Recognition memory for familiar "public" faces: Effects of orientation and delay*

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Recognition memory for familiar "public" faces, unfamiliar human faces, canine faces, and architecture was investigated as a function of upright vs rotated test orientation and immediate vs delayed tests. Recognition accuracy was reliably greater for upright stimuli and for familiar faces. The delayed test showed no significant effects. Rotation of stimuli resulted in a greater recognition error ratio for familiar and unfamiliar faces than for dog faces and buildings on the immediate test. Rotation of buildings on the delayed test, however, substantially increased their error scores equal to the error levels for human faces. It was concluded that verbal coding facilitated recognition of familiar faces in the upright but not in the rotated orientation.

Scapinello & Yarmey (1970) found that pictorial stimuli presented for seven successive inspection trials were significantly better recognized than pictorial stimuli inspected only once. Recognition performance declined, however, as a function of stimulus rotation and a 20-min delay in testing for familiar stimuli but not for unfamiliar stimuli. Performance decrement was significantly greater after stimulus rotation for human faces than for dog faces or buildings on both the immediate and the delayed tests.

One purpose of the present study was an attempt to replicate the results of Scapinello and Yarmey for stimuli presented only once. A second purpose was to explore further the effect of rotation of familiar human faces in recognition memory. As stated above, Scapinello and Yarmey defined familiarity by experimental procedures. In the present investigation, familiarity of human faces was defined by using well-known "public" persons, easily identified by name, as stimuli. The experiment was designed to test whether or not highly available verbal encodings (names) would minimize the decrement in recognition performance of rotated human faces.

SUBJECTS

Eighty introductory psychology students (40 males and 40 females) were assigned randomly to one of four experimental conditions: upright vs rotated recognition with immediate recall and upright vs rotated recognition with delayed recall. Each treatment had an equal number of males and females.

MATERIALS

The materials consisted of a mixed list of four sets of stimuli. Set A

consisted of 30 facial photographs of unfamiliar male adults, Set B consisted of 30 facial photographs of dogs, and Set C consisted of 30 photographs of buildings. Sets A, B, and C are the same stimuli employed by Scapinello & Yarmey (1970) and are fully described in that paper. Set D materials consisted of 30 familiar male persons, e.g., Pierre Trudeau, L. B. Johnson, Richard Nixon, Frank Sinatra, etc. The stimuli were black-and-white full face photographs taken from popular journals. Each face was cut beneath the chin and around the hairline. All stimuli were photographed and made into 5 x 6 in. flash cards. Four independent judges were employed to select the stimuli. Only those stimuli that elicited immediate verbal recognition were chosen.¹

PROCEDURE

Each S inspected 80 flash cards, 20 from each of the four sets, presented manually in random order and in an upright orientation. Each stimulus was inspected singly for 5 sec. The test stage consisted of presenting the stimulus cards in either an upright or a 180-deg rotated orientation, depending on the experimental conditions. Forty of the original stimuli were replaced with a new set of pictures, with the restriction that there be an equal number of unfamiliar human faces, canine faces, architecture, and familiar human face photographs. In order to control for ease of inspection and testing of stimuli, the target items and filler items were counterbalanced over conditions. The Ss had to identify within 10 sec whether the stimulus was old (previously seen) or new (never seen before). Half of the Ss (N = 40) were given the recognition test immediately after the inspection stage. Twenty of these Ss viewed the test stimuli in an upright orientation, and the remaining viewed the test

stimuli upside down. Forty other Ss were tested in the same manner after a 20-min delay.

A postexperimental questionnaire encouraged Ss to list the stimuli that were the most difficult to learn and to give reasons for this difficulty. The questionnaire also encouraged Ss to state their particular learning strategies.

RESULTS AND DISCUSSION

Mean error scores for all materials are given in Table 1. In addition, the scores from Scapinello & Yarmey (1970) for comparative conditions are also presented. The table shows that recognition was more difficult in this study over all conditions, which may reflect the use of 80 as opposed to 60 inspection cards. The data were analyzed by a 4 by 2 by 2 analysis of variance, in which stimulus materials were treated as a within-Ss variable and orientation and test intervals were treated as between-Ss variables. Sex was not treated as a variable, although equal numbers of males and females occurred in each condition. Significant effects were found for stimulus materials, $F(3,228) = 59.86$, $p < .001$, and for orientation, $F(1,76) = 43.73$, $p < .001$. The main effect for test intervals was not significant, $F < 1.00$. The only significant interaction was Materials by Interval Effect, $F(3,228) = 3.84$, $p < .01$. Table 1 shows that unfamiliar human faces and dog faces, in contrast to buildings, yielded slightly more errors on the immediate test, whereas in the delayed test architecture showed a substantial decline in performance and unfamiliar human faces and dog faces improved performance. In addition, the table indicates that familiar "public" faces were easily recognized in contrast to the other sets of materials on both the immediate and delayed tests. Although this interaction effect differed from Scapinello & Yarmey (1970), the present data suggest that unfamiliar human faces and dog faces may be high-arousal materials with poorer immediate recognition because of competing consolidation processes. The 20-min test delay, however, may have permitted better consolidation and improved performance for these materials (see Kleinsmith & Kaplan, 1963; Wallace, Coltheart, & Forster, 1970).

All materials were more difficult to recognize after rotation. The degree of variation, however, varied with the materials. Planned comparisons on the immediate test showed the effects of rotation to be statistically significant for familiar human faces, $F(1,228) = 9.17$, $p < .01$, unfamiliar human faces, $F(1,228) = 9.86$, $p < .01$, canine faces, $F(1,228) = 4.69$, $p < .05$, but not for buildings. These

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Table 1
Mean Errors and SD for All Experimental Stimuli with Immediate and Delayed
Recognition for Yarmey (Y) and Scapinello and Yarmey (S-Y)

Presentation	Materials															
	Familiar Faces				Unfamiliar Faces				Unfamiliar Dogs				Unfamiliar Buildings			
	Y		S-Y		Y		S-Y		Y		S-Y		Y		S-Y	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Upright, Immediate Recognition	0.7	0.9	0.4	0.5	4.6	3.1	2.5	1.6	4.8	2.2	2.6	1.6	4.5	2.5	3.0	1.3
Rotated, Immediate Recognition	2.8	2.1	1.5	1.3	6.8	2.1	4.0	1.4	6.2	1.8	3.0	1.3	5.4	2.3	3.4	1.2
Mean Errors for Immediate Test	1.8		1.0		5.7		3.2		5.5		2.8		5.0		3.2	
Upright, Delayed Recognition	0.6	0.8	0.5	0.5	3.0	1.4	2.4	1.2	4.5	1.6	2.2	1.1	4.6	2.4	2.8	1.3
Rotated, Delayed Recognition	2.8	3.5	2.1	0.9	6.4	2.8	3.8	1.6	6.0	2.7	2.8	1.3	7.7	2.8	3.6	1.8
Mean Errors for Delayed Test	1.7		1.3		4.7		3.1		5.2		2.5		6.2		3.2	

data, with the exception of dog faces, are similar to the results of Scapinello & Yarmey (1970). Human faces, both familiar and unfamiliar, were more difficult to recognize after rotation than were dog faces and buildings in both studies. Although dog faces were not more difficult to recognize after rotation in the Scapinello and Yarmey study, the magnitude of the error variance ratio for human faces in this study is twice that for dog faces. Rotation of building had no significant effect on recognition on the immediate test in either this study or in Scapinello and Yarmey.

Planned comparisons for the delayed test condition yielded effects similar to the immediate test, with the exception that rotation of buildings also yielded reliable differences, $F(1,228) = 21.49$, $p < .01$. The error variance ratios for familiar human faces, $F(1,228) = 10.34$, $p < .01$, and unfamiliar human faces, $F(1,228) = 25.10$, $p < .01$, again were substantially greater than the error variance for dog faces, $F(1,228) = 4.69$, $p < .05$.

The questionnaire reports of Ss' learning strategies and learning difficulties confirmed the reports found by Scapinello and Yarmey. The most popular inspection strategies in rank order were: (1) to pick out distinctive features of the stimuli, (2) to verbally encode the stimuli, (3) to pair the stimulus with some idiosyncratic cue, and (4) to use rote memory. Buildings were considered the most difficult to learn, followed by unfamiliar human faces, canine faces, and familiar human faces. The reports, with the exception of the reversal of dog faces and unfamiliar human faces, are consistent with the inversion recognition performance.

These results add further support to

the hypothesis that familiarity improves recognition memory for pictorial stimuli (Arnoult, 1956; Nickerson, 1968; Scapinello & Yarmey, 1970). Pictorial recognition was not affected by the short delay interval, which is consistent with the results of other investigators who have employed moderate to long delay test intervals (Clark, 1965; Goldstein & Chance, 1970; Nickerson, 1968; Rock & Engelstein, 1959).

Hochberg & Galper's (1967) finding that recognition memory of human facial photographs is strongly associated with upright visual orientation has been repeatedly confirmed (Bradshaw & Wallace, 1971; Scapinello & Yarmey, 1970; Yin, 1969; and the present investigation). Several interpretations have been made to explain this finding. Galper & Hochberg (in press) state that facial photographs are recognized on the basis of face-specific properties and expressional cues. They point out, however, that facial expression coding in the absence of specific instructions to code by expression is not a sufficient explanation. Yin (1969) concluded that facial recognition was contingent upon face-specific properties and stimulus familiarity. Scapinello & Yarmey (1970) and the present investigation, however, demonstrated that recognition accuracy for rotated human faces is independent of familiarity. Furthermore, Goldstein in an unpublished study has found evidence to demonstrate that inverted recognition of faces becomes worse as familiarity increases.² The hypothesis that recognition of faces is dependent upon unitary "Gestalten" processing was not supported by Bradshaw & Wallace (1971). These investigators suggest that faces are recognized by

sequential self-terminating processing without replacement, i.e., serial discrimination, of facial features.

It seems apparent that human faces are coded in a person-specific manner. Perception of persons cannot be equated to perceptions of some classes of other physical objects, since human faces are more likely to evoke psychological properties such as attitudes, intentions, emotions, traits, etc., which are not present in observation of rocks or architecture (see Tagiuri, 1969). Perhaps one reason that canine faces were of intermediate recognition accuracy after rotation is that Ss may anthropomorphize dogs but not buildings. In addition to these cognitive processes, standard sensory variables such as size, brightness, texture, etc., must be involved in the encodings of faces. Finally, the data of the present study demonstrate that verbal coding of faces in the form of readily available names does facilitate recognition memory of upright oriented faces but not inverted faces. These data partially support Goldstein & Chance (1970), who found that verbal mediation did not improve recognition memory for pictorial stimuli.

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NOTES

1. Selection of 30 familiar "public" faces proved to be surprisingly difficult. Public faces are not easily identified without supporting contextual information.
2. A. G. Goldstein, personal communication, 1971.

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