Research Article

The Cross-Category Effect

Mere Social Categorization Is Sufficient to Elicit an Own-Group Bias in Face Recognition

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ABSTRACT—*Although the cross-race effect (CRE) is a well-established phenomenon, both perceptual-expertise and social-categorization models have been proposed to explain the effect. The two studies reported here investigated the extent to which categorizing other people as in-group versus out-group members is sufficient to elicit a pattern of face recognition analogous to that of the CRE, even when perceptual expertise with the stimuli is held constant. In Study 1, targets were categorized as members of real-life in-groups and out-groups (based on university affiliation), whereas in Study 2, targets were categorized into experimentally created minimal groups. In both studies, recognition performance was better for targets categorized as in-group members, despite the fact that perceptual expertise was equivalent for in-group and out-group faces. These results suggest that social-cognitive mechanisms of in-group and out-group categorization are sufficient to elicit performance differences for in-group and out-group face recognition.*

The cross-race recognition deficit, known more simply as the cross-race effect (CRE), is one of the best-replicated phenomena in face perception (Anthony, Copper, & Mullen, 1992; Chance & Goldstein, 1981; Cross, Cross, & Daly, 1971; Malpass & Kravitz, 1969). Explained simply, the CRE is a tendency for recognition accuracy to be better for same-race faces than for cross-race faces, an effect that has been shown to be surprisingly robust across numerous racial groups and research paradigms (Meissner & Brigham, 2001).

Generally, two different kinds of theoretical models have been proposed to explain the CRE: perceptual-expertise models and social-categorization models. Perceptual-expertise models are perhaps the longest-standing explanations for the CRE (see Meissner & Brigham, 2001). Although there are many variations of this hypothesis (Ng & Lindsay, 1994), the core argument is that de facto racial segregation leads perceivers to have differential expertise in processing same-race versus cross-race faces. This differential expertise then leads to differential recognition accuracy. The lesser contact with individuals of other races than with individuals of the same race yields fewer opportunities for distinguishing between cross-race faces, meaning perceivers are relatively inexpert at distinguishing between cross-race faces. Although there is general consensus about why differential expertise occurs, the specific mechanism by which this differential expertise elicits differential recognition of cross-race faces is a matter of some debate (see Sporer, 2001, for a review). For example, a proposal in line with popular models of recognition memory (e.g., McClelland & Chappell, 1998) is that a lack of contact may lead to a lack of expertise with the dimensions on which cross-race faces actually vary (see MacLin & Malpass, 2001). Alternatively, lower levels of expertise with cross-race faces may elicit less holistic and more feature-based processing of cross-race faces relative to same-race faces (Michel, Rossion, Han, Chung, & Caldara, 2006; Rhodes, Brake, Taylor, & Tan, 1989).

Mechanisms aside, this perceptual-expertise hypothesis has a history of empirical support. For example, Malpass, Lavigueur, and Weldon (1973) found that practice at perceptual discrimination between same-race and cross-race faces in the laboratory can at least temporarily reduce the magnitude of the CRE (see also Elliott, Wills, & Goldstein, 1973; Goldstein & Chance, 1985). In addition, cross-race faces are perceptually discriminated with less facility than are same-race faces (e.g., Byatt & Rhodes, 1998; Walker & Tanaka, 2003). More recently, Sangrigoli, Pallier, Argenti, Ventureyra, and de Schonen (2005) found that lifelong training with cross-race faces can even reverse the direction of the CRE. In their study, individuals of Korean heritage who were adopted as children by Caucasian families in Europe showed a reversal of the CRE by adulthood. That is, despite their Korean heritage, these adoptees who grew to maturity among Caucasian families were like their adoptive

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Caucasian parents in finding Asian faces more difficult to recognize than White faces.

Despite this corpus of supportive empirical evidence, some recent studies have begun to call into question the extent to which differential expertise alone is sufficient to explain the CRE. For example, Hugenberg, Miller, and Claypool (2007) recently found that instructing subjects at encoding that they were likely to show a racial bias in recognition, and that they should attend closely to the individuating characteristics of the faces, was sufficient to eliminate the CRE. The sufficiency of instructions to eliminate the CRE suggests that the CRE may partly originate from motivational differences elicited by social categorization. In related research, MacLin and Malpass (2001, 2003) found that adding Latino- or Black-stereotypic hairstyles to racially ambiguous Latino-Black faces not only influenced race categorization, but also was sufficient to elicit the CRE. For example, ambiguous-race faces with Latino-stereotypic hairstyles were not only categorized as Latino, but were also better recognized by Latino perceivers than were faces with Black-stereotypic hairstyles.

Taken together, this research falls in line with a number of recent models that in part explain the CRE via social-cognitive mechanisms of *categorization* versus *individuation* (Sporer, 2001). At the core of social-cognitive theory is the ubiquitous tendency of perceivers to think categorically about out-group members (e.g., Bodenhausen, Macrae, & Hugenberg, 2003). Thus, according to social-categorization models, the CRE is not due to differential expertise with cross-race faces per se, but rather is due to differences in social cognitions typically elicited when processing in-group and out-group members (see Sporer, 2001, for a review). Indeed, a large body of research has shown that merely categorizing a stimulus as an in-group or an out-group member has a host of important cognitive, motivational, and behavioral sequelae (Tajfel, 1982; Tajfel, Billing, Brundy, & Flament, 1971; Tajfel & Turner, 1986). As is the case with perceptual-expertise models, social-categorization models vary in the specific proposed mechanisms underlying the CRE. For example, in Levin's (1996, 2000) feature-selection model, thinking categorically about out-group members leads individuals to search for category-specifying features (e.g., skin tone) in cross-race faces, instead of the individuating features that distinguish one face from another (see also MacLin & Malpass, 2001, 2003). Alternatively, categorizing a target as an out-group member might reduce processing motivation, leading to weaker encoding of the individuating features of cross-race faces relative to same-race faces (Rodin, 1987).

Regardless of specific mechanisms, these recent findings suggest that the CRE may have its origins, at least in part, in social categorization. If social categorization is implicated in the CRE, the ramifications are quite profound. First, the CRE should be reduced or even eliminated by factors that tend to reduce reliance on social categories (Hugenberg et al., 2007). Second, if the CRE is due at least in part to social categorization, then social categorization alone, absent any differences in expertise, should be sufficient to elicit recognition differences between in-group and out-group targets.

Drawing on this logic, we hypothesized that merely labeling or categorizing faces as belonging to an in-group should facilitate recognition, relative to recognition of faces believed to belong to an out-group, even when perceivers' expertise with the stimuli is held constant. We designed two studies to test the hypothesis that beliefs about targets' group membership alone, independent of race or a priori expertise or exposure, are sufficient to elicit recognition differences. In essence, we hypothesized that the CRE may be, in part, a subset of a broader cross-category effect, such that mere social categorization is sufficient to lead to differences in recognition.

STUDY 1

Overview

Study 1 tested the hypothesis that individuals are better able to recognize in-group than out-group faces, even when perceptual expertise with the in-group and out-group faces is equal. White subjects saw a series of White faces presented on red and green backgrounds. Subjects in the category-label condition were instructed that faces on the red background were university in-group members (i.e., fellow Miami University students) and that faces on the green background were university out-group members (i.e., students at Marshall University, a perennial football rival). Subjects in the control condition were given no specific instructions regarding the background color. Subjects in the control condition were expected to show equivalent performance for faces on the red and green backgrounds. However, if merely categorizing targets as in-group and out-group members is sufficient to elicit cross-race-like effects (i.e., cross-category effects), subjects told that the background was indicative of group affiliation would be expected to show better recognition performance for faces on red backgrounds than for faces on green backgrounds. Because all subjects and targets were of the same race, and targets were counterbalanced across backgrounds, a perceptual-expertise model would predict no differences in face recognition across backgrounds in the category-label condition.

Method

Subjects and Design

Sixty White Miami University undergraduates (22 women) participated for course credit. A 2 (background color: red, green) $\times$ 2 (category label: present, not present) mixed-model experimental design was used, with repeated measures on the first factor.

Materials

Eighty gray-scale faces of White college-age males displaying neutral expressions were used as the stimuli (no stimuli were Miami or Marshall University students). Adobe Photoshop was

used to resize the images to approximately 2.25 × 1.5 in., and each face was then placed on both red and green backgrounds measuring 3 × 3 in. For the control condition, the words "Red" and "Green" were inscribed in white letters at the bottom of the red and green backgrounds, respectively. For the category-label condition, the university name ("Miami University" for red; "Marshall University" for green) was inscribed in white at the bottom of the background (red and green are the school colors for Miami and Marshall, respectively; see Fig. 1 for example stimuli).

Procedure

After providing informed consent, subjects were seated at computers in individual cubicles and instructed that they would complete a face recognition experiment consisting of a learning phase and a recognition phase. All instructions and stimuli were presented via computer. Subjects were instructed that during the learning phase, they would see 40 faces on the computer screen and should attend closely to these faces in order to recognize them later. Subjects in the control condition received no instructions regarding the background colors. Subjects in the category-label condition, however, were instructed that the faces on red backgrounds were fellow Miami University students, whereas the faces on green backgrounds were Marshall University students. Subjects then began the learning phase, during which 40 target faces (20 on the green background and 20 on the red background) were displayed in a randomized order. Each face was displayed for 2 s, and the interstimulus interval was 500 ms. All faces were counterbalanced across background color and for presence/absence during the learning phase on a between-subjects basis, such that for each subject, each face was equally likely to be on a red or green background and was equally likely to be seen or not seen during the learning phase. Preliminary analyses found no effects of the counterbalancing; therefore, it is not discussed further.

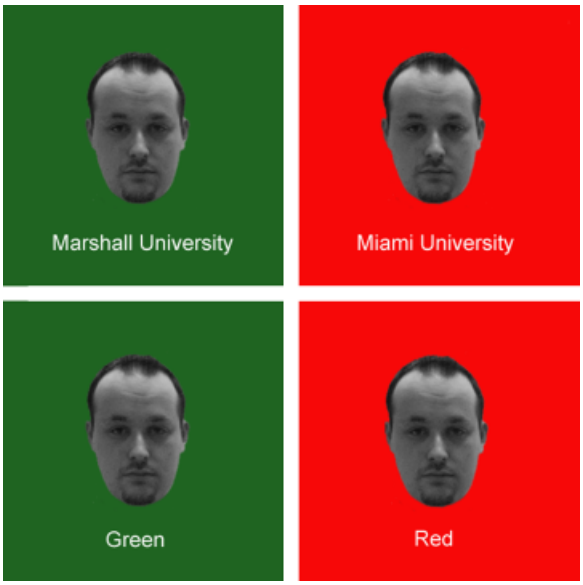

Fig. 1. Example of stimuli in the experimental (top) and control (bottom) conditions in Study 1.

After completing a 5- to 7-min unrelated distractor task, subjects engaged in the recognition phase. They were instructed that they would see a series of faces, some of which they had seen during the learning phase (old faces) and some of which they had not seen (new faces). Subjects were instructed that as each face appeared on the screen, they should report if they had or had not seen it during the learning phase. Each face remained on the screen until a decision was rendered, at which point the next face appeared. The 80 faces presented during the recognition phase included the 40 faces previously seen during learning and 40 new faces (20 on the green background and 20 on the red background), displayed in a separate random order for each subject. Each face remained on the screen until a response was made, and then the next trial began. After completing all tasks, subjects were probed for suspicion, thanked, and debriefed.

Results and Discussion

Of interest was the extent to which the presence of the category labels influenced face recognition. Within the signal detection framework, the CRE is observed as lower sensitivity (d') for cross-race compared with same-race faces. Thus, hit rates and false alarm rates were calculated separately for targets on red and green backgrounds, and these rates were then used to calculate the separate sensitivity (d') parameters for red and green targets.[1]

To test whether the mere presence of social-category labels influenced face recognition, we subjected sensitivity scores for red- and green-background targets to a 2 (background color) × 2 (category label) mixed-model analysis of variance (ANOVA), with repeated measures on the first factor. Results were in line with the social-categorization account, as the ANOVA revealed the predicted Background Color × Category Label interaction, $F(1, 58) = 5.16$, $p < .05$, $p_{rep} = .91$, $\eta^2 = .082$ (see Fig. 2, top panel). When no social-category labels were present, recognition performance was equivalent for the red ($M = 1.08$, $SD = 0.58$) and green ($M = 1.14$, $SD = 0.56$) backgrounds, $t(27) < 1$. However, when category labels were present, faces on the red background (i.e., in-group members; $M = 1.23$, $SD = 0.66$) were better recognized than were faces on the green background (i.e., out-group members; $M = 0.94$, $SD = 0.77$), $t(31) = 2.97$, $p < .01$, $p_{rep} = .96$, $d = 0.40$. Thus, when perceivers did not believe the background color was diagnostic of group membership, no recognition differences emerged. However, as predicted by the social-categorization account of the CRE, when background color was indicative of group status, faces on red (in-group) backgrounds were better recognized than were faces on green

[1]For both studies, we conducted preliminary analyses on criterion, but no reliable interaction was found in either study. Therefore, criterion is not discussed further.

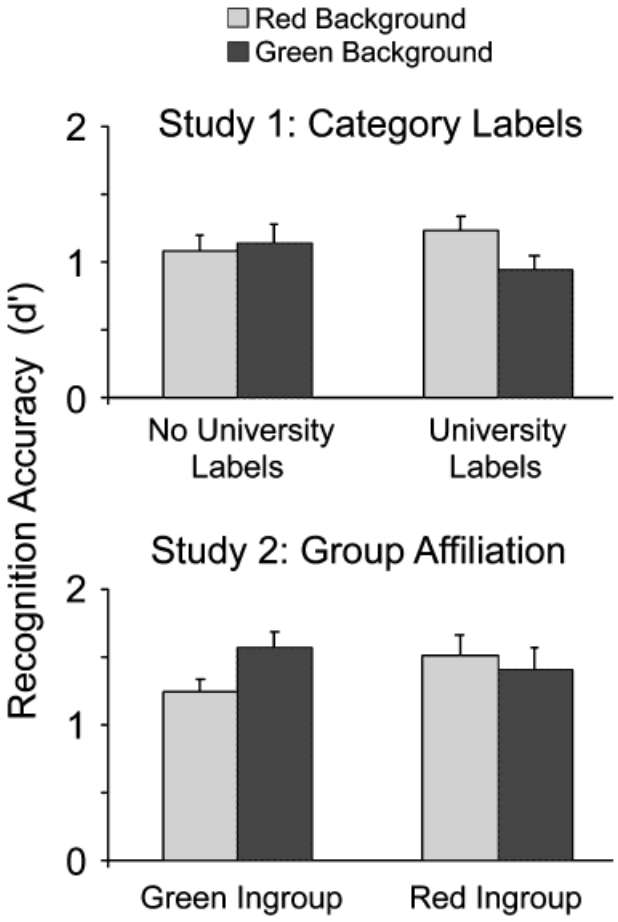

Fig. 2. Recognition accuracy (d') for faces with red and green backgrounds as a function of category label (Study 1, top panel) and minimal-group manipulation (Study 2, bottom panel).

(out-group) backgrounds. Because the race of the faces was held constant and the background color for each target was counterbalanced, subjects' perceptual expertise with the targets was equated across conditions. Thus, the recognition differences between in-group and out-group targets seem difficult to explain using solely an expertise mechanism. Instead, the mere presence of category labels seems sufficient to have elicited a pattern of recognition analogous to the CRE, even without manipulating race.

Although the current results are consistent with social-categorization accounts of the CRE, this study did rely on preexisting groups (i.e., university affiliations), which itself could be problematic. For example, insofar as the out-group label may have been infrequently seen relative to the in-group label prior to this study, this novelty may have competed for participants' attention during encoding. Alternatively, specific stereotype content about the out-group may have made subjects unwilling to attend to faces of that out-group. To eliminate problems that may arise because of preexisting in-group/out-group distinctions, we turned to the well-established *minimal-group paradigm*. In the social-cognitive literature, research employing this paradigm has shown strong cognitive, motivational, and behavioral differences in responses to relatively arbitrarily constructed in-groups and out-groups (e.g., DeSteno, Dasgupta, Bartlett, & Cajdric, 2004; Tajfel et al., 1971). The strong version of the social-categorization explanation for the CRE suggests that even categorizing perceivers into relatively minimalistic groups with no previous history of between-groups distinctions should be sufficient to lead to differences in face recognition. If mere categorization into in-groups and out-groups is sufficient to elicit cross-race-like effects, or cross-category effects, then similar results should be observed when subjects are separated into artificially constructed social groups as well. Therefore, we performed a second study using a variant of the minimal-group paradigm to extend the current results and to ensure that in-group/out-group categorizations alone are sufficient to elicit differences in face recognition accuracy.

STUDY 2

Overview

Study 2 used a design similar to that of Study 1; however, before completing the learning phase, all subjects completed a bogus personality test that categorized them as having either "red" or "green" personality types. No description of the personality types was provided. Subjects then saw faces of 40 people labeled as belonging to these personality types (i.e., 20 people per personality type). If social categorization is sufficient to elicit differences in face recognition, subjects would be expected to recognize members of their newly found personality type better than members of the other personality type.

Method

Subjects and Design

Forty-three White Miami University undergraduates (39 women) participated for course credit. Four subjects were removed from the analysis; 2 did not receive the group manipulation because of experimenter error, and 2 admitted not following instructions or not understanding the task. Analyses were conducted on data from the remaining 39 subjects. A 2 (background color: red, green) $\times$ 2 (in-group: red, green) mixed-model experimental design was used, with repeated measures on the first factor.

Materials

The faces used in the previous study were used in this study, except that all faces had "Red" or "Green" category labels.

A bogus personality test was used to create the minimal groups. Forty questions taken from the Big Five Personality Test (Goldberg, 1993; John & Srivastava, 1999) were presented to subjects one at a time on the computer screen. Each question remained on the screen until a response was made. Responses were given on 7-point Likert scales, with higher values indi-

cating greater agreement. The questions were not systematically representative of personality dimensions; therefore, these data were not analyzed.

Procedure

The procedure was identical to that of Study 1, except as noted. After providing informed consent, subjects were instructed that they would take a computerized personality test. After subjects completed this test, the computer ostensibly analyzed their responses, and informed them that they were either a "red" or a "green" personality type. Subjects were then instructed:

> This personality measure has been found to be very good at predicting future success both socially and monetarily. The measure itself is often used by businesses and organizations as a means of identifying strong candidates for competitive positions. Further, psychologists who study relationships often use this personality inventory to identify future success in relationships.

Subjects were given no further description of the personality types. They were then given a green or red wristband to wear, and told it was to identify them as a member of their particular group (see DeSteno et al., 2004, for a similar procedure). Subjects were then instructed that they would view faces on the computer, and that the background color for each face would denote whether that person had the red personality type or the green personality type. As in Study 1, all faces were counterbalanced across background color and for presence/absence in the learning phase on a between-subjects basis, such that for each subject, each face was equally likely to be on a red or green background and equally likely to be seen or not seen during the learning phase.

Results and Discussion

As in Study 1, sensitivity scores (d') for red and green targets were subjected to a 2 (background color) × 2 (in-group) mixed-model ANOVA, with repeated measures on the first factor. Results were in line with the social-categorization model, as the ANOVA yielded the predicted Background Color × In-Group interaction, $F(1, 37) = 4.36$, $p < .05$, $p_{rep} = .89$, $\eta^2 = .11$ (see Fig. 2, bottom panel). Critically, this study tested whether a relatively arbitrarily constructed in-group is sufficient to elicit cross-race-like effects. To test this hypothesis, we collapsed the data across in-group color, to directly compare performance for in-group and out-group faces. As predicted, in-group faces ($M = 1.55$, $SD = 0.56$) were better recognized than out-group faces ($M = 1.34$, $SD = 0.56$), $t(38) = 2.06$, $p < .05$, $p_{rep} = .88$, $d = 0.38$, replicating the pattern of recognition shown in Study 1. Thus, even when subjects have equivalent perceptual expertise with in-group and out-group targets, and the in-groups and out-groups are constructed in the experimental session itself, merely categorizing targets as in-group and out-group members is sufficient to elicit better face recognition for in-group targets. Moreover, insofar as this study experimentally created in-groups and out-groups, it rules out alternate explanations that involve properties of preexisting groups.

GENERAL DISCUSSION

Our results fall clearly in line with social-categorization models of the CRE. That is, we found that merely categorizing faces as belonging to an in-group facilitates their recognition, relative to faces believed to belong to an out-group. Across two studies using both real and minimal groups, faces categorized as in-group members were better recognized than those categorized as out-group members. Critically, this phenomenon occurred even though perceivers' expertise with the stimuli was held constant. In our studies, subjects and targets were always of the same race, and in all cases, stimuli were counterbalanced to equate expertise with the stimuli across conditions. Thus, perceptual-expertise models do not seem entirely adequate to explain the current findings. Instead, it appears that merely categorizing a face as a member of the in-group or out-group is sufficient to influence recognition accuracy, as predicted by social-categorization models of the CRE.

Although the findings of these two studies are in line with other recent findings suggesting that the CRE may be due, in part, to social-cognitive phenomena (e.g., Hugenberg et al., 2007; Levin, 1996, 2000; MacLin & Malpass, 2001, 2003; Sporer, 2001), the current research is one of only a handful of studies to show that social categorization alone, absent differences in expertise, is sufficient to elicit deficits in face recognition. Moreover, considering the current findings in light of the CRE may also offer parsimonious explanations for other phenomena previously attributed to differential expertise with same-race and cross-race faces. For example, Sangrigoli et al. (2005) showed that Korean children adopted by French Caucasian parents had better recognition for White than Asian targets. Sangrigoli et al. interpreted their findings to indicate that immersion in a cross-race environment yields substantial practice with cross-race faces, leading to better cross-race than same-race recognition. Though we agree that the experience of these adoptees yielded substantial expertise with cross-race faces, this experience may also have changed the adoptees' manner of self-categorization. Adopted Korean children living in a primarily European Caucasian environment may implicitly categorize themselves as belonging to the predominant White group in their community. If so, just as Miami University students recognized supposed Miami students better than supposed students from other universities, so too may Koreans adopted by Whites recognize White faces better than Asian faces. This same process could also explain other between-groups biases in face recognition, such as the "own-age bias" (Anastasi & Rhodes, 2006) and the "own-sex bias" (Wright & Sladden, 2003).

Although the current results are difficult to explain using a pure expertise mechanism, this does not mean that perceptual

expertise plays no role in face-processing biases such as the CRE. To the contrary, we argue that perceptual expertise is certainly a necessary condition for strong recognition (Hugenberg et al., 2007). Perceivers who lack facility with the dimensions on which stimuli (faces included) differ are certain to have substantial difficulties in recognizing those stimuli (Tanaka & Farah, 1993; Tanaka, Kiefer, & Bukach, 2004). Indeed, the in-group/out-group model (IOM; Sporer, 2001), a theoretical model designed to explain the CRE by integrating social-categorization and perceptual-expertise mechanisms, makes predictions quite similar to our findings. In this model, as a result of greater expertise, in-group faces are processed in a default, automatic manner, characterized by holistic processing and superior recognition. When out-group cues are detected, however, social categorization disrupts default holistic processing, and may be a cue to disregard the stimulus, resulting in poor recognition. A significant implication of the IOM is that recognition will suffer not just for cross-race faces, but for out-group faces more generally. Thus, the current findings are consistent with the IOM and other models designed to synthesize social-cognitive and perceptual-expertise explanations for the CRE. When we strip away differences in perceptual expertise, a recognition deficit still occurs for out-group faces, strongly suggesting that social categorization is at play in the CRE, as well as in similar cross-age and cross-sex effects.

It is important to note that the observed advantage for in-group recognition in these studies (i.e., the cross-category effect) may involve mechanisms that are partially different from those that are typically employed to explain the CRE. Although this work extends study of face recognition biases beyond the CRE, it does not yet provide a mechanism to account for these biases. Although it is possible that our subjects employed greater holistic processing for in-group than for out-group faces, a plausible alternative is that they differentially attended to in-group and out-group targets during encoding. For example, perhaps perceivers attended to the category-specifying information (i.e., the category labels), rather than the individuating features of the faces, when processing out-group targets (Levin, 1996, 2000). Alternatively, perhaps faces categorized as out-group members are cognitively disregarded (Rodin, 1987), deemed as less deserving of attention than faces of in-group members, leading to worse out-group recognition. Or perhaps the evaluative positivity elicited by in-group targets (Claypool, Hugenberg, Housley, & Mackie, 2007; Tajfel & Turner, 1986) facilitates deeper encoding. Such positivity itself may elicit more holistic processing (Gasper & Clore, 2002; see Johnson & Fredrickson, 2005, for a similar argument), thereby facilitating later recognition (Michel et al., 2006; Rhodes et al., 1989). Current work in our lab is investigating these possibilities.

Although the CRE certainly involves elements of differential perceptual expertise with same-race and cross-race faces, the current research provides novel evidence that in-group and out-group social-category distinctions are sufficient to elicit differences in face recognition, even when perceptual expertise is held constant. More research is certainly needed to show how perceptual-expertise and social-categorization mechanisms act together to elicit biases in face recognition. However, the current results, taken together with other recent findings (e.g., Hugenberg et al., 2007; Johnson & Fredrickson, 2005), suggest that researchers should take seriously the possibility that cross-category biases in face recognition, such as the CRE, may be due in part to social categorization.

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