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Recognition of faces of ingroup and outgroup children and adults

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Abstract

People are often more accurate in recognizing faces of ingroup members than in recognizing faces of outgroup members. Although own-group biases in face recognition are well established among adults, less attention has been given to such biases among children. This is surprising considering how often children give testimony in criminal and civil cases. In the current two studies, Euro-Canadian children attending public school and young adults enrolled in university-level classes were asked whether previously presented photographs of Euro-American and African American adults (Study 1) or photographs of Native Canadian, Euro-Canadian, and African American children (Study 2) were new or old. In both studies, own-group biases were found on measures of discrimination accuracy and response bias as well as on estimates of reaction time, confidence, and confidence–accuracy relations. Results of both studies were consistent with predictions derived from multidimensional face space theory of face recognition. Implications of the current studies for the validity of children's eyewitness testimony are also discussed.

Keywords: Eyewitness identification; Own-race bias; Own-group bias; Cross-race effect; Other-race effect

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Introduction

Our ability to remember things we have seen before is truly remarkable. Standing, Conezio, and Haber (1970) found that more than 90% of participants accurately recognized many of the 2500 pictures they had seen 3 days earlier. These results were obtained even when pictures were presented for only 1 s and some of them were inverted. Accurate visual recognition is not limited to pictures of scenes and objects; it is also found in our ability to recognize people's faces. Several studies report that children (Lie & Newcombe, 1999) and adults (Bahrick, Bahrick, & Wittlinger, 1975; Bruck, Cavanagh, & Ceci, 1991) were highly accurate in identifying faces of classmates they had not seen in many years. Being able to recognize someone we once knew has important personal, theoretical, and applied implications. Quite apart from avoiding the embarrassment that comes with misidentifying a former lover or friend, questions about how visual information is processed and later recalled form the basis of theories of visual processing and theories of face perception in particular (Levin, 2000; Valentine, 1991; Valentine & Endo, 1992). The applied aspects of face recognition are no less important; accurate face recognition is the basis of eyewitness testimony, evidence that can lead to conviction or exoneration of an accused person (Kassin, Tubb, & Hosch, 2001).

Our ability to recognize faces of other people, although often accurate, is not without its limitations. People are more likely to recognize faces of ingroup members than to recognize faces of outgroup members, and they are more likely to incorrectly identify which outgroup member was actually seen (Chance & Goldstein, 1996; Meissner & Brigham, 2001; Shapiro & Penrod, 1986; Sporer, 2001). In addition, most of the research on own-group biases in face recognition (also known as the cross-race effect, other-race effect, or own-race bias) has been conducted with adults; children's ability to recognize faces of previously seen others, in contrast, has been given less attention.[1] Like adults, children are often asked to give eyewitness testimony in which group membership of the accused may be involved (Pozzulo & Lindsay, 1998). Moreover, children's ability to recognize familiar and unfamiliar people can address theoretical questions such as the development of ingroup biases in face recognition, how memory for faces of ingroup and outgroup members is influenced by factors such as level of intergroup contact, and how information about others is organized in memory.

To frame these and other issues properly, a selective overview of studies on adult and children's recognition of faces of ingroup and outgroup members sets the context for Study 1. Two factors are discussed in Study 1: the influence of the perceiver's age and the influence of group membership of the photographed person on recognition of previously seen photographs of adult faces of ingroup and outgroup members. Results of several studies show that although children show own-group biases in face recognition, it is unclear whether such biases show any developmental trajectories. These issues were examined in Study 1 by asking Euro-Canadian children and young adults to recognize previ-

[1] Own-group bias in face recognition is the more inclusive term because biases discussed here are not restricted to cues based on race or ethnicity but rather are present where cues give rise to ingroup–outgroup categorization based on age, gender, or social status (e.g., Dehon & Bredart, 2001; Wright & Sladden, 2003). Moreover, because group membership can lead to biases in face recognition, research and theory in own-group biases in face recognition can be tied to results of other studies on own-group biases in judgments, preferences, evaluations, and memory.

ously seen photographs of Euro-American and African American adults. Results of Study 1 raise questions about the generality of own-group biases in face recognition as well as questions about relations between individual differences in level of intergroup contact and recognition of faces of outgroup members. These issues were addressed in Study 2 by asking Euro-Canadian children and young adults to recognize previously seen photographs of Euro-American, African American, and Native Canadian children. To assess relations between level of intergroup contact and recognition of outgroup members, the quantity and quality of intergroup contact participants enjoyed with outgroup peers was also assessed.

Recognizing faces of ingroup and outgroup members

When presented with photographs of previously seen ingroup and outgroup members, people are more accurate in recognizing faces of ingroup members than in recognizing faces of outgroup members (Brigham & Barkowitz, 1978; Caroo, 1987; Chiroro & Valentine, 1995; Malpass & Kravitz, 1969; Meissner & Brigham, 2001; Shapiro & Penrod, 1986). These findings are not limited to comparisons between Whites and African Americans; they are also found in comparisons between other ethnocultural groups (Meissner & Brigham, 2001), across different memory tasks (e.g., match to sample tasks, lineup identification procedures, standard recognition paradigms), and dependent variables (e.g., reaction time, hits, false alarms, confidence ratings). Although effect sizes for such biases are in the weak to moderate range of 6–11% across studies (Anthony, Cooper, & Mullen, 1992; Meissner & Brigham, 2001; Shepard, Deregoski, & Ellis, 1974), the consistency of the effect is impressive.

Unlike research on face recognition among adults, there are few studies on children's ability to recognize faces of ingroup and outgroup members or studies on developmental trends associated with ingroup biases in face recognition. Brigham (2002) stated the matter succinctly: "At present, we do not know whether the ORB (own-race bias) occurs in children as well [as adults]; nor do we know whether the ability to recognize faces of other-race children develops at the same rate as the ability to recognize same race others" (p. 131). The study by Chance, Turner, and Goldstein (1982) comes closest to the current study and provides direct evidence of developmental changes in own-group biases in face recognition. Euro-American children were more accurate in recognizing previously presented photographs of ingroup faces than in recognizing previously presented photographs of outgroup faces, with this effect being greater among older children than among younger children. Although there is little quarrel with Chance and colleagues' findings of own-group biases, their report that such biases increase with age defies easy explanation because recent studies find no such effects. Pezdek, Moore, and Blandon-Gitlin (2003) asked Euro-American and African American participants to identify photographs of previously seen videotaped Euro-American and African American actors now embedded in a number of foils. Pezdek and colleagues found increasing accuracy with age but, more critically, similar levels of bias in Euro-American and African American children in kindergarten and Grade 3 and young adults. Sangrigoli and de Schonen (2004a, Study 2), using a match to sample task, found comparable levels of ingroup bias among 4- and 5-year-olds presented with photographs of ingroup and outgroup members, and when exposure time was increased, 3-year-olds (Sangrigoli & de Schonen, 2004a, Study 3) showed biases similar to those of older children (see also Gilhrist & McKone, 2003; Sangrigoli & de Schonen, 2004b; Tanaka, Kay, Grinnell, Stansfield, & Szechter, 1998). Results of more recent studies on children's recognition of previously seen faces suggest that, like language development (Kuhl, Williams, Lacerda, Stevens, & Lindblom, 1992), biases in face recognition develop early and remain relatively stable across a wide age span.

A multidimensional perspective of own-group biases in face recognition

Although there is little disagreement about biases in face recognition, there is considerable debate about explaining them. Multidimensional face space theory (Valentine, 1991), for example, posits that own-group biases reflect how faces of ingroup and outgroup members are encoded, stored, and later recalled (for reviews of other explanations, see Meissner & Brigham, 2001; Sporer, 2001). Like many perceptual learning theories, multidimensional face space theory argues that repeated exposure to ingroup members results in learning those dimensions that reflect recurring and enduring features found in faces of ingroup members. Although it is unclear what these dimensions are, and their number and metric are also unclear (Levin, 2000), it is assumed that they reflect facial features that facilitate withingroup differentiation such as eye color, hair color, skin tone, and skin texture. Knowledge and use of these dimensions to encode and process frequently encountered faces develops relatively early, possibly before 5 years of age (Sangrigoli & de Schonen, 2004a, 2004b), and by 10 years of age children can recognize familiar faces presented upright, inverted, scrambled, or with extraneous features such as hats, glasses, and different hair (Carey & Diamond, 1977; Friere & Lee, 2001; Gilhrist & McKone, 2003; Rhodes, Tan, Brake, & Taylor, 1989; Sangrigoli & de Schonen, 2004a; Tanaka et al., 1998). Familiar others are better recognized because people use the generated dimensions to create facial exemplars that define those dimensions. When one is introduced to a new ingroup member, characteristics of that face are located on dimensions nearest the exemplar that best represents features of the new face. Because there are many dimensions, exemplars are well distributed in face space; as a result, accurate recognition is likely because fewer exemplars are activated at retrieval (Valentine, 1991; Valentine & Endo, 1992).

In contrast, because people often have less exposure to outgroup members than to ingroup members, perceivers have difficulty in distinguishing between previously presented faces and new faces of outgroup members. Difficulties arise because people may use dimensions appropriate for processing faces of ingroup members, use only one of many possible dimensions available (e.g., skin tone), and/or use irrelevant superficial cues to encode faces of outgroup members (e.g., big lips, shiny forehead). One consequence of such encoding is that exemplars corresponding to faces of outgroup members are clustered closely together in face space; as a result, accuracy is reduced because many exemplars are activated at encoding or retrieval. In the face space model, the "they all look the same to me" effect reflects the manner in which faces of outgroup members are encoded, processed, and retrieved from memory.

Study 1: Recognition of faces of adult ingroup and outgroup members

Results of studies on children's processing of facial information (Friere & Lee, 2001; Gilhrist & McKone, 2003; Sangrigoli & de Schonen, 2004b; Tanaka et al., 1998) and recent studies on biases in face recognition (Pezdek et al., 2003; Sangrigoli & de Schonen, 2004a, Study 3) suggest that from a young age children use appropriate dimensions for encoding facial information about ingroup members and that such use remains relatively constant across age (for alternate explanations of these results, see Brigham, 2002). One implication of these ideas is that children should be more accurate in recognizing faces of ingroup members than in recognizing faces of outgroup members and that level of accuracy should be similar across a wide age range. Children and adults, however, are more than just accurate recognizers of familiar others. Slone, Brigham, and Meissner (2000) suggested that biases in face recognition stem more from differences in false alarms (rather than level of accuracy) made in response to faces of ingroup faces as compared with faces of outgroup members. This idea is examined in Study 1 by looking at the proportion of false alarms made in response to faces of ingroup and outgroup members and beta (B″), a composite measure of response bias derived from signal detection theory. Knowing and using appropriate dimensions to process familiar others should also be reflected in metacognitive measures of information processing. Because fewer exemplars are activated during processing, judgments of whether ingroup members had been seen previously should be made more quickly and with more confidence than is the case when judging whether outgroup members had been seen previously. In Study 1, participants should (a) be more accurate in recognizing previously seen faces of ingroup members than in recognizing faces of outgroup members, (b) show fewer false alarms when responding to new faces of ingroup members than when responding to new faces of outgroup members, (c) respond more quickly to previously seen faces of ingroup members than to previously seen faces of outgroup members, and (d) show greater diagnostic use of confidence in judgments about ingroup members than in judgments about outgroup members. These hypotheses were tested in Study 1 by asking Euro-Canadian children in Grades 2 to 8 and young adults to recognize previously seen faces of Euro-American and African American adults. Results of Study 1 raised questions about whether biases in face recognition extend to children's memory of their peers and whether such biases are associated with the level of children's intergroup contact. These questions were addressed in Study 2.

Method

Participants

A total of 169 Euro-Canadians from six public schools and students attending university classes participated in Study 1. Approximately 28% of the participants were in Grades 2 to 4 (mean age = 9.21 years, $SD = 0.93$), 27% were in Grades 5 and 6 (mean age = 11.09 years, $SD = 0.72$), 22% were in Grades 7 and 8 (mean age = 12.79 years, $SD = 0.58$), and 21% were students from introductory psychology classes (mean age = 20.03 years, $SD = 2.16$) who participated in exchange for course credit. Participants within the grade levels used here were selected for study because these levels are comparable to those used by Chance and colleagues (1982). The six schools from which children were drawn have been relatively stable in their racial/ethnic compositions, with most of the students being of European heritage, 30–40% being of Native Canadian origins, and 1–2% being of Asian backgrounds. There were no African Canadian children enrolled in any of the participating schools. The six schools were homogeneous in their socioeconomic status; the catchment area could be described as lower–lower to middle–middle class.

Stimulus materials

Photographs of African American and Euro-American adults were taken from a large database of photographs maintained by the second author. To control for factors that increase recognition accuracy (Meissner, Brigham, & Butz, 2005; Vokey & Read, 1992), 20 undergraduate psychology students rated, on appropriately labeled 7-point scales, each pictured individual's face on level of physical attractiveness ("How attractive is this person?"), memorability ("Suppose you saw this person at a bus stop; how likely is it that you would remember them?"), and distinctiveness ("Look at this person's face; how distinctive are the features either singly or taken together?"). The 76 photographs that fell between 3.0 and 5.0 on all scales were used in Study 1 (19 from each group membership and gender category).

In traditional face recognition studies, two sets of photographs are created. The first set consists of photographs shown during the initial encoding phase of the study. The second set, shown later during the recognition phase, consists of a subset of photographs from the first set and new photographs. In Study 1, photographs shown at encoding consisted of 24 gray scale images (12 gender-balanced photographs from each group membership category) randomly drawn from the larger pool of 76 photographs. These photographs showed adults wearing street clothes and standing in front of a gray background in a full frontal smiling pose. Photographs shown during the recognition phase consisted of 12 randomly selected photographs (3 gender-balanced photos from each group membership category) from those shown at encoding and 36 distracter photographs (9 gender-balanced photos from each group membership category) randomly selected from the pool of 76 photographs. Photographs displayed at recognition showed people wearing gray-colored sweatshirts and standing in front of a gray background in a full frontal nonsmiling pose. Changes in clothing and expression were done to ensure that judgments reflected responses to invariant facial features rather than to attributes associated with the photographs.

Procedure

Practice session

Children who received parental permission to participate and who themselves agreed to be tested were taken by a female tester to a quiet area of the school or, in the case of the university students, were asked to report to a testing room. Participants sat before a laptop computer and were informed that they would be shown some drawings and should pay attention because some questions would be posed later. To familiarize participants with providing recognition and confidence judgments on the computer, 10 pen and ink drawings were shown for 2500 ms, each followed by a 1500 ms interstimulus interval (ISI, a blank white slide). The presentation of the drawings was randomized across participants. After the final drawing, participants spent 5 min completing a nonverbal perceptual filler task (e.g., mazes, puzzles, hidden figures). Following this task, participants were instructed that they would now see more drawings, some of which would be new and others of which they had seen before. Of the previous 10 drawings, 3 were randomly selected for presentation at test along with 9 new distracter drawings. Participants were told to respond as quickly as possible and to indicate whether each drawing was new or old by pressing a key labeled "O" for old or "N" for new. Each participant received a different random order of the drawings. Following each drawing, a confidence rating slide appeared and consisted of five circles of increasing diameter with the numbers 1–5 written below each one and with the labels *not very sure*, *not sure*, *sort of sure*, *quite sure*, and *very sure* written below the numbers. When the first confidence slide appeared, the tester said,

> You said that the last picture you saw was old [or new]. Now I would like you to say how sure you are about what you said. If you are not very sure, press 1, or press 5 if you are very sure the picture was old [or new]. If you are not sure, press 2, or quite sure, press 4, and if you are sort of sure, press 3.

The tester watched to see whether children understood the instructions and repeated them if necessary. Instructions for providing confidence ratings were repeated for the second drawing, after which participants were able to rate their level of confidence for the remaining drawings without any further help.

Face recognition task

Following the practice session, participants were shown the 24 photos of African American and Euro-American adults contained in the encoding set. Participants were asked to watch each photograph carefully because they would need to answer some questions later. Faces were presented for 2500 ms followed by a 1500 ms ISI (a blank white slide). Presentation of the faces was randomized across participants. Following encoding, participants worked for 10 min on a nonverbal perceptual filler task. After the filler task, participants were shown the 48 photographs of African American and Euro-American males and females contained in the recognition set. Each photograph was shown for 2500 ms followed by a 1500-ms ISI (a blank white slide). On seeing each face, participants were asked to respond as quickly as possible by pressing a key labeled "O" for old if the face had been seen before or pressing a key labeled "N" for new if the face was new. Each participant received a different random order of the photographs. It seemed, at the time, to be an onerous and tiring task to ask children to rate their confidence on all 48 faces. For this reason, we arbitrarily chose 16 trials (4 in each group membership–gender combination) on which participants were asked to rate their confidence as to whether the previously seen photograph was old or new. The 16 trials were randomly chosen for each participant but were constrained to ensure that an equal number of old and new ratings was obtained in each group membership and gender combination. A computer program (DirectRT) recorded participants' judgments and ratings and the time taken to respond.[2]

Following the recognition phase, participants rated their overall level of confidence in recognizing "White" and "Black" faces on two separate 5-point scales labeled *not really sure at all* (1), *sort of sure* (2), *pretty sure* (3), *very sure* (4), and *completely sure* (5). Participants were thanked for their help, were told that they had done well, and (in the case of the children) were returned to their classrooms.

[2] The time taken to make confidence ratings reflects several sources of variance such as time taken to find numbers 1–5 on the keypad and looking time from screen to keypad. For these reasons, the time taken to make confidence ratings is not discussed further.

Results

A 4 (Grade Level: Grades 2–4, Grades 5 and 6, Grades 7 and 8, or young adults) × 2 (Participant Gender: male or female) × 2 (Group Membership: photographs of ingroup members or photographs of outgroup members) × 2 (Gender Cues Contained in the Photograph: male or female) analysis of variance (ANOVA) with repeated measures on the last two factors was conducted on all measures discussed here. Initial analysis indicated few significant effects for participant gender or gender cues contained in the photograph, and of those that were significant, none bears on the hypotheses being tested and none alters any of the results or conclusions discussed below. For these reasons, responses were collapsed across these variables and all outcome measures were analyzed in a 4 (Grade Level) × 2 (Group Membership) ANOVA with repeated measures on the last factor.[3]

Discrimination accuracy and response bias

Discrimination accuracy (A′) and response bias (B″) (for calculation formulas, see Donaldson, 1992) were used to examine recognition of previously presented photographs of ingroup and outgroup members. A′ can range from 0 to 1, with higher scores indicating greater recognition accuracy, and B″ can range from −1 to +1, with higher scores indicating that a more conservative criterion was adopted before responding. As predicted, participants were more accurate ($M = 0.69$, $SD = 0.15$) in identifying faces of ingroup members than in identifying faces of outgroup members ($M = 0.60$, $SD = 0.16$), $F(1, 165) = 28.302$, $p < .0001$, $MSE = 0.02$. Analysis of B″ scores revealed that a more conservative criterion was adopted when participants responded to faces of ingroup members ($M = 0.62$, $SD = 0.38$) than when they responded to faces of outgroup members ($M = 0.08$, $SD = 0.43$), $F(1, 165) = 383.62$, $p < .0001$, $MSE = 0.06$. Euro-Canadian children, like adults, were more accurate in identifying faces of ingroup members than in identifying faces of outgroup members, and they adopted a more conservative criterion when responding to faces of ingroup members (Slone et al., 2000).

Hits and false alarms

Measures of discrimination accuracy and response bias reflect the ratio of hits to false alarms. To explore where ingroup biases in A′ and B″ arise, separate ANOVAs were done on the proportion of hits and the proportion of false alarms made in response to old and new faces of ingroup and outgroup members. More hits were made in response to faces of outgroup members ($M = 0.59$, $SD = 0.21$) than in response to faces of ingroup members ($M = 0.42$, $SD = 0.21$), $F(1, 165) = 65.26$, $p < .0001$, $MSE = 0.03$. In contrast, more false alarms were made in response to faces of outgroup members ($M = 0.45$, $SD = 0.17$) than in response to faces of ingroup members ($M = 0.19$, $SD = 0.13$), $F(1, 165) = 451.84$, $p = .0001$, $MSE = 0.01$. Ingroup members were not necessarily more accurate in identifying previously seen ingroup members; rather, they were less likely to

[3] Results of the ANOVA from the full model for Studies 1 and 2 are available from the first author.

make errors in misidentifying which ingroup members they had actually seen (Slone et al., 2000).[4]

Confidence ratings

Analysis of online confidence ratings of previously seen faces of ingroup and outgroup members indicated greater expressed confidence in recognizing previously seen outgroup members ($M = 3.21$, $SD = 1.73$) than in recognizing previously seen ingroup members ($M = 2.46$, $SD = 2.03$), $F(1, 164) = 11.57$, $p < .008$, $MSE = 3.78$. In contrast, analysis of confidence ratings of responses to new ingroup and outgroup members revealed higher levels of confidence in recognizing new faces of ingroup members ($M = 3.90$, $SD = 0.79$) than in recognizing new faces of outgroup members ($M = 3.63$, $SD = 1.01$), $F(1, 1640) = 15.17$, $p < .001$, $MSE = 0.379$.

Analysis of overall levels of confidence revealed that grade school participants (Ms = 3.17, 2.99, and 2.95, SDs = 0.97, 0.84, and 0.80) were more confident than young adults ($M = 2.39$, $SD = 0.76$), $F(3, 164) = 8.77$, $p < .0001$, $MSE = 1.01$, and that greater confidence was expressed about judgments of ingroup faces ($M = 2.98$, $SD = 0.85$) than about judgments of outgroup faces ($M = 2.82$, $SD = 0.96$), $F(1, 164) = 5.89$, $p = .02$, $MSE = 0.47$. These effects were qualified by a Grade Level × Group Membership interaction, $F(3, 164) = 4.84$, $p = .003$, $MSE = 0.47$. Children in Grades 2 to 4 were more confident in rating ingroup members ($M = 3.26$, $SD = 0.92$) than were young adults ($M = 2.72$, $SD = 0.74$), and children in public school (Ms = 3.09, 3.04, and 2.95, SDs = 1.01, 0.89, and 0.76) were more confident in rating outgroup members than were young adults ($M = 2.06$, $SD = 0.79$).[5]

Confidence–accuracy relations

Participants' overall level of confidence and their confidence when making correct rejections were higher when responding to faces of ingroup members than when responding to

[4] To conserve space, only a summary of the response time data is presented; a complete listing of the effects is available from the first author. Analysis of the amount of time taken to accurately recognize previously seen photographs of ingroup and outgroup members revealed that participants responded faster to photographs of ingroup members ($M = 1034$ ms) than to photographs of outgroup members ($M = 1344$ ms) and that children in Grades 5 and 6, children in Grades 7 and 8, and young adults all were significantly faster than children in Grades 2 to 4. Analysis of the time taken recognize new photographs of ingroup and outgroup members (correct rejections) revealed faster responses to photographs of outgroup members ($M = 1307$ ms) than to photographs of ingroup members ($M = 1758$ ms) and that children in Grades 5 and 6, children in Grades 7 and 8, and young adults all were significantly faster than children in Grades 2 to 4. A Group Membership × Grade Level interaction, $F(3, 164) = 5.01$, $p < .002$, showed that participants at all grade levels were slower in responding to new faces of ingroup members than to new faces of outgroup members; this effect was greater for participants in Grades 2 to 4.

[5] Participants in Study 1 included 33 children, of whom 68% were Native Canadian, 5% were Asian Canadian, and 26% were from other racial/ethnic groups. Because preliminary analysis revealed no significant effects for gender, ethnic origin, or gender cues contained in the photograph, responses were collapsed across these variables and entered into a 4 (Grade Level) × 2 (Group Membership) ANOVA with repeated measures on the last factor. The analysis revealed that these participants, like their majority group peers, were significantly more accurate in identifying photographs of majority group adults ($M = 0.69$) than in identifying photographs of minority group adults ($M = 0.62$), adopted a higher criterion when making judgments about Euro-Americans ($M = 0.66$) than when making judgments about African Americans ($M = 0.12$), and were faster in responding to new photos of Euro-Americans than in responding to new photos of African Americans.

faces of outgroup members. What is unclear in these results is whether confidence is more diagnostic of accuracy in identifying faces of ingroup members. To examine relations between accuracy and confidence, γ coefficients were calculated between each participant's online confidence ratings and his or her accuracy (hits + correct rejections). The resulting coefficients were entered into a 4 (Grade Level) × 2 (Group Membership) ANOVA with repeated measures on the last factor. As predicted, the analysis revealed stronger confidence–accuracy relations when responding to faces of ingroup members ($M = 0.24$, $SD = 0.65$) than when responding to faces of outgroup members ($M = -0.01$, $SD = 0.68$), $F(1, 154) = 10.93$, $p = .001$, $MSE = 0.46$. Participants' confidence in judging faces of ingroup members was more diagnostic of accuracy in differentiating between old and new photographs of them than was the case when judging faces of outgroup members.

Discussion

It was predicted that Euro-Canadian children and young adults would be more likely to recognize previously seen faces of ingroup members than to recognize previously seen faces of outgroup members. This prediction was supported. Participants, regardless of age, were more accurate in recognizing faces of previously presented adults from their ingroup than in recognizing faces of previously presented adults from their outgroup. Own-group biases in face recognition were not limited to measures of recognition accuracy. Participants responded faster to (see footnote 4), and expressed more overall confidence in, judgments about ingroup members as compared with judgments about outgroup members, and online confidence ratings were more diagnostic of accuracy for faces of ingroup members than for faces of outgroup members. These results depart from those reported by Chance and colleagues (1982), who found linear increases in own-group biases with age. Although procedural differences (see General discussion later) can account for some of the contrast between the current study and that of Chance and colleagues, it is interesting to note that results of Study 1 are consistent with other studies (e.g., Carey & Diamond, 1977; Friere & Lee, 2001; Pezdek et al., 2003; Sangrigoli & de Schonen, 2004a) that found that by early elementary school, children know and apply appropriate dimensions for encoding faces of familiar others in a way that leads to accurate retrieval of previously seen faces (Valentine, 1991). It is important to note, however, that in the current results, unlike the results from recent studies, there were no significant effects for grade or age on any outcome measure. Although there were methodological differences between Study 1 and more recent studies, the absence of grade effects cannot be attributed to a lack of power; with post hoc power analysis indicating a beta exceeding 0.99 (Buchner, Erdfelder, & Faul, 1997).

It is somewhat misleading to say that participants were more accurate in identifying faces of ingroup than in identifying faces of outgroup members given that analysis of hits and false alarms presents a more complex picture. On the one hand, participants recognized familiar outgroup members more often than they recognized familiar ingroup members; on the other hand, participants were two and a half times more likely to correctly recognize new faces of ingroup members as new than to make similar judgments about new faces of outgroup members. As Valentine (1991) argued, own-group biases in face recognition appear to be less a matter of getting it right as of not getting it wrong. One way of not getting it wrong is to raise the response criterion or degree of certainty needed before saying "old" to what appears to be a familiar ingroup member. In this study, the response criterion for ingroup member faces was nearly eight times that observed when recognizing faces of outgroup members.

Alternatively, differences in the response criterion may reflect the distribution of exemplars within face space. According to face space theory (Valentine, 1991), one consequence of the denser clustering of faces of outgroup members is that participants should take more time to decide whether an outgroup member was seen previously or was new and should be less confident in their judgments about outgroup members than about ingroup members. Results of Study 1 are generally consistent with both ideas; participants responded faster (see footnote 4) and, on overall ratings, with more confidence to faces of ingroup members than to faces of outgroup members. What this may mean is that not only are exemplars more evenly distributed along dimensions defining the ingroup's face space, but also fewer of them are activated when deciding whether a face is old or new.

Study 2: Recognition of children's faces

In criminal cases, adults make up the majority of witnesses and those accused of crimes. For these reasons, it makes good sense that studies of biases in face recognition use photographs of adults as stimuli. What remains unclear and largely neglected, however, is what children remember about faces of peers who are members of their ingroup or their outgroup. This question is more than just one of external validity; what children remember about their peers addresses several theoretical questions. Results of a number of studies have shown own-group biases in judgments, evaluations, preferences, and recall of information about ingroup peers (e.g., Corenblum, 2003), and group biases in processing visual information are also possible. Moreover, multidimensional face space theory (Valentine, 1991) would predict that once children know and are able to use dimensions for processing faces of ingroup members (Sangrigoli & de Schonen, 2004a), it matters little whether the face is that of an adult or a child; own-group biases should be seen when children attempt to recognize faces of ingroup peers. In Study 2, these ideas were tested by asking Euro-Canadian children and young adults to recognize previously seen faces of children who were members of participants' ingroup or outgroup.

Study 2 also examined relations between individual differences in the amount of contact that participants have with outgroup members and their accuracy in identifying faces of previously seen outgroup members. According to the contact hypothesis and face space theory, for different reasons, accuracy in identifying previously seen outgroup members should be associated with the quality and quantity of contact with outgroup members (Allport, 1954; Chiroro & Valentine, 1995; Pettigrew, 1998; Sporer, 2001). Although support for the contact hypothesis has been equivocal (Meissner & Brigham, 2001), studies examining relations between contact and recognition accuracy have used adult participants. A more direct test of the hypothesis would be among school-age children where outgroup contact is part of the informal school curriculum. Relations between level of intergroup contact and recognition of faces of outgroup members was addressed in Study 2 by relating measures of Euro-Canadian children's intergroup contact to their recognition of faces of more and less familiar outgroup peers. In the schools where Study 2 was conducted, approximately 40% of the enrollments are from children of Native Canadian ancestry, but there are no African Canadian children in these schools, and in the city as a whole there are only a few people of African Canadian heritage.

Valentine's (1991) multidimensional face space model would predict that because participants within the grade levels used here know the dimensions for encoding faces of ingroup members and, to a lesser degree, the dimensions for processing faces of known outgroup members, the results of Study 2 should be similar to those reported in Study 1. Specifically, it was predicted that in Study 2, (a) Euro-Canadian participants should be more accurate, express more confidence, show a more conservative response bias, and respond more quickly when shown faces of previously seen ingroup members than when shown faces of previously seen outgroup members; (b) participants should have higher levels of accuracy, more conservative bias scores, faster responses, and more confidence in judgments when shown previously seen faces of Native Canadian children than when shown previously seen faces of African American children; and (c) according to the contact hypothesis, positive relations should be found between individual difference measures of intergroup contact and recognition of previously seen faces of Native Canadian children.

Method

Participants

A total of 161 Euro-Canadians from six public schools described in Study 1 and students attending university classes participated in Study 2. Of these participants, 27% were in Grades 2 to 4 (mean age = 8.83 years, $SD = 0.75$), 31% were in Grades 5 and 6 (mean age = 10.68 years, $SD = 0.63$), 22% were in Grades 7 and 8 (mean age = 12.47 years, $SD = 0.63$), and 20% were students from introductory psychology classes (mean age = 20.39 years, $SD = 3.68$) who participated in exchange for course credit.

Materials

Stimulus materials

Photographs of 7- to 10-year-old African Americans, Native Canadians, and Euro-Canadians were obtained from old school photographs, magazines, and modeling agencies. Photographs were rated on appropriately labeled 7-point scales (for details and rationale, see Study 1) by 32 undergraduate psychology students on levels of perceived physical attractiveness, memorability, and distinctiveness. Photographs of faces that fell between 3.0 and 5.0 on all scales ($N = 78$) were retained for study. As in Study 1, two sets of gray scale photographs were created from this pool: an encoding set containing 24 photographs (8 gender-balanced photos from each group membership category) randomly chosen from the larger pool. Photographs in this set showed children wearing street clothes and standing in front of a gray background in a full frontal smiling pose. Photographs in the recognition set consisted of 54 new faces (18 gender-balanced photos from each group membership category) randomly drawn from the larger pool and 18 previously seen photographs from the encoding set (6 gender-balanced photos from each group membership category). To reduce the likelihood that cues associated with the photographs rather than face recognition guided recognition judgments, the background of each photograph was altered from gray shades seen at encoding to gray diagonals seen at recognition.

Measures of intergroup contact

After completing confidence ratings (described subsequently), participants responded to questions about their level of contact with Native Canadians. Participants were asked to indicate on a 5-point scale (1 = *never* to 5 = *more than three times*) how often, during the past week, they had talked to a Native child, shared snacks with a Native child, ate lunch with a Native child, walked home with a Native child, invited a Native child to play at their house, and worked on class projects with a Native child. On all questions except sharing snacks, participants also indicated whether the activity was done with one or more than one Native child. Other questions queried participants about how many Native friends they had in their class or school (1 = *none* to 5 = *more than five*) and, if they do have such friends, whether they were *OK kids* (1), *good friends* (2), *your best friends* (3), or *your very best friends* (4). For university participants, the wording of some questions was changed to fit their circumstances (e.g., “sharing snacks” was changed to “sharing food”, “playing in your house” was changed to “hanging out at your place”).

Procedure

The procedures used in Study 2 closely followed those used in Study 1. As before, participants were administered the practice session used in Study 1 to familiarize them with the recognition task. The face recognition task was then given by presenting 24 faces in the encoding set at a presentation rate of 2500 ms with a 1500-ms ISI (a blank white slide). Following a 10-min distracter task similar to that used in Study 1, 72 faces from the recognition set were presented at a presentation rate of 2500 ms with a 1500-ms ISI (a blank white slide). The order of presentation of faces at encoding and test was randomized across participants. Participants were asked to respond as quickly as possible using the keys labeled “O” (for old) and “N” (for new). Confidence ratings were again collected (in the manner detailed in Study 1) for a randomly selected one third of faces presented at recognition. After completing the recognition phase, participants rated their overall level of confidence in recognizing “White,” “Black,” and “Native” faces in the manner described earlier and then answered questions about their level of contact with Native Canadians.

Results

A 2 (Participant Gender: male or female) × 4 (Grade Level: Grades 2–4, Grades 5 and 6, Grades 7 and 8, or young adults) × 3 (Group Membership: African American, Euro-Canadian, or Native Canadian) × 2 (Gender Cues Contained in the Photograph: male or female) ANOVA with repeated measures on the last two factors was conducted on all performance measures presented below. As in Study 1, the analysis yielded few significant effects for gender cues contained in the photograph or participant gender, and of the effects that were significant, none bears on any hypothesis discussed below. For these reasons, responses to all outcome measures were collapsed across both variables and analyzed in a 4 (Grade Level) × 3 (Group Membership) ANOVA with repeated measures on the last factor.

Discrimination accuracy and response bias

Analysis of discrimination accuracy scores (A′) revealed, consistent with predictions, $F(2, 314) = 9.17$, $p = .002$, $MSE = 0.01$, that participants were more accurate in identifying faces of ingroup members ($M = 0.79$, $SD = 0.14$) than in identifying faces of outgroup members (African American, $M = 0.73$, $SD = 0.13$; Native Canadian, $M = 0.77$, $SD = 0.15$),

Fs$(1, 314) = 88.87$ and 4.00, ps $< .0001$ and .05. In addition, and consistent with predictions, faces of Native Canadian children were recognized more accurately than were faces of African American children, $F(1, 314) = 8.13$, $p < .0001$. The analysis also revealed that young adults ($M = 0.81$, $SD = 0.08$) and participants in Grades 7 and 8 ($M = 0.78$, $SD = 0.09$) were more accurate in identifying previously seen faces of ingroup and outgroup members than were participants in Grades 2 to 4 ($M = 0.73$, $SD = 0.09$) and Grades 5 and 6 ($M = 0.76$, $SD = 0.11$), $F(3, 157) = 8.58$, $p = .0001$, $MSE = 0.02$.

Analysis of response bias scores (B″) revealed that participants adopted a more conservative criterion when responding to faces of ingroup members ($M = 0.71$, $SD = 0.38$) than when responding to faces of African American ($M = -0.08$, $SD = 0.48$) and Native Canadian ($M = -0.29$, $SD = 0.67$) children, $F(2, 314) = 256.18$, $p < .0001$, $MSE = 0.17$; differences between all three means were significant, $p < .0001$. The analysis also revealed that as grade level increased, participants adopted a more liberal response criterion in responding to faces of ingroup and outgroup members, $F(3, 153) = 5.84$, $p < .001$, $MSE = 0.42$. These effects were qualified by a Group Membership × Grade Level interaction, $F(6, 314) = 3.40$, $p = .003$, $MSE = 0.17$. As shown in Table 1, young adults adopted a more liberal response criterion when responding to photographs of African American and Native Canadian children compared with all other participants, whereas children in Grades 5 and 6 and Grades 7 and 8 adopted a more liberal criterion than did those in Grades 2 to 4 (all ps $= .05$). Although grade-level participants showed no significant differences in the response criterion adopted across outgroup faces, young adults adopted a more liberal criterion when judging photographs of Native Canadian than when judging photographs of African American children, $p = .05$.

Hits and false alarms

Analyses of the proportion of hits made in response to faces of ingroup and outgroup members revealed that more hits were made in response to faces of African American ($M = 0.72$, $SD = 0.20$) and Native Canadian ($M = 0.74$, $SD = 0.24$) children than in response to faces of Euro-Canadian children ($M = 0.48$, $SD = 0.22$), $F(2, 314) = 94.63$, $p < .0001$, $MSE = 0.04$. The analysis also revealed that young adults produced more hits ($M = 0.75$, $SD = 0.16$) than did participants in Grades 2 to 4 ($M = 0.56$, $SD = 0.23$), $F(3, 157) = 6.56$, $p = .0001$, $MSE = 0.07$.

Table 1
Means (and standard deviations) of response bias scores for each level of grade and group membership in Study 2

Group membership	Grade level			
	2–4	5–6	7–8	University
Euro-Canadian	0.80	0.74	0.69	0.67
	(0.38)	(0.41)	(0.32)	(0.41)
African American	0.10	–0.02	–0.09	–0.27
	(0.50)	(0.52)	(0.45)	(0.34)
Native Canadian	0.05	–0.24	–0.24	–0.68
	(0.69)	(0.69)	(0.64)	(0.45)

Note. Standard deviations are in parentheses.

Analysis of the proportion of false alarms made in response to new photographs indicated a significant effect for group membership, $F(2, 314) = 281.23$, $p < .00001$, $MSE = 0.02$. Consistent with predictions, more false alarms were made in response to new photographs of African American children than in response to new photographs of Native Canadian children (Ms = 0.41 and 0.35, SDs = 0.18 and 0.18), $F(1, 314) = 15.00$, $p < .0001$, and more false alarms were made in response to photographs of Native Canadian children than in response to photographs of Euro-Canadian children ($M = 0.097$, $SD = 0.10$), $F(1, 314) = 254.50$, $p < .00001$.[6]

Confidence ratings

Analysis of online confidence ratings of previously seen photographs indicated that greater confidence was expressed when faces of African American and Native Canadian children (Ms = 3.76 and 3.59, SDs = 1.36 and 1.46) were correctly recognized than when faces of Euro-Canadian children ($M = 2.91$, $SD = 1.99$) were correctly recognized, $F(2, 306) = 12.52$, $p < .0001$. Analysis of online confidence ratings of correct rejections indicated that more confidence was expressed in correctly rejecting new faces of ingroup members ($M = 4.03$, $SD = 0.74$) than in correctly rejecting new faces of African Americans and Native Canadians (Ms = 3.61 and 3.70, SDs = 1.11 and 1.04), $F(2, 306) = 18.22$, $p < .0001$. Analysis of participants' overall confidence in recognizing faces of "White", "Black", and "Native" children revealed no significant main effects or interactions.

Confidence–accuracy relations

As in Study 1, γ coefficients were calculated between participants' online confidence ratings and their accuracy in recognizing faces of ingroup and outgroup members. A 4 (Grade Level) $\times$ 3 (Group Membership) ANOVA with repeated measures on the last factor revealed only a marginal interaction between grade level and group membership, $F(6, 300) = 1.92$, $p = .07$, $MSE = 0.38$. Post hoc tests indicated that for participants in Grades 5 and 6 (Ms = .32 and .15, SDs = 0.68 and 0.65) and young adults (Ms = .41 and .04, SDs = 0.64 and 0.53), confidence was more diagnostic of accuracy when recognizing ingroup members than when recognizing Native Canadians; however, for participants in Grades 2 to 4, this trend was reversed (Ms = .04 and .20, SDs = 0.77 and 0.78).

[6] As in Study 1, to conserve space, a summary of the response time data is presented; a complete listing of the effects is available from the first author. The amount of time taken to accurately recognize previously seen photographs of ingroup and outgroup members revealed faster responses to faces of ingroup members ($M = 703$ ms) than to faces of African American children ($M = 920$ ms) and Native Canadian children ($M = 946$ ms) who were not significantly different from each other. The analysis also revealed that older participants were faster in responding to previously seen photographs of group members than were younger participants. Analysis of the amount of time taken to accurately respond to new photographs (correct rejections) indicated that faster responses were made to photographs of African American children ($M = 806$ ms) than to photographs of Native Canadian children ($M = 886$ ms), which in turn were responded to faster than photographs of Euro-Canadian children ($M = 1077$ ms). The analysis also indicated that older participants responded faster to photographs of group members than did younger children.

Individual differences in outgroup contact

A measure of intergroup contact ($\alpha = .81$) was formed from the sum of responses to questions assessing the frequency with which participants talked to, shared snacks with, ate lunch with, walked home with, worked with, and invited home Native peers as well as the quality and quantity of their friendships with Native peers. Correlations between level of intergroup contact and proportion of hits, false alarms, A′, and B″ made in response to photographs of Native Canadian children indicated positive but nonsignificant relations between contact and false alarms ($r = .02$) and B″ ($r = .17$) but indicated negative relations between contact and hits ($r = -.16$, $p = .05$) and A′ ($r = -.17$, $p = .03$). An analysis of covariance with contact entered as a continuous measure along with grade level and group membership was conducted on all of the outcome measures discussed above and revealed no significant main effects or interactions for level of intergroup contact on any outcome measure.[7]

Discussion

According to multidimensional face space theory (Valentine, 1991), one result of encoding faces on appropriate dimensions is that exemplars defining those dimensions are well distributed in face space; as a result, there is less overlap between to-be-recognized faces and those stored in memory. One consequence of this is that people should be more accurate in identifying faces of ingroup members than in identifying faces of outgroup members. Results reported in Study 2 were consistent with these theoretical ideas. Children and adults not only were more accurate in recognizing faces of ingroup members than in recognizing faces of outgroup members, they also were faster in responding to previously seen faces of ingroup members (see footnote 6) and more confident in judgments about new faces of ingroup members than they were when responding to new faces of outgroup members.

There are interesting parallels between results reported in Study 2 and those found in Study 1. In both studies, faces of ingroup members were more accurately recognized than were faces of outgroup members. Multidimensional face space theory would predict that better discrimination of ingroup faces should occur because children and adults use dimensions appropriate for encoding faces of ingroup members and it matters little whether such faces are those of children or adults. Along similar lines, in both studies, biases in recogni-

[7] Participants in Study 2 included 33 children, of whom 57% were Native Canadian, 21% were Asian Canadian, and 21% were from other non-Caucasian groups. Because preliminary analysis revealed no significant effects for ethnic origin or gender cues contained in the photograph, responses were collapsed across these variables and entered into a 4 (Grade Level) × 2 (Participant Gender) × 3 (Group Membership) ANOVA with repeated measures on the last factor. The analysis revealed a Participant Gender × Group Membership effect, $F(2, 58) = 3.04$, $p < .055$. Females were more accurate in identifying faces of Native Canadian children ($M = 0.86$) than in identifying faces of White children ($M = 0.74$) or African American children ($M = 0.68$). Males were not significantly different in recognizing faces of White, African American, and Native Canadian children. Analysis of the bias scores indicated that participants adopted a higher response criterion ($M = 0.62$) when responding to faces of White children than when responding to faces of African American children ($M = 0.06$) and Native Canadian children ($M = 0.05$). Participants were faster in responding to new faces of children from the majority group ($M = 1762$ ms) than in responding to new faces of African American children ($M = 2125$ ms) and Native Canadian children ($M = 2015$ ms).

tion accuracy arose more from a criterion shift when judging previously seen ingroup members than from more hits being recorded (Slone et al., 2000). Less than half of previously seen ingroup members were correctly recognized in Study 2, but nearly three quarters of previously seen faces of outgroup members were correctly classified. At the same time, however, more than 40% of new faces of African American and Native Canadian children were misclassified as old compared with less than 10% of new faces of Euro-Canadian children.

Although there were notable consistencies in responses across studies reported here, there were also some differences. In Study 1, recognition of adult faces was unaffected by grade level. It appears to have mattered little to participants that they were looking at faces of adults; group membership cues guided responses. It might be that dimensions corresponding to mature facial features are known to young children; this is not an unreasonable assumption considering that children in the age range used here have spent many years in the company of adults (see Malpass, 1990). In Study 2, however, adults adopted a more liberal response criterion than did elementary school children when attempting to recognize faces of children. For adults and, to a lesser degree, for children in higher grades, the recognition task was a difficult one because two thirds of the photographs constituted a double outgroup based on age and group membership and one third of the photographs were from a single outgroup based on age. Children in Grades 2 to 4, in contrast, made judgments of a single outgroup based on group membership cues alone. From a theoretical perspective, exemplar density for outgroup faces should be greater for adults and older children than for younger children. It is important to note, however, that it is difficult to assess the independent effect of age and group membership cues on any performance measure because both are confounded in the photographs used here. Perhaps future studies could independently assess the effects of age, group membership, and other cues to determine their influence on measures of recognition accuracy and metamemory.

Study 2 tested predictions from contact theory about relations between self-reported levels of intergroup contact and recognition of faces of Native Canadian peers. There was no evidence here that individual differences in the level of intergroup contact were associated with accurately identifying faces of outgroup members, and where there were significant relations, the direction of those associations was in the opposite direction from that predicted by contact theory (Meissner & Brigham, 2001; Sporer, 2001). In contrast, previously seen photographs of Native Canadians were more accurately recognized than were previously seen photographs of African Americans. Consistent with predictions from perceptual learning theories, repeated and continuous exposure to faces of outgroup members results in acquisition of dimensions appropriate for encoding faces of outgroup members. These results should not be taken to mean that Euro-Canadian children could recognize faces of Native Canadians as easily as they could recognize faces of ingroup members. Participants were less accurate, made more false alarms, and were slower when responding to previously seen photographs of Native Canadians than when responding to photographs of ingroup members. More telling of the evanescent nature of outgroup recognition was the finding that even when participants were correct in differentiating between old and new faces of Native Canadian peers, they were less confident in those judgments than when differentiating between old and new faces of ingroup peers. Repeated exposure to outgroup members does appear to increase the likelihood that dimensions needed to make perceptual discriminations between faces of outgroup members will be learned. At the same time, however, the amount of exposure that ingroup members have to faces of outgroup members is not just less than the amount they have for ingroup members; in addition, exposure to ingroup members is enhanced by peer group relationships that range from overlapping and stable work and play groups to friendships that vary in their levels of intimacy (Aboud, Mendelson, & Purdy, 2003; Jackman & Crane, 1986). Ingroup members know more about other ingroup members—that is, more than just their physiognomy—than they know about outgroup members.

General discussion

In a recent review of research on own-group biases in face recognition, Brigham (2002) queried whether children would show an own-group bias in face recognition and whether children's recognition of outgroup members follows the same developmental path as does their recognition of ingroup members. Results of studies presented here indicate not only that children show an own-group bias in discrimination accuracy but also that such biases extend to measures of response criterion, response time, and confidence. Biases in face recognition have been described as a robust phenomenon (Meissner & Brigham, 2001), and that too was clearly seen in results presented here. Biases were found across several measures and across different samples of participants who were exposed to photographs that varied in terms of group membership, gender, and age cues. Across this diverse stimulus array, children and young adults not only recognized faces of ingroup members more accurately than they recognized faces of outgroup members, but consistent with predictions from contact theory, they also were more accurate in recognizing faces of familiar outgroups than in recognizing faces of less familiar outgroups.

Perhaps the major contribution of the current studies is that, taken together, results reported here are consistent with general predictions from perceptual learning theories in general and from Valentine's (1991) multidimensional face space theory in particular. Repeated and continuous exposure to faces of ingroup (and, to a lesser extent, outgroup) members results in knowing and using those dimensions appropriate for processing and recalling faces of people who perceivers know (reasonably) well, a process that occurs early in life and remains relatively stable across a wide age range.

From a developmental perspective, what is striking about the results of the current studies is that despite differences in ages and grade levels, participants were consistent in their level of accuracy when responding to faces of ingroup and outgroup adults. Children in the youngest age group knew and used the appropriate dimensions for encoding and processing faces of ingroup members in a manner similar to that of older children and adults. Chance and colleagues (1982) also found own-group biases in recognition accuracy, but unlike the current studies, Chance and colleagues' study also reported developmental trends in recognition accuracy. There were a number of methodological differences between Chance and colleagues' study and the current studies. Attention was paid here to the selection and scaling of photographs to reduce the influence of variables associated with face recognition such as level of physical attractiveness (Meissner et al., in press; Vokey & Read, 1992). In addition, different photographs were used at encoding and recognition to ensure that invariant aspects of the face, rather than characteristics of the photograph, guided recognition. Chance and colleagues (1982) clipped photographs from college yearbooks, and although photographs containing distinctive facial features were removed, no attempt was made to scale pictures for cues that might aid in recognition.

Studies on face recognition typically focus on the number of hits or the overall level of accuracy made in response to faces of ingroup and outgroup members. Hits or level of accuracy, however, tell only part of the story. Slone et al. (2000) argued that own-group biases in face recognition may be due more to saying "seen before" to new faces of outgroup members (i.e., false alarm responses) than to accurate recognition of faces of ingroup members. In the current studies, more than one third of responses to new faces of outgroup members were false alarms compared with less than 10% of responses made to new faces of ingroup members. These responses were obtained even though the number of hits made to outgroup faces was larger than that made to ingroup faces. The significant response bias effect observed in both studies may stem from a number of perceptual and cognitive sources such as use of inappropriate dimensions, attention to salient but nondiagnostic encoding cues, and use of stereotypes or other category-based expectancies at each phase of the information processing sequence (Valentine, 1991). Whatever the source, future studies need to attend to the response criterion participants use as well as to the level of accuracy they achieve when discriminating between previously seen ingroup and outgroup members.

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