Birds of a feather get misidentified together: High entitativity decreases recognition accuracy for groups of other-race faces

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Purpose. The cross-race effect can be exaggerated when faces are presented in groups, leading to less accurate eyewitness identifications (Pezdek, O’Brien, & Wasson, 2012, Law Hum. Behav., 36, 488). Our current study examined the effect of entitativity, the degree to which members of a group are perceived as a coherent unit (Campbell, 1958, Behav. Sci., 3, 14), on recognition accuracy for same- and cross-race faces presented in groups.

Methods. White participants viewed 16 slides of 3-face groups (eight White groups, eight Black groups). Prior to viewing the faces they were told that the entitativity of each 3-face group was high (‘friends who do things together’) or low (‘people in line at the bank’). They were then tested on 32 individually presented faces (16 old and 16 new).

Results. When cross-race faces were presented in high rather than low entitativity groups, less accurate face recognition memory resulted. Increasing group entitativity decreased recognition accuracy for cross-race faces but increased recognition accuracy for same-race faces.

Conclusions. The results suggest that the perception of a group negatively impacts eyewitness memory. Contextual factors such as entitativity need to be considered along with other estimator variables when assessing eyewitness identification accuracy.

A major factor contributing to eyewitness identification accuracy is whether the eyewitness and the perpetrator are of the same or different race or ethnicity. Individuals are more accurate identifying faces of their own race than faces of another race, a phenomenon known as the cross-race effect (CRE) or own-race bias (Malpass & Kravitz, 1969). In a meta-analysis by Meissner and Brigham (2001), the CRE was verified as a robust construct ($d = .30$); individuals were 1.4 times more likely to identify correctly a previously seen face if it was a same-race face than a cross-race face, and false alarm rates for new faces were 1.56 times greater for cross-race than same-race faces. Further, the Innocence Project has reported that of the 75% of wrongful convictions involving eyewitness memory, in at least 40% of these misidentifications the victim and perpetrator were of different races (http://www.innocenceproject.org/understand/Eyewitness-Misidentification.php). The CRE has also been observed across numerous ethnic groups and cultures (Chiroro, Tredoux, Radaelli, & Meissner, 2008; Platz & Hosch, 1988) and various ages (Pezdek, Blandon-Gitlin, & Moore, 2003).

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Several social-cognitive theories have been proposed to account for the CRE (see Hugenberg, Young, Bernstein, & Sacco, 2010; Meissner, Brigham, & Butz, 2005; Sporer, 2001; Susa, Meissner, & de Heer, 2010). The primary component in these theories involves differences that occur during encoding of same- and cross-race faces. Hugenberg et al. (2010) proposed the categorization-individuation model (CIM) that describes multiple interacting processes responsible for the CRE. According to the CIM, three processes—categorization, motivation, and experience—interact to determine whether a face is processed using categorization or individuation. Categorization involves attending to and encoding facial information that is characteristic of a category or group such as skin tone; individuation involves attending to and encoding facial features that distinguish among members of the same category. Individuation produces better face recognition memory than categorization.

According to the CIM framework, the first process initiated when viewing a face is social categorization, where a social category is activated. This activation of a social category prompts attention to be directed towards facial information that is diagnostic of that category, such as skin tone. The stronger the social category the more attention is directed towards category diagnostic facial information. Cross-race faces typically elicit stronger category activation than same-race faces. Accordingly, this should elicit stronger attention to category diagnostic facial information in cross-race faces leading to higher recognition memory error rates. The second process in CIM is motivation. If a signal is present that highlights the importance of a face, the perceiver is likely to direct more attentional resources to encoding individuating facial features of that face. The third element in the CIM is the experience the perceiver has discriminating among category members. With more experience, one is better able to discriminate among members of a category, such as race, and more efficient encoding individuating facial features.

In their meta-analysis, Meissner and Brigham (2001) identified estimator variables that moderate the CRE, such as exposure time and test delay. Another factor that moderates the CRE is whether the perpetrator was seen in a group or alone (Pezdek et al., 2012). Pezdek et al. (2012) reported that recognition of cross-race faces was less accurate when a target face was presented in a 3-face group rather than individually; group presentation had no impact on recognition accuracy of same-race faces. Experiment 2 of that study examined face recognition accuracy when viewing a target face in a racially homogeneous versus heterogeneous group. Recognition was less accurate for cross-race faces presented in racially homogeneous than heterogeneous groups. One explanation for these findings is that viewing a cross-race target face in the context of two other cross-race faces (i.e., a racially homogeneous group) increases the priming of outgroup race for those faces. Consequently, these faces are processed even less in terms of their individuating features, and lower recognition accuracy results. Our current study extends these findings and tests if the perception of a group impacts the encoding of cross-race faces. Based on the findings from our previous study, we predict that factors that increase the perception of cross-race faces as outgroup members and therefore increasing categorization, would lead to encoding fewer individuating facial features and further reducing recognition accuracy for cross-race faces compared to same-race faces. Our current study examines how the perceived cohesiveness of a group of individuals affects encoding of the individual faces by manipulating the social psychological construct of entitativity.

Entitativity is the degree to which members of a social group are perceived as a coherent unit (Campbell, 1958; Lickel et al., 2000). Entitativity is determined by many factors including the degree of interdependence among the group members, physical similarity, and proximity (Campbell, 1958; Gaertner & Schopler, 1998). Different types of
groups elicit varying degrees of perceived entitativity. Lickel et al. (2000) identified four distinct types of groups, intimacy groups (e.g., family, friends, relationship partners), task groups (e.g., work groups or committees), social categories (e.g., race, religion, gender), and loose associations (e.g., people at a bus stop). Intimacy groups are rated highest in entitativity; loose associations are rated lowest (Lickel et al., 2000). The relationship between group entitativity and the CRE is important because in real eyewitness cases, same- and cross-race individuals are often observed in groups and the perception of these groups is likely to affect how the individual faces are encoded. Our study examines this important dynamic.

A few studies have examined the effect of entitativity on perception and memory for faces of individuals in a group. Brewer, Weber, and Carini (1995) assigned participants to a ‘majority’ group, a ‘minority’ group, or a control group and had participants watch a video interaction of a group of people that were either in the ‘majority’ or ‘minority’ group. Race was not a factor in their study. They reported that individuals assigned to the ‘majority’ or control condition made more recognition errors and hypothesized that this was due to less individuation of the group members when observing ‘minority’ (or outgroups) than ‘majority’ groups. Further, these researchers suggested that this decrease in individuating members of the minority group may be the result of minority groups being perceived higher in entitativity than majority groups. Dasgupta, Banaji, and Abelson (1999) used physical similarity to manipulate entitativity, specifically by varying the skin tone of racially ambiguous faces. They found that recognition accuracy was poorer for high entitativity (groups with similar skin tone) compared to low entitativity groups (groups with more diverse skin tone). These studies suggest the effect that entitativity may have on recognition accuracy.

Our study examines the effect of group entitativity on the CRE. Although we do not use this study to confirm the CIM framework per se, based on this framework it is predicted that entitativity will affect social categorization, the first prong of the CIM. Specifically, it is predicted that when presented in high rather than low entitativity groups, the perception of cross-race faces as an outgroup will be exacerbated. Consequently, either the outgroup faces will (1) more likely be encoded with processes that involve categorization rather than individuation or (2) be perceived as more homogeneous and more similar to each other. This study does not specifically test which of these processes accounts for the effect of entitativity. However, because both of these processes are associated with encoding more category-congruent than individuating facial features, reduced face recognition accuracy is predicted for cross-race faces presented in high rather than low entitativity groups. No differences in the effect of entitativity on memory for same-race faces is predicted because of the high level of individuation normally associated with encoding same-race faces.

In our study entitativity was manipulated using either high entitativity group instructions (intimacy group) or low entitativity group instructions (loose associations) while looking at a group each consisting of three same- or three cross-race faces. White participants viewed 16 slides of 3-face groups (eight White groups, eight Black groups). Prior to viewing the faces participants read instructions that the entitativity of each 3-face group was high (‘friends who do things together’) or low (‘people in line at the bank’). A recognition memory test followed. A significant 2 (entitativity: high or low) × 2 (race of target face: same-race [White faces] and cross-race [Black faces]) interaction is predicted; recognition memory for cross-race faces is predicted to be less accurate for high entitativity groups than low entitativity groups. No effect on same-race faces is predicted.
This study also tests if in addition to affecting the encoding processes for same- and cross-race faces articulated above; entitativity also alters the phenomenological qualities of memories for same- and cross-race faces. Meissner et al. (2005) used the dual-process approach to assess the phenomenological basis for the CRE. Participants recognized same and cross-race faces and made a Remember/Know/Guess judgment for each test face following the procedures of Gardiner and Richardson-Klavehn (2000). They reported that the CRE reflects greater reliance on recollection (i.e., a higher proportion of Remember responses) for same-race than cross-race faces with no difference in familiarity (i.e., proportion of Know responses). In our study, the Remember/Know procedure was utilized to test for phenomenological differences in memory for same- and cross-race faces in the high versus low entitativity conditions.

Many theories differentiate between recollection and familiarity. According to dual-process models, there are two independent processes involved in recognition accuracy, recollection and familiarity (Wixted & Mickes, 2010; Yonelinas, 2002). Recollection is thought to be supported by more qualitative detailed information, whereas familiarity is thought to be more automatic and lacks the elaborate details found in recollection. More recent dual-process models view both recollection and familiarity as continuous processes that each contribute to the overall memory strength (Wixted & Mickes, 2010). Important to our study is not which of these process models is correct, but rather whether the phenomenological differences in processing reflected by the proportion of Remember versus Know responses to same- versus cross-race faces differs in the high and low entitativity conditions.

Method

Participants and design
A total of 190 White participants were recruited from Amazon.com’s Mechanical Turk (MTurk). MTurk was vetted as a valid data collection method by Paolacci and Chandler (2014), establishing it as a high quality and reliable alternative to traditional methods. The design was a 2 (entitativity: high or low) x 2 (race of target face: same-race [White faces] and cross-race [Black faces]) within-subjects design.

Procedure and materials
This experiment included a presentation phase followed immediately by a test phase using the same procedure as Pezdek et al. (2012). In the presentation phase, participants viewed 16 slides each presenting a 3-face group (eight White male groups and eight Black male groups) with one randomly selected target face in each group. Faces were drawn from Meissner’s database of White and Black faces (http://iilab.utep.edu/stimuli.htm). The target face appeared equally often in the first, second, or third position of each 3-face group, randomized between participants to insure no effect of group position. Each 3-face group was presented for 15 s with a 1.5 s inter-stimulus interval. Presentation was blocked by entitativity condition such that half of the participants were first presented a block of low entitativity instructions followed by eight 3-face groups and then were presented a block of high entitativity instructions.

Consistent with the relevant research literature, in this paper Non-Latino Caucasian people and faces will hereafter be referred to simply as White.
followed by eight 3-face groups. These two conditions were counterbalanced so that half of the participants received high entitativity instructions first and half received low entitativity instructions first. Prior to receiving the entitativity instructions, all participants were told that they would view a series of slides, each presenting three male faces, and their task was to remember the faces because they would be tested on them later. They were not told which of the three faces was the target face nor were they told that they would be tested on only one face per slide.

The entitativity conditions were chosen based on the findings of Lickel et al. (2000) in which participants rated 40 different ‘collections of people’ on a scale from 1 (not a group at all) to 9 (very much a group). ‘Friends who do things together’ was rated high in entitativity \((M = 7.75, SD = 1.72)\), and ‘people in line at the bank’ was rated low in entitativity \((M = 2.40, SD = 1.82)\). As a manipulation check, after reading the entitativity instructions and just prior to the presentation phase, participants were asked to type in the nature of the relationship among the men in each 3-face group they were going to view. This manipulation check was conducted for both the first and the second block of entitativity instructions, and this was used as an exclusion criterion (i.e., when asked what the relationship was among the three men, participants had to indicate the correct response, that they were friends who did things together or people in line at the bank.); 12 participants who did not correctly remember the entitativity instructions from both the first and the second block were excluded from all analyses.

In the test phase, participants viewed 32 faces (half old target faces and half new faces) presented one at a time. They provided two responses to each: (1) they responded ‘old’ or ‘new’, and (2) if they reported that a face was ‘old’, they were asked to describe their memory for the face using the Remember, Know, and Guess responses provided (following procedures of Gardiner & Richardson-Klavehn, 2000). All conditions were counterbalanced across subjects so that in the high and low entitativity conditions each face appeared equally often as a target (i.e., ‘old’) and foil (i.e., ‘new’) test face.

**Results**

A total of 176 participants were included in the analyses – \(M_{age} = 35\) years, \(SD = 12.18\); 82 (46.6%) male and 94 (53.4%) female. Participants were from 35 different states in the contiguous United States with the highest percentage from California (11.9%), Pennsylvania (7.4%), Ohio (6.8%), Texas (6.8%), Florida (6.3%), and New York (6.3%). Participants were not included if they were not White, were not from the United States or did not correctly answer both manipulation check questions. One multivariate outlier was identified and removed based on Mahalanobis distances with a critical \(\chi^2 = 18.47\), criterion \(\alpha = .001\) and four variables, the four \(d'\) measures (Tabachnick & Fidell, 2007).

**Recognition accuracy**

The recognition accuracy data were analyzed in terms of the signal detection measures of \(d'\), hit rate and false alarm rate data. The primary dependent variable reported was discrimination accuracy assessed by \(d'\), where a value of 0 is associated with chance, and the higher the value the better the discrimination accuracy. Hit and false alarm rates of 0 or 1 were corrected for the \(d'\) calculation using \(.5/n\) or \(1 - .5/n\), respectively (Stanislaw & Todorov, 1999). The entitativity condition only applied to ‘old’ faces therefore only one omnibus false alarm rate was used per race to calculate \(d'\) (for a similar analytic procedure
Means and standard deviations for all measures are presented in Table 1. The primary predictions were tested with a 2 (entitativity condition) × 2 (race of target face) repeated measures ANOVA performed on the data.\(^2\) Consistent with previous CRE research, there was a significant main effect of race of face; same-race faces (\(M = 0.83, SD = 0.94, CI_{95} [.72, .95]\)) were recognized more accurately than cross-race faces (\(M = 0.38, SD = 0.94, CI_{95} [.26, .50]\), \(F(1, 175) = 32.49, p < .001, d = .48\)). More important, memory for cross-race faces was even less accurate when each group of cross-race faces was perceived to be in a cohesive high entitativity group. In other words, the predicted interaction of race of face by entitativity condition was significant, \(F(1, 175) = 10.48, p = .001, d = .24\). As predicted, and as can be seen in Table 1, whereas cross-race faces were significantly less accurately recognized in high entitativity (\(M = 0.29, SD = 0.91, CI_{95} [.16, .43]\)) than low entitativity groups (\(M = 0.47, SD = 0.97, CI_{95} [.32, .61]\), \(t(175) = 2.21, p = .028, d = .17\), same-race faces were significantly more accurately recognized in high entitativity (\(M = 0.94, SD = 0.94, CI_{95} [.80, 1.08]\)) than low entitativity groups (\(M = 0.73, SD = 0.95, CI_{95} [.59, .87]\), \(t(175) = 2.59, p = .010, d = .20\)).\(^3\)

Because the entitativity manipulation only applied to old target faces seen in the presentation phase, only the main effect of race could be assessed with false alarm rate data. There was a significant main effect of race, \(F(1, 175) = 34.56, p < .001, d = .49\); as predicted, false alarm rates were significantly higher for cross-race (\(M = 0.46, SD = 0.23, CI_{95} [.32, .38]\)) than same-race faces (\(M = 0.35, SD = 0.22, CI_{95} [.32, .38]\)).

In the analysis of the hit rate data only a significant interaction resulted, \(F(1, 175) = 10.68, p = .001, d = .25\). This interaction mirrors the pattern of \(d'\) results and suggests that the use of one false alarm rate when calculating \(d'\) per race did not impact the results. Consistent with the \(d'\) results, whereas for same-race faces hit rates were higher in high entitativity (\(M = 0.66, SD = 0.26, CI_{95} [.62, .70]\)) than low entitativity groups (\(M = 0.59, SD = 0.27, CI_{95} [.55, .63]\), \(t(175) = 2.65, p = .009, d = .20\), for cross-race faces hit rates were higher in low entitativity (\(M = 0.62, SD = 0.28, CI_{95} [.58, .67]\)) than

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\(^2\) The recognition accuracy data were also analyzed using the non-parametric measure \(A'\), and a consistent pattern of significance resulted in the analysis of these data. Thus, the results were not dependent on the choice of using the parametric or non-parametric measure of recognition accuracy.

\(^3\) Interpretations of 95% confidence intervals are different from interpretations of standard error bars. Overlapping 95% confidence intervals can still be significant. On this point, see Belia, Fidler, Williams, and Cumming (2005).
high entitativity groups ($M = 0.56, SD = 0.29, CI_{95} [.52, .61]), t(175) = 2.21, p = .028, d = .17.$

**Remember-Know judgments**
The Remember/Know/Guess judgments were included in this study to assess if entitativity altered the phenomenological qualities of memories for same- and cross-race faces in a manner consistent with the dual processes of recollection (Remember) and familiarity (Know). When participants responded ‘old’ to a test face, they were asked to describe their memory for the target face using the Remember/Know/Guess procedure. In the dual-process model, recollection and familiarity are considered to be independent processes. It is therefore necessary to correct for this independence; otherwise the calculation of Remember/Know assumes that these processes are mutually exclusive (Yonelinas & Jacoby, 1995). Independence was corrected using KnowC in place of Know$^4$ [see Meissner et al. (2005) for the use of this calculation]. Means and standard deviations for Remember and KnowC responses in each condition are presented in Table 2.

Following procedures of Meissner et al. (2005), a 2 (entitativity condition) × 2 (race of target face) repeated measures MANOVA was performed on the proportion of Remember and KnowC responses for correctly identified old test faces. There was a main effect of race of target face $F(1, 175) = 16.14, p < .001$, $d = .30$, and a significant interaction of race of target Face × Entitativity, $F(1, 175) = 10.49, p = .001$, $d = .24$. The principle finding was the interaction of race of target Face × Remember/Know responses which approached significance, $F(1, 175) = 3.47, p = .064$, $d = .14$. Although this interaction was only marginally significant, the direction of the effect was consistent with the results of Meissner et al. (2005); there was a higher proportion of Remember responses for same-race ($M = 0.30, SD = 0.25$) than cross-race faces ($M = 0.22, SD = 0.24), t(175) = 4.65, p < .001, d = .35$, and no difference in the proportion of KnowC responses between same-race ($M = 0.26, SD = 0.30$) and cross-race faces ($M = 0.23, SD = 0.29), t(175) = 1.23, p = .220, d = .09$. Further, and relevant to the purpose of including this analysis in our study, the second order interaction of race of Face × Entitativity × Remember/Know responses was not significant, $F < 1.00$. Entitativity did not alter the pattern of Remember/Know responses to same- and cross-race faces, and suggests that the effect of entitativity did not result from changes in the phenomenological qualities of the memories for same- and cross-race faces that were articulated by Meissner et al. (2005).

**Discussion**
The CRE describes an empirical finding that results from social-cognitive processes that people utilize when viewing other individuals. The results of this study help clarify some of the factors that impact these social-cognitive processes. We know from the findings of Pezdek et al. (2012) that presenting faces (1) in 3-face groups rather than individually, and (2) in racially homogeneous rather than heterogeneous groups reduces recognition accuracy for cross-race faces but not same-race faces. Both of these manipulations increased the outgroup perception of cross-race faces compared to observing a single cross-race face alone. Consistent with this interpretation, we found in this study that when

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$^4$ KnowC = Know/(1 – Remember).
cross-race faces were presented in homogeneous groups, telling subjects in the presentation phase that each group was a cohesive one with high entitativity resulted in even less accurate face recognition than low entitativity instructions. Entitativity instructions had the opposite effect on recognition accuracy for same-race faces where high entitativity instructions increased recognition accuracy.

Applying the CIM framework, our results suggest that when cross-race faces are presented in groups, telling subjects that each group is a cohesive one with high entitativity increases initial social categorization at the expense of more individuating encoding processes, consequently impairing subsequent face recognition accuracy. This finding is reflected in the significant interactions of race of face by entitativity condition on both $d’$ data and hit rate data. For cross-race faces, high entitativity instructions decreased general face recognition accuracy ($d’$) and reduced correct identification of old faces (hit rate).

Remember/Know responses were also examined to assess whether entitativity alters the phenomenological differences between memory for same- and cross-race faces, and it did not. Consistent with the results of Meissner et al. (2005), these results suggest that in both high and low entitativity conditions there was a greater reliance on recollection for same-race than cross-race faces with no difference in familiarity. However, more recently Wixted and Mickes (2010) convincingly argued that Remember/Know data alone are insufficient for differentiating between processes of recollection and familiarity; Remember/Know data in combination with confidence data are necessary for this determination. Thus, additional research incorporating confidence ratings is necessary to assess if the effects reported in our study are specifically related to the processes of recollection and familiarity per se.

We confirmed in this study the primary prediction that cross-race faces observed in high entitativity groups were recognized more poorly than those observed in low entitativity groups. Further, although no effect of entitativity was predicted for same-race faces, in fact same-race faces in high entitativity groups were recognized even more accurately than those in low entitativity groups. According to the CIM framework, in addition to social categorization, motivation and expertise are relevant factors that determine how faces are encoded. These additional components of the CIM framework can be useful in interpreting the unanticipated effect of entitativity on memory for same-races faces. If a person has more expertise and can better discriminate among faces of a specific group (e.g., same-race faces) they are more likely to encode individuating features of the faces. The CIM predicts that in some circumstances, category information may be a motivating factor for signalling the need to individuate among group members. Seeing a highly cohesive group of same-race faces presented simultaneously may be a motivating factor for participants to individuate even more among the group members. In processing

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Table 2. Proportion of Remember and Know$_C$ responses to old test faces correctly recognized in each condition.
same-race faces, entitativity may add a category-level component, but with same-race faces this may not be a sufficiently strong factor to trump the facilitative effects of motivation and expertise on same-race faces. Future research is needed to elucidate the facilitative effect of entitativity on memory for same-race faces. Together, these findings are important because they suggest that group entitativity likely influences different social-cognitive mechanisms in the encoding of same- and cross-race faces.

One limitation of this study relates to the fact that we did not utilize a complete cross-over design with White and Black participants observing White and Black faces; consistent with most studies in this area only White participants were tested. Without the bidirectional comparison and the use of non-White participants caution should be used in generalizing our findings to all applications of the CRE.

Conclusions
This study contributes to the growing literature on how recognition accuracy for faces seen in groups is affected by social variables. Social psychologists have long known that different types of social groups elicit different perceptions and that these perceptions can affect recognition accuracy for individuals in the group. In addition to the theoretical contribution of our findings, these results are relevant to the circumstances of real-world eyewitness memory. Our findings highlight the importance of considering specific contextual factors in assessing the reliability of eyewitness memory. The results of this research suggest that group presentation and the entitativity of that group are important estimator variables to be considered by attorneys, jurors, and forensic professionals seeking to evaluate the reliability of eyewitness identifications. We know from previous research that cross-race faces are recognized less accurately than same-race faces, and that cross-race faces are even less accurately recognized when the faces are observed in groups, especially homogeneous groups. The results of our current study suggest that face recognition accuracy for cross-race individuals, at least for those observed by White individuals, is further impaired if the individuals are observed in a group that appears to be a cohesive one, for example, members of a gang or members of a team rather than a group of people simply waiting in line together.

References
Entitativity and the cross-race effect


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