

The Effects of Familiarity and Distinctiveness in Recognizing Faces

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THE EFFECTS OF FAMILIARITY AND DISTINCTIVENESS IN RECOGNIZING FACES¹

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This study was performed in order to examine whether we could recognize the photographs of persons in their primary school from the photographs from the age of nineteen to twenty-four or from nineteen to twenty-four and from thirteen to eighteen. Fourteen Ss participated in the experiment 1 using unfamiliar faces. Results suggested as follows. (a) Hit rate regarding high distinctive faces showed superior to less distinctive faces. (b) There was a significant difference between the double presentation and single the presentation condition. Seventeen Ss took part in the experiment 2 using familiar faces. There was no difference of two levels. Compared experiment 1 with 2, these results indicated that in the case of low familiarity the clue is distinctiveness and that while the photographs of the faces have high familiarity the clue is familiarity itself.

Key words: face recognition, familiarity, distinctiveness.

INTRODUCTION

Suppose we encounter our old friends from our childhood days after a 20 year interval.

Can we recognize who they are?

Seamon (1982) concluded that dynamic recognition was the reliable natural phenomenon that can be facilitated by familiarity. In recent study Bruck, Cavanagh, & Ceci (1991) found out that former classmates could match name-faces connection better than control Ss. However, both studies did not take facial distinctiveness into consideration.

The purpose of this study was to investigate how familiarity and distinctiveness affected decline of facial recognition after years interval.

EXPERIMENT 1

The objective of experiment 1 using unfamiliar faces was to investigate the effects of distinctiveness and stimuli presentation conditions.

METHOD

Dependent variable "distinctiveness" (within-subjects factor): Before performing study task, facial distinctiveness was ranked by Ss who did not partake in the recognition task. Ten stimuli were presented per set. The Ss were asked to rank their faces from first to tenth. Ss were

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instructed not to rank the same order.

Dependent variable "presentation method" (between-Subjects factor): The *Ss* were assigned into two presentation conditions. For one group stimuli were presented a facial picture per person, aged from 19 to 24 ('single presentation condition'). For another group stimuli were presented two facial pictures per person simultaneously, aged from 19 to 24 and from 13 to 18 ('double presentation condition').

Subjects: Fourteen *Ss* participated in this experiment. Seven *Ss* partook in the single presentation condition and the remaining 7 *Ss* partook in the double presentation condition. They were students of Psychology from Tohoku University. They had normal visual acuity or corrected normal acuity.

Materials: Target stimuli consisted of 60 black-and-white photographs of faces. They were all male. Three kinds of photographs per person were collected, i.e., aged from 6 to 12, from 13 to 18, and from 19 to 24. Distractors consisted of 20 black-and white photographs of faces, aged from 6 to 12. They were all male. All the These faces showed neutral expression. They had no moles, scars or glasses to exclude cue of recognition.

In recognition task, a target and a distractor were paired ($FAC=2$). All the stimuli were unfamiliar to *Ss*.

Apparatus: Stimuli were presented by flash pak projector on 54cm by 41cm screen. They subtended a visual angle of approximately 5 deg. A manual stopwatch was used for controlling the stimuli presentation.

Procedure: A study task on four pictures of faces, 2×2 matrix, were arrayed irrespective of presentation conditions. *Ss* were informed previously that the right side of the matrix was the same male, and the same for the left. In single presentation condition, each matrix slide was presented for 6 seconds, while in double presentation condition for 4 seconds. After carrying out the study task, a word association, which was interfere, was given. Then *Ss* were required to recognize target faces and to rate confidence ratings(1-least 6-most). When recognition, forced-choice method was used. Response pace was left to each *S*. For half the *Ss* answering, clockwise order was given. For the other half, there was counterclockwise order. Presentation order was randomized.

RESULTS

Hit rate on recognition and average confidence ratings are given in Figure 1 and Table 1 respectively.

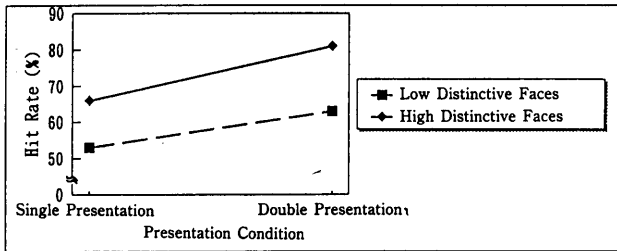


Fig. 1. Hit rate on presentation conditions and distinctiveness (in percentages)

Table 1. Means of confidence ratings on presentation conditions and distinctiveness (no dimension).

	Single presentation	Double presentation
Low distinctiveness	2.74(1.29)	2.41(0.42)
High distinctiveness	2.97(0.95)	2.76(0.52)

Note. Numbers in parentheses are standard deviations.

Percentages of correct recognition: Two-way-split-plot ANOVA was carried out to determine the effects of distinctiveness and presentation conditions. A main effect of distinctiveness was significant ($F(1,27) = 9.37, p < .01$). A main effect of presentation condition was also significant ($F(1,27) = 6.52, p < .05$). There was not significant interaction.

It was revealed that *Ss* recognized highly distinctive faces better than less distinctive faces, and that the double presentation condition than the single presentation condition.

Confidence ratings: Two-way-split-plot ANOVA was carried out to determine the effects of distinctiveness and presentation conditions. Data showed marginal significance on distinctiveness ($F(1,27) = 4.14, p < 0.10$).

DISCUSSION

The results of experiment 1 are discussed in terms of model by Bruce and Young (1986). Two main findings were obtained. (a) Recognition rate varied with presentation conditions. These results signify that the double presentation condition generated "structural encoding" more effectively. (b) In the recognition of unfamiliar faces, distinctiveness functioned as one of the important factors of recognition. When his or her face was less distinctiveness, there was only one pathway to recognition, i.e., from structural encoding to face recognition units. On the other hand when his or her face was highly distinctiveness, another pathway was added, namely from structural encoding to directed visual encoding with cognitive system. The increase of facial recognition rates can be explained because another pathways added.

Then, why do confidence ratings on the recognition of unfamiliar faces so lower? Because the unfamiliar faces do not have the identity nodes and the name generation, they probably

make recognition rate lower. It can make confidence ratings higher that knowledge about the specific faces.

EXPERIMENT 2

The purpose of experiment 2 using familiar faces was to examine the effects of distinctiveness and the stimuli presentation conditions.

METHOD

Dependent variable "distinctiveness" (within-subjects factor): This dependent variable were the same as in the experiment 1.

Dependent variable "presentation method" (between-subjects factor): This dependent variable were the same as in the experiment 1.

Subjects: Seventeen Ss participated in this experiment. Eight subjects partook in the single presentation condition and the remaining 9 subjects partook in the double presentation condition. They were students of Psychology from Tohoku University. They had normal visual acuity or corrected normal acuity.

Materials: All the faces were familiar to the Ss because the persons in the pictures belonged to the same Department. The other aspects of stimuli were the same as in the experiment 1.

Apparatus: The apparatus was the same as used in the experiment 1.

Procedure: The procedure were the same as in the experiment 1.

RESULTS

Hit rate on recognition and average confidence ratings are given in Fig. 2 and Table 2 respectively.

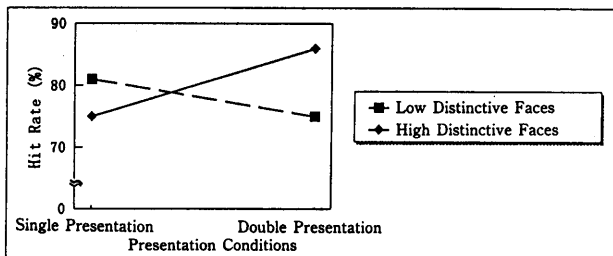


Fig. 2. Hit rate on presentation condition and distinctiveness (in percentages)

Table 2. Means of confidence ratings on presentation conditions and distinctiveness (no dimension)

	Single presentation	Double presentation
Low distinctiveness	3.50(1.09)	4.09(0.92)
High distinctiveness	3.69(1.03)	3.86(0.91)

Note. Numbers in parentheses are standard deviations.

Percentages of correct recognition: Two-way-split-plot ANOVA was performed. There was no main effect and interaction.

Confidence ratings: Two-way-split-plot ANOVA was performed. There was no main effect and interaction.

DISCUSSION

The results of the experiment 2 are also discussed in terms of model by Bruce and Young (1986). Different from the results of the experiment 1, ANOVA revealed that there was no significant difference between the two presentation conditions. These results suggested that additional inputs did not influence the recognition.

The results on distinctiveness were incongruent with the studies presented so far (Bartlett, Hurry, & Thorley, 1984; Cohen & Carr, 1974; Going & Read, 1974). As mentioned by Bruce and Young (1986), when recognize familiar faces distinctiveness functions in both view-centered descriptions and directed visual processing.

When we recognize familiar faces, structural encoding has already generated enough in face recognition units. Because of the reason, we could explain that the pathway from view-centered descriptions to face recognition units via expression independent descriptions does not influence the facial recognition.

We could answer the question in the introduction. When familiarity is low, distinctiveness can play the important role in the face recognition. However as familiarity becomes higher, not distinctiveness but familiarity can help facial recognition.

GENERAL DISCUSSION

The objective of the experiment 1 and 2 was to investigate the effects of familiarity, distinctiveness and stimuli presentation conditions. The effects of distinctiveness and presentation conditions were already pointed out. Therefore we focus on the role of familiarity.

Compared with the experiment 1 with 2, the effect of familiarity on recognition was revealed. Namely a main effect of familiarity was significant ($F(1,27) = 9.27, p < .01$). Hitherto many evidences from researches presented on the difference between familiar faces and unfamiliar faces have been set forth (Bruyer et al., 1983; Diamond & Carey, 1977; Ellis, Shepard, & Davies, 1979; Endo, Takahashi, & Maruyama, 1984; Malone et al., 1982). This study was congruent with the results above mentioned.

Then, three-way-split-plot ANOVA on confidence ratings are discussed. A main effect of familiarity was significant ($F(1,27) = 10.50, p < .01$). If recognition rate was high on familiar faces, then confidence ratings became also high. It may be said that confidence ratings mirror the recognition. An interaction of familiarity \times distinctiveness was also significant ($F(1,27) = 4.66, p < .05$). A simple main test was performed to survey the interaction. Indeed both the effects of familiarity on low distinctiveness and on high distinctiveness were also significant, the degree on low distinctive faces was greater than high distinctive faces. In recognizing unfamiliar faces confidence ratings on distinctive faces were higher than on less distinctive faces, but in recognizing familiar faces there was no significant difference on confidence ratings regardless of levels of distinctiveness.

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