Briefly, it consisted of a 4-in. skeletal cube mounted on a vertical diagonal axis by one corner, and viewed through a viewing tunnel from a distance of 40 in. The cube was rotated at 60 rpm in a clockwise direction. The level of illumination, measured from the point of observation with a Macbeth illuminometer, was 115 ft-L.

Responses were recorded on a moving paper tape. Pressure on a Morse key operated an electromagnet which offset a recording pen until the key was released. A Palmer 50-cycle, 240-V recorder was set at a constant paper speed of ½ in./sec for recording purposes. The lighting and recorder were operated from the same switch.

SUBJECTS AND PROCEDURE

Ten volunteers from the introductory psychology course at the University of Western Australia served as Ss. All were naive as to the purpose of the experiment. The experiment was conducted in a soundproof room.

The following instructions were read to S: "I am going to show you a wire cube, similar to this [S was shown a demonstration cube] in this box. It will be rotating in a clockwise direction (demonstrate). Just to the right of the cube is a white bead which you are to fixate with both eyes. After a time the cube will appear to change its direction of rotation, so that it will appear to either oscillate, backwards and forwards, or reverse completely (demonstrate). When this hap-

pens you are to press this key (demonstrate) and only release it when the cube resumes its normal direction of rotation. Remember to hold the key down as long as the cube appears to be either oscillating or rotating in an anticlockwise direction, and release it when the direction appears to be clockwise. Remember to keep your eyes fixed on the bead at all times."

Each S was tested individually for the time taken to observe 20 apparent reversals, i.e., 20 occasions of P2.

RESULTS AND DISCUSSION

The mean duration of each of the two phases over 20 occasions is plotted in Fig. 1. It may be seen that the duration of the P1 phase showed wide fluctuations during the second half of the observation period.

A replication of this experiment produced essentially the same results as those shown in Fig. 1. After both experiments some Ss reported difficulty in maintaining fixation over the prolonged viewing period, which suggested that the fluctuations may have been due to nonfixation. A subsequent experiment with different Ss showed that the occurrence of reversals was significantly reduced by removing the fixation point. Howard (1961) obtained similar results with a rotating fixation point.

The possibility that the above results were due to Ss failing to report reversals seems remote, since the widest fluctuations were influenced by only a few Ss. The individual data indicated that particular Ss would have had to miss about 15 consecutive reversals in order to account for the results on Occasions 12 and 19.

Bruner et al found that with passive observation of the Schroeder staircase figure, 17 of their 19 Ss reported fewer

Fig. 1. Mean duration of the initial percept (P1) and reversal phase (P2) over 20 occasions (N = 10).

reversals during the second half of a 10-min trial. Torii (1960) reported a similar decline in reversal rate from an unpublished study of figure-ground reversals. Although wide differences in stimuli and methodology prevent any direct comparison, these results were consistent with those of the present experiment.

More recently, Ammons & Ammons (1965, 1967) found that the reversal rate of the Necker cube decreased during prolonged continuous viewing, following a 5-min rest. However, their Ss were instructed to reverse perspective as rapidly as possible, and this may have been a major factor in their results. No statistical tests were reported by Ammons and Ammons, but their graphs indicated a steady decline in the reversal rate curve over the last 7 min of an 8-min trial.

By comparison with the above studies, the total observation time in the present experiment was quite short ($\bar{X} = 3.45$ min). However, the use of a rotating stimulus could account for the early decline in reversal rate. Reversals tend to occur much more rapidly in the case of plane figures, and the frequent changes of percept would be expected to hold the attention more readily. In addition, some Ss in experiments with the Howard cube have reported a tendency to track visually the path of rotation of the cube. Such tracking responses would reduce the number of reversals recorded by extending the duration of the P1 phase, since reversals tend to occur only during periods of steady fixation.

It is suggested that the decline in reversal rate observed in previous studies may result from fluctuations in perspective duration, rather than from any systematic increase in the duration of either phase. Further investigation is needed to clarify the effects of prolonged observation of reversible figures, and to establish the asymptotic level of the P1 phase.

REFERENCES

- AMMONS, R. B., & AMMONS, C. H. Learning and performance of rotary pursuit and reversal of perspective with continuous practice and a single rest. Paper presented to Rocky Mountain Psychological Association, 1965.
- AMMONS, C. H., & AMMONS, R. B. Differences in reversible perspective performance related to proficiency. Paper presented to Rocky Mountain Psychological Association, May 1967.
- BRUNER, J., POSTMAN, L., & MOSTELLER, F. A note on the measurement of reversals of perspective. *Psychometrika*, 1950, 15, 63-72.
- HOWARD, I. P. An investigation of a satiation process in the reversible perspective of revolving skeletal shapes. *Quarterly Journal of Experimental Psychology*, 1961, 13, 19-33.
- PRICE, J. R. Perspective duration of a plane reversible figure. *Psychonomic Science*, 1967a, 9, 623-624.
- PRICE, J. R. Two components of reversal rate for a rotating skeletal cube: "Conditioned satiation." *Australian Journal of Psychology*, 1967b, 19, 261-270.
- TORII, S. Figure-ground reversals under successively repeated observations. *Japanese Psychological Research*, 1960, 9, 25-37.

The effects of perceptual organization on performance in classification tasks

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Three experiments are reported which investigated the relationship between stimulus organization and performance in classification tasks. In Experiment 1, a conjunctive solution involving proximate stimuli was learned more rapidly than a solution involving nonproximate stimuli. In Experiments 2 and 3, type of solution (similar stimuli vs nonsimilar stimuli in Experiment 2; and unique vs nonunique stimuli in Experiment 3) and number of dimensions had interaction effects on rate of learning.

The major purpose of this paper was to indicate ways in which to study the relationship between the perceptual organization of the to-be-categorized stimulus material and performance in classification (concept identification) tasks. Hence, the experiments reported should be viewed more as demonstrations of a technique than as final answers to the issues which were raised. These concerns stemmed from previous findings (e.g., Bourne, 1966; Shepard, Hovland, & Jenkins, 1961), which showed that perceptual factors influenced classification performance. In the Shepard et al study, for example, Ss learned a conjunctive concept significantly faster when the stimulus dimensions were imbedded in a single figure than when they were distributed across three figures.

Three experiments are reported here. The first deals with the Gestalt grouping principle of proximity (Kohler, 1947). This principle states that stimuli which are in close proximity to each other are seen as a group. It was hypothesized that a conjunctive solution which involved proximate stimuli would be attained faster than a conjunctive solution which involved adjacent nonproximate stimuli. The second experiment deals with the Gestalt grouping principle of similarity (Kohler, 1947). This principle states that in a stimulus array, similar stimuli are seen as a group. It was

hypothesized that a conjunctive solution which involved similar stimuli would be attained faster than a conjunctive solution which involved nonsimilar stimuli. The third experiment deals with the von Restorff effect (Kohler, 1947): In an otherwise homogeneous stimulus array, unique stimuli are perceived as a group. It was hypothesized that a conjunctive solution which involved unique stimuli would be attained faster than a conjunctive solution which involved nonunique stimuli. The overriding view of the three experiments is that perceptual organization is probably important in determining either the order in which Ss test alternative solutions and/or in determining which information will be remembered.

EXPERIMENT 1

Subjects and Procedure

This experiment investigated the effects of the Gestalt grouping principle of proximity. Ss were 120 undergraduate students enrolled in introductory psychology courses at the University of Cincinnati, run in a 2 by 3 factorial design experiment.

Four decks of 20 3 x 5 cards were constructed containing either three-dimension, two-value stimuli, four-dimension, two-value stimuli, six-dimension, two-value stimuli, or eight-dimension, two-value stimuli. A dimension was defined as the fixed location of a letter on the stimulus card. Each location was occupied by either an "A" or "B"—the two values of each dimension. The three, four, six, or eight locations were strung out on a line parallel to the long sides of the card. This type of stimulus display is similar to that used by Glanzer, Huttenlocher, & Clark (1963).

The locations of the letters on the four-, six-, and eight-dimension cards were juxtaposed so that, introspectively, the letters appeared as pairs. This was accomplished by using a single typewriter space (pica) between the first and second, third and fourth, etc., location, and three spaces between the second and third, fourth and fifth, etc., locations, e.g.,