Recognition of faces: I. An exploratory study [1]

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Shepard's recognition procedure was applied to photographs to test its usefulness for exploring perception of, and memory for, faces. Recognition was measured as a function of number of faces viewed and of vertical orientation. Recognition accuracy was significantly greater for upright than for inverted photographs, suggesting that faces are not here perceived and stored simply as patterns. Inspection Series length did not significantly affect recognition accuracy. Comparison of upright-viewing-and-upright-recognition with inverted-viewing-and-upright-recognition yielded no significant differences in accuracy, suggesting that unlike information stored during upright viewing, information stored during inverted viewing is not strongly tied to orientation.

Shepard (1967) recently reported data suggesting that Ss can retain enough information from single brief exposures of each of approximately 600 pictures of objects to be able subsequently to recognize them all. The present experiments determined that a short version of Shepard's procedure is suitable for exploring how people perceive and remember faces, since recognition scores are high, yet responsive to transformation (i.e., inversion) which reduces the recognizability of faces without changing the stimulus configurations.

Experiment 1

Thirty-two Ss were shown a set of photographs, presented individually, serially, and self-paced. Of these pictures, 15 were presented to S a second time, this time paired with another photograph not previously seen, and S was asked to indicate which one he had seen before.

Subjects. A different group of eight Ss (four male and four female) were used for each of four experimental conditions. Ss were graduate and undergraduate students, and a few faculty members.

Materials. Seventy-five pictures of females were selected randomly from a college yearbook after those with glasses or distinctive clothing or backdrop had been eliminated. These were rephotographed and reduced to 3/4 x 1 in. in size.

Procedure. The four experimental conditions are shown in Table 1.

Prior to each administration, 15 photographs were randomly chosen and set aside for use in the Test series. Fifteen photographs to be later paired with them were also chosen randomly and were then spaced throughout the Inspection series. Spacing was symmetrical around the middle of the series, and such that the first and last two photographs in each Inspection series did not appear in the Test series. Each S was thus shown a different subset of photographs in the Inspection series, and of pairs of photographs in the Test series. Inspection series order was random; Test series order followed the sequence of the "old" photographs in the Inspection series.

Inspection series. In each condition, Ss viewed the photographs serially, with the aim of being able later to recognize them as having appeared in the series. No specific information was given them at this time about the nature of the recognition task. Ss were told that "most people spend about 5 to 15 sec on each picture," but that they could proceed at their own pace. The only viewing restrictions were that: (a) pictures could not be turned or tilted (this was made explicit only when necessary); (b) once a photograph had been viewed and placed face down, it could not be viewed again; and (c) only one photograph could be viewed at a time.

Test series. Immediately after the Inspection series, Ss were presented serially with the Test series of 15 side-by-side pairs, and told that one member of each pair would be an old photograph, while the other would be a new one, and that they were to indicate which (right or left) they had seen before. Ss were instructed to guess, if uncertain, but to indicate their uncertainty. The position of the "old" picture was assigned semirandomly, such that the correct answer was "right" for seven or eight of the pairs, and "left" for the others; the correct answer was never the same for more than three sequential pairs.

Table 1. Experimental Conditions, Means and Standard Deviations of Errors, Median Errors, Median Percentage Correct Recognition (Rights minus Wrongs), and Range of Mean Viewing Times per Photograph (in sec).

EXPERIMENT 1

Condition	Inspection Series	Test Series	Mean Errors	SD	Median Errors	Median % Correct	Range (in sec) of Mean Times/Photo
1	35 Upright	Upright	0.375	0.74	0.0	100 %	7.77 - 16.20
2	60 Upright	Upright	1.750	1.58	1.5	90	3.60 - 9.87
3	35 Inverted	Inverted	2.625	1.60	3.0	80	5.69 - 12.60
4	60 Inverted	Inverted	3.500	2.20	4.5	70	7.30 - 11.82

EXPERIMENT 2

Condition	Inspection Series	Test Series	Mean Errors	SD	Median Errors	Median % Correct	Range (in sec) of Mean Times/Photo
5	35 Inverted	Upright	3.500	2.27	2.5	83	7.86 - 18.40

Experiment 2

When the direction of results in Experiment 1 was apparent, an additional group of eight Ss was run, in which pictures were inverted in the Inspection series and upright in the Test series. Otherwise, procedures were identical to those of Condition 3 (see Table 1).

Results

Mean and median errors, SDs, and range of viewing times across Ss, are given in Table 1 for each experimental condition. Analysis of variance of the errors, after square root transformation, yields a highly significant difference among conditions ($F = 5.14$, df = 3/28, $p < .01$), a highly significant difference between upright and inverted conditions ($F = 10.92$, df = 1/28, $p < .005$), and no significant difference as a function of Inspection series length ($p > .08$) or the interaction between length and orientation ($F < 1$).

Median Test series recognition scores, corrected for guessing (rights minus wrongs) appear as percentages in column 7 of Table 1. An estimate of the numbers of stored Inspection series faces can be obtained by multiplying Inspection series length by these corrected percentages.

Discussion

The significant difference in recognition accuracy between upright and inverted faces in this procedure supports the intuitive notion that something other than pattern storage and pattern recognition is operating in the recognition of faces, since inversion leaves pattern unchanged. Since recognition accuracy in Condition 5 is not significantly different from that of Condition 3 ($t = 0.9$), it may be inferred that the information stored during inverted viewing is not strongly tied to orientation.

Although the effects of such procedural variables as Test series length have not been investigated, the technique in its present form seems usable without further modification, and we are currently applying it to study the effects of such stimulus variables as left-right and negative-positive reversal; ratio of Negro to Caucasian faces in the Inspection series; and expression-change between Inspection and Test series.

References

SHEPARD, R. N. Recognition memory for words, sentences, and pictures. *J. verbal Learn. verbal Behav.*, 1967, 6, 156-163.