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Reports

The influence of ingroup/outgroup categorization on same- and other-race face processing: The moderating role of inter- versus intra-racial context ☆

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ABSTRACT

We investigated the impact of ingroup/outgroup categorization on the encoding of same-race and other-race faces presented in inter-racial and intra-racial contexts (Experiments 1 and 2, respectively). White participants performed a same/different matching task on pairs of upright and inverted faces that were either same-race (White) or other-race (Black), and labeled as being from the same university or a different university. In Experiment 1, the same- and other-race faces were intermixed. For other-race faces, participants demonstrated greater configural processing following same- than other-university labeling. Same-race faces showed strong configural coding irrespective of the university labeling. In Experiment 2, faces were blocked by race. Participants demonstrated greater configural processing of same- than other-university faces, but now for both same- and other-race faces. These results demonstrate that other-race face processing is sensitive to non-racial ingroup/outgroup status regardless of racial context, but that the sensitivity of same-race face processing to the same cues depends on the racial context in which targets are encountered.

An uncomfortable perception during interactions with members of other ethnic groups is that their faces "all look the same." The reduced individuation of other-race relative to same-race faces can have life-changing implications, as in cases of eyewitness misidentification (Brigham, Bennett, Meissner, & Mitchell, 2007). The importance of this own-race advantage in individuation has motivated a profusion of attempts to identify its causes, with as yet no definitive answers. In the current research, we investigated how ingroup/outgroup categorization influences the perception of same- and other-race faces presented in an inter-racial or intra-racial context.

Several theories have been proposed to explain the "other-race effect" (Meissner & Brigham, 2001; Meissner, Brigham, & Butz, 2005). Perceptual expertise accounts, for example, suggest that perceivers are more familiar with same-race than other-race faces and consequently process same-race faces more accurately and efficiently than other-race faces (e.g., Brigham & Malpass, 1985; Goldstein & Chance, 1985). In contrast, social categorization accounts suggest that the other-race effect occurs because the categorization of other-race faces as outgroup members undermines the motivation to process other-race faces in terms of individual identity (e.g., Hugenberg & Sacco, 2008) or because of the coding of race-specifying information (e.g., skin tone) at the expense of individuating information (Levin, 1996, 2000).

These accounts differ in the proposed locus of the other-race effect, but say little about possible interactions between expertise and social categorization, or the specific aspects of face processing that may be affected by these factors. There is evidence that same-race faces tend to be processed more configurally (i.e., in terms of the spatial relationships between facial features) than other-race faces (Michel, Caldara, & Rossion, 2006; Michel, Corneille, & Rossion, 2007, 2009; Michel, Rossion, Han, Chung, & Caldara, 2006; Tanaka, Kiefer, & Bukach, 2004). Specifically, inverting faces is known to be more detrimental to configural than to feature-based processing (Diamond & Carey, 1986; Thompson, 1980; Yin, 1969) and to produce greater recognition costs for same-race than other-race faces (e.g., Hancock & Rhodes, 2008; Rhodes, Brake, Taylor, & Tan, 1989; Sangrigoli & de Schonen, 2004). This suggests that there may be different "default" processing strategies: configural for same-race faces and featural for other-race faces. Nonetheless these processing strategies may be modulated by differential expertise or categorization-related motivation.

Recent evidence has revealed that motivational processes related to social categorization can indeed influence face processing. Michel et al. (2007, 2009), for example, asked Caucasian participants to make same/different judgments to sequentially presented pairs of Caucasian, Asian, and racially ambiguous (i.e., Caucasian–Asian morphed) faces. The target faces were aligned or misaligned composites in which the top parts either depicted the same individual or two different individuals. When racially ambiguous faces were categorized

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as same-race rather than other-race (according to cues provided by the experimenter), participants processed the faces more configurally, evidenced by responses to a half-face target being more disrupted when the faces were aligned relative to when they were misaligned (the so-called "face-composite effect"; Young, Hellawell, & Hay, 1987). These results suggest that manipulations related to social categorization can modulate how faces are processed, with stronger configural processing emerging when faces are categorized as racial ingroup members—at least when the targets are racially ambiguous.

There is also evidence that social categorization can affect the structural encoding of same-race faces. Hugenberg and Corneille (2009), again using the face-composite manipulation, asked White participants to make same/different judgments to sequentially presented pairs of same-race faces categorized as ingroup or outgroup members on the basis of university affiliation. Participants showed greater configural processing when faces were categorized as ingroup members than when they were categorized as outgroup members. These results suggest that outgroup categorization is sufficient to debilitate the strong "default" configural processing normally observed for same-race faces.

The above evidence indicates that categorization of same-race faces as outgroup members decreases the likelihood of processing these faces in a default configural manner. To date, however, the direct effects of non-racial ingroup/outgroup categorization on face encoding have only been demonstrated when the faces are presented in isolation. In this circumstance, racial ingroup/outgroup membership provides the primary dimension for categorization. In other circumstances, however, racial ingroup/outgroup membership may represent only one among multiple possible dimensions for categorization, and may not be perceived as the primary or most useful dimension. When other dimensions are used, changes in configural processing as a function of racial ingroup/outgroup status might not be anticipated. In addition, the effects of non-racial ingroup/outgroup categorization have only been examined with same-race faces. Given that most perceivers have greater experience with same-race than other-race faces, it is possible that their facility with configural processing will be greater for same-race than other-race faces. As a consequence, their processing of same-race faces, relative to the processing of other-race faces, might be less amenable to context-driven shifts reflecting other dimensions of ingroup/outgroup categorization. In the current research, we examined how different categorization contexts affect face processing, for both same-race and other-race faces.

Experiment 1: random presentation of same- and other-race faces

In the first experiment, we examined the effects of ingroup/outgroup university affiliation on face processing when same-race faces were presented along with other-race faces—that is, in an inter-racial context that provided both race and university affiliation as dimensions for ingroup/outgroup categorization. Following past research (Hugenberg & Corneille, 2009), we expected that perceivers would engage in greater configural processing of ingroup (same-university) than outgroup (other-university) faces. However, we also expected that the inter-racial context would serve to keep race salient as a categorization alternative, with potential implications for the strength of university-based categorization effects. Given perceivers' likely fluency in the configural processing of same-race races, we expected that race salience would mitigate the influence of the newly-assigned group membership (i.e., university affiliation) for the processing of same-race faces. As a consequence, we anticipated that evidence for greater configural processing of same-university than other-university faces would emerge more strongly — or perhaps even only — for other-race faces (following Michel et al., 2007, 2009). To attempt to isolate the effects to face encoding, we used a perceptual matching task and the opportunity for configural processing was manipulated by presenting faces as upright or inverted (cf. Maurer, Le Grand, & Mondloch, 2002).

Method

Participants and design

Thirty-three students from the University of Birmingham completed the study for course credit; all had normal or corrected-to-normal vision. The data for one participant were removed from the analysis because of an error rate in excess of 20%, leaving 32 participants (31 female; $M_{age} = 20.3$ years). The experiment was based on a 2 (trial type: same versus different) × 2 (target race: same-race versus other-race) × 2 (target university: same-university versus other-university) × 2 (target orientation: upright versus inverted) within-participants design.

Materials

The materials included face stimuli and university primes. The face stimuli were graphic files depicting 80 Black and 80 White faces, taken from previous research (Shriver, Young, Hugenberg, Bernstein, & Lanter, 2008) as well as from the CAL/PAL face database (Minear & Park, 2004) and the Stanford face database (Eberhardt, Davies, Purdie-Vaughns, & Johnson, 2006). All faces were adult men in a forward pose with neutral expressions. The images were standardized in Adobe Photoshop CS2 to be grayscale and sized 236 pixels vertically. An inverted version of each face was also created. This resulted in a total of 320 experimental stimuli. The university primes were graphic files depicting the University of Birmingham (same-university prime) and University of Nottingham (other-university prime) names (in their respective corporate fonts) and official crests.

The face stimuli were grouped into same-race, same-orientation pairs, with an effort to match paired stimuli along a variety of dimensions (e.g., luminance, contrast and head/hair shape).[1] The pairs were divided into sets such that each face appeared as an ingroup member for some participants but an outgroup member for others, and on a "same" trial for some but a "different" trial for others. Each face appeared four times per set (twice upright and twice inverted). Each stimulus set included 384 experimental trials, presented in random order.

Procedure

After providing informed consent, participants completed a short task designed to enhance their identification to their ingroup (University of Birmingham). Specifically, participants completed a brief questionnaire, ostensibly from university student services, in which they reported five ways in which they were similar to their fellow University of Birmingham students.

Participants then completed the target face perception task; all instructions and stimuli were presented via a personal computer running MediaLab and DirectRT research software (Empirisoft Corporation, 2006). Participants learned that during the task, they would see faces of students from either the University of Birmingham or the University of Nottingham.[2] They learned further that on each trial of the task, they would see two faces and that their task was to indicate as quickly and accurately as possible, by means of a key press, whether the faces depicted the same individual or two different individuals. Trials were initiated with the presentation of a fixation cross for 500 ms, followed by the university prime that appeared centered at the top of the screen for 1500 ms. Two

[1] This procedure meant that for "different" trials, any given face was always paired with the same other face. Although random pairing would have been optimal, this procedure was necessary to minimize participants' ability to use non-identity-specifying cues such as hair shape or skin tone to make "different" judgments (because such cues obviously could not be used to make "same" judgments).

[2] We chose the University of Nottingham as the outgroup university because of its similarity to the University of Birmingham (e.g., geographic region, status, student demographics) and familiarity to University of Birmingham students. It is thus a relevant comparison for University of Birmingham students, without invoking status issues.

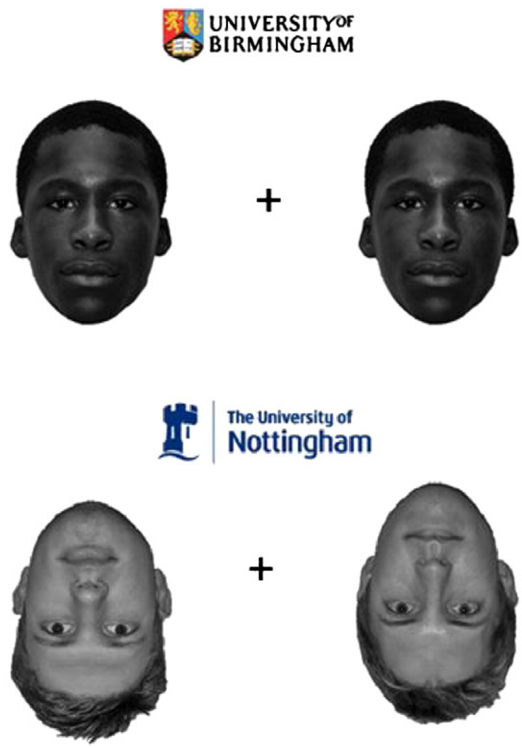

Fig. 1. Example stimuli used in the experiments.

faces then appeared below the prime, flanking the central fixation cross, and were displayed until participants produced a response. The intertrial interval was 1000 ms. Responses and their latencies were recorded by the computer program. Fig. 1 depicts examples of stimuli used during the task.

Results

Mean discrimination latencies served as the dependent measure of interest.[3] Due to the presence of outlying responses in the data set, response times over 2.5 standard deviations from the mean were excluded (6.09% of the data) along with trials where errors were committed (2.69% of the data). The data were submitted to a 2 (trial type: same versus different) × 2 (target race: same-race versus other-race) × 2 (target university: same-university versus other-university) × 2 (target orientation: upright versus inverted) repeated-measures ANOVA.

The analysis revealed a significant main effect of target orientation, $F(1, 31) = 48.23$, $p < .001$, $\eta_p^2 = .60$, demonstrating that participants were slower to discriminate inverted than upright targets ($Ms = 992$ and 913 ms, respectively). There were also a number of significant interactions: Trial Type × Target University, $F(1, 31) = 35.77$, $p < .001$, $\eta_p^2 = .54$; Trial Type × Target Race × Target University, $F(1, 31) = 7.65$, $p = .009$, $\eta_p^2 = .19$; and the predicted Target Race × Target University × Target Orientation interaction, $F(1, 31) = 7.57$, $p = .01$, $\eta_p^2 = .20$. The Trial Type × Target University and Trial Type × Target Race × Target University interactions were theoretically unimportant and did not moderate or interact with the predicted pattern, and so we did not analyze them further. We provide the Trial Type × Target Race × Target University means in Table 1 for the reader's interest.[4]

[3] We also analyzed error rates. For both experiments, the error rates were generally low (overall average = 2%) and followed the same trends as the RT data (i.e., there was no evidence of a speed–accuracy trade-off). The error rate results are thus not reported further.

[4] In general, the pattern suggested that participants were faster to respond "same" to same-university than other-university targets and faster to respond "different" to other-university than same-university targets, and that this pattern was more pronounced for same-race than other-race targets.

Table 1
Mean discrimination latencies (ms) as a function of trial type, target race, and target university, Experiment 1.

	Same university (Birmingham)	Other university (Nottingham)
"Same" trials		
Same race (White)	925 (35.29)	962 (43.48)
Other race (Black)	924 (34.57)	950 (36.28)
"Different" trials		
Same race (White)	999 (46.20)	934 (52.68)
Other race (Black)	971 (37.57)	955 (41.11)

Numbers in parentheses represent standard error.

The predicted Target Race × Target University × Target Orientation interaction was analyzed further by conducting separate Target University × Target Orientation ANOVAs for each target race (see Fig. 2). For same-race faces, there was only a significant main effect of target orientation, $F(1, 31) = 24.87$, $p < .001$, $\eta_p^2 = .45$. Participants responded more quickly to upright targets than to inverted targets ($Ms = 909$ and 989 ms, respectively); university categorization did not affect performance, $F(1, 31) = 0.52$, $p = .48$, $\eta_p^2 = .016$.

For other-race targets, the analysis revealed a significant main effect of target orientation, $F(1, 31) = 55.29$, $p < .001$, $\eta_p^2 = .64$, which was subsumed within a significant Target University × Target Orientation interaction, $F(1, 31) = 11.84$, $p = .002$, $\eta_p^2 = .28$. Participants responded more quickly to upright than inverted other-race targets for both same-university targets, $t(31) = 7.18$, $p < .001$, and other-university targets, $t(31) = 4.39$, $p < .001$; however, inversion was significantly more disruptive for same-university than other-university targets, $t(31) = 3.04$, $p = .005$.

Discussion

The current study examined how non-race-based ingroup/outgroup categorization influences the perceptual encoding of same-race and other-race faces presented in an inter-racial context. In addition to the typically observed face-inversion effect (i.e., faster RTs for upright than inverted faces), the results demonstrated that, for other-race faces, inversion was more disruptive to the discrimination of same-university than other-university faces. For same-race faces, however, there were no effects of ingroup/outgroup categorization on the basis of university affiliation, and inversion was equally disruptive to the discrimination of same-university and other-university faces.

We argue that this pattern emerged because the inter-racial context kept race salient as a dimension for categorization. For same-race faces, race salience would serve to encourage the typically observed differences in the processing of same- and other-race faces — that is, more configural processing of same-race faces. For same-race faces, the equivalence in processing same-university and other-university faces suggests that this "default" processing, once activated, is sufficiently fluent to mitigate against sensitivity to other bases for ingroup/outgroup categorization. For other-race faces, however, lack of expertise means that configural processing is not the default but can be employed when ingroup membership is stressed, as here by university affiliation.

Experiment 2: blocked presentation of same- and other-race faces

In the second experiment, we examined the effects of ingroup/outgroup university affiliation on face processing in an intra-racial context—that is, when same-race and other-race faces were presented in separate blocks, making university affiliation the most salient ingroup/outgroup categorization within each block. In past research (Hugenberg & Corneille, 2009), university categorization yielded

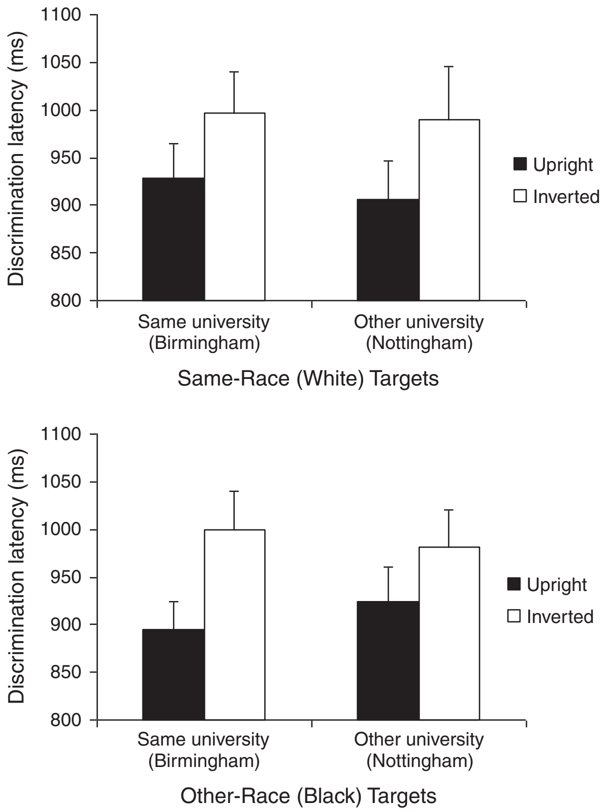

Fig. 2. Mean discrimination latencies (ms) as a function of target race, target university, and target orientation, Experiment 1. Note. Error bars represent standard error.

stronger configural processing for same-university than other-university faces. That research, however, examined the processing of same-race faces only, and this was extended here to other-race face processing. In this context, we expected that participants would engage in greater configural processing of ingroup (same-university) than outgroup (other-university) faces irrespective of target race. Hugenberg and Corneille's work suggests that when race salience is minimized, the configural processes normally associated with same-race faces can be disrupted by outgroup categorization along another dimension. If outgroup categorization can disrupt the configural processing of same-race faces, then it should be equally able to disrupt the processing of other-race faces, with which perceivers often lack expertise.

Method

Participants and design

Forty-four students from the University of Birmingham completed the study for course credit; all had normal or corrected-to-normal vision. The data for one participant were removed from the analysis because of an error rate in excess of 20%, leaving 43 participants (41 female; $M_{age} = 20.7$ years). The experiment was based on a 2 (trial type: same versus different) × 2 (target race: same-race versus other-race) × 2 (target university: same-university versus other-university) × 2 (target orientation: upright versus inverted) × 2 (block order: same-race-first versus other-race-first) mixed design with block order as a between-participants factor.

Materials

The materials were as in Experiment 1.

Procedure

The procedure was as in Experiment 1, with one exception. Rather than completing the same/different task in one fully randomized block, participants completed the task in two blocks, one comprised only Black faces and the other comprised only White faces. Block order was randomized across participants.

Results

Mean discrimination latencies served as the dependent measure of interest. Due to the presence of outlying responses in the data set, response times over 2.5 standard deviations from the mean were excluded (1.99% of the data) along with trials where errors were committed (5.48% of the data). The data were submitted to a 2 (trial type: same versus different) × 2 (target race: same-race versus other-race) × 2 (target university: same-university versus other-university) × 2 (target orientation: upright versus inverted) × 2 (block order: same-race-first versus other-race-first) mixed-model ANOVA with block order as a between-participants factor.

The analysis revealed a significant main effect of target orientation, $F(1, 42) = 52.20$, $p < .001$, $\eta_p^2 = .55$, demonstrating that participants were faster to discriminate upright than inverted targets ($Ms = 795$ and 842 ms, respectively). There was also a main effect of trial type, $F(1, 42) = 6.87$, $p = .012$, $\eta_p^2 = .14$, such that participants were faster to respond "same" than "different" ($Ms = 805$ and 831 ms, respectively).

The analysis also yielded a number of significant interactions: Trial Type × Target Race, $F(1, 42) = 4.29$, $p = .045$, $\eta_p^2 = .093$; Trial Type × Target University, $F(1, 42) = 11.08$, $p = .002$, $\eta_p^2 = .209$; Trial Type × Target Orientation, $F(1, 42) = 5.85$, $p = .020$, $\eta_p^2 = .12$; Target Race × Block Order, $F(1, 42) = 7.87$, $p = .008$, $\eta_p^2 = .16$; and Trial Type × Target Race × Target University × Block Order, $F(1, 42) = 5.49$, $p = .024$, $\eta_p^2 = .12$. These interactions were theoretically unimportant and did not moderate or interact with the predicted pattern, and so we did not analyze them further. We provide the means for the highest-order interactions (Trial Type × Target Orientation, Trial Type × Target Race × Target University × Block Order) in Tables 2 and 3 for the reader's interest.[5]

Importantly, the analysis also yielded the predicted Target University × Target Orientation interaction, $F(1, 42) = 12.17$, $p = .001$, $\eta_p^2 = .23$ (see Fig. 3). This interaction was analyzed further by conducting paired t-tests, which demonstrated that, regardless of target race, participants were faster to respond to upright than inverted faces for both same-university targets, $t(43) = 7.57$, $p = .001$, and other-university targets, $t(43) = 5.82$, $p = .001$. Moreover, as with Black targets in Experiment 1, the inversion cost was greater for same-university than other-university targets, $t(43) = 3.51$, $p = .003$. Unlike in Experiment 1, this pattern was not moderated by target race (Target Race × Target University × Target Orientation $F(1, 42) = 0.053$, $p = .82$, $\eta_p^2 = .001$).

Discussion

The current study examined how non-racial bases for ingroup/outgroup categorization influence the perceptual encoding of same-race and other-race faces presented in an intra-racial context. We once again found the typical face-inversion effect, and replicated the pattern of Experiment 1 in which inversion was more disruptive to the discrimination of other-race faces when those faces were categorized as same-university versus other-university. In contrast

[5] In general, the Trial Type × Target Orientation effect suggested that inversion costs were greater for "different" trials. The Trial Type × Target Race × Target Orientation × Block Order interaction was less clear-cut than the Trial Type × Target Race × Target Orientation interaction found in Experiment 1, but again provided general support for a pattern whereby participants were faster to respond "same" to same-university than other-university targets and "different" to other-university than same-university targets.

Table 2
Mean discrimination latencies (ms) as a function of trial type and target orientation, Experiment 2.

	Upright faces	Inverted faces
"Same" trials	788 (19.78)	823 (24.21)
"Different" trials	802 (17.45)	860 (20.61)

Numbers in parentheses represent standard error.

Table 3
Mean discrimination latencies (ms) as a function of trial type, target race, target university, and block order, Experiment 2.

	Same-race block first		Other-race block first	
	Same university (Birmingham)	Other university (Nottingham)	Same university (Birmingham)	Other university (Nottingham)
"Same" trials				
Same race (White)	817 (30.62)	840 (32.46)	761 (30.62)	778 (32.46)
Other race (Black)	806 (33.13)	816 (36.59)	795 (33.13)	828 (36.59)
"Different" trials				
Same race (White)	895 (28.24)	863 (29.15)	796 (28.24)	795 (29.16)
Other race (Black)	818 (27.53)	823 (29.69)	829 (27.53)	832 (29.69)

Numbers in parentheses represent standard error.

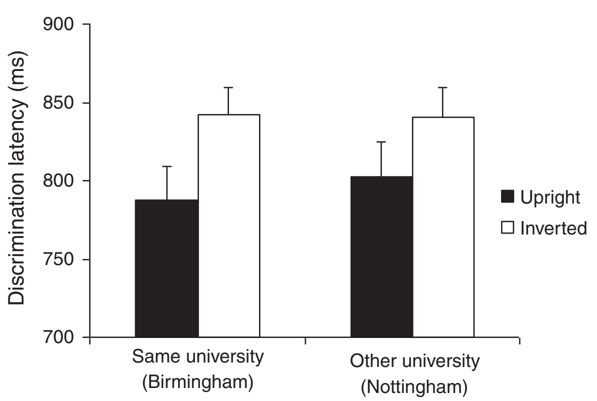

Fig. 3. Mean discrimination latencies (ms) as a function of target university and target orientation, Experiment 2. Note. Error bars represent standard error.

to Experiment 1, however, ingroup/outgroup categorization on the basis of university affiliation also influenced same-race face processing; inversion was more disruptive to the discrimination of same-race faces when those faces were categorized as same-university versus other-university. Thus, when race salience was minimized, participants' processing was guided by the university-based dimension, which was most salient in the context. In this case, default configural processing was overridden for same-race faces categorized as belonging to another university.

General discussion

The results of these two experiments demonstrate that other-race face processing is sensitive to non-racial ingroup/outgroup status regardless of racial context, but that the sensitivity of same-race face processing to the same cues depends on the racial context in which targets are encountered. For other-race faces, non-racial ingroup/outgroup categorization influenced the way in which the faces were encoded, a novel result within the social categorization literature. Inversion was more disruptive to the processing of other-race faces when those faces were categorized as ingroup rather than outgroup members on the basis of university affiliation, suggesting that non-racial ingroup categorization induced stronger configural encoding. Moreover, this pattern held true regardless of whether the faces were presented in inter-racial (i.e., intermixed presentation) or intra-racial (i.e., blocked presentation) contexts.

For same-race faces, non-racial ingroup/outgroup categorization influenced the way in which the faces were encoded, but only in the intra-racial context. In this context, inversion was more disruptive to the processing of same-university than other-university faces. In the inter-racial context, however, inversion was equally disruptive to same-university and other-university faces. We suggest that when Black and White faces were intermixed, race became salient as a dimension for categorization and the familiarity and visibility of racial ingroup/outgroup status trumped university-based ingroup/outgroup status, such that all faces were perceived in terms of race. As a result, all same-race faces were perceived as ingroup members, and configural processing was adopted as the default. Only when racial groupings were weighted less strongly — when the faces were blocked by race — did participants perceive same-race other-university faces as outgroup members and override the configural processing default.

Stated differently, context can determine whether same-race faces are perceived as ingroup versus outgroup members, and inter-racial contexts promote ingroup categorization. This interpretation is supported by follow-up contrasts that explored the effect of context, in which we combined the same-race data from Experiments 1 and 2. As we would expect, same-university faces were perceived as ingroup members regardless of the context in which they were presented; that is, inversion costs (and presumably configural processing) were equivalent for same-university faces presented in intra-racial and inter-racial contexts ($Ms = 53$ vs. 69 ms, respectively; $t(74) = 1.001$, $p = .32$). Other-university faces, however, were perceived as outgroup members to a greater extent when race was less salient; that is, inversion costs were smaller (indicating less configural processing) for other-university faces presented in an intra-racial rather than inter-racial context ($Ms = 38$ vs. 84 ms, respectively; $t(74) = 2.29$, $p = .025$).

Our findings for the intra-racial context are consistent with previous research, which has focused on the effects of social categorization when same-race faces are encoded. Hugenberg and Corneille (2009), for example, presented same-race faces and provided evidence for greater configural processing of ingroup- than outgroup-categorized targets. These data indicate that social categorization can influence the extent to which same-race faces are processed configurally when the faces are presented in a mono-racial context. Our evidence, however, also demonstrates that this pattern does not hold for same-race faces when they appear in an inter-racial context, where non-racial ingroup–outgroup categorization exerts negligible influence. We suggest that this reflects the increased salience of race when same-race and other-race faces are presented together. In this context, there might be automatic categorization of same-race faces as ingroup members (on the basis of race) that triggers configural encoding and is insensitive to non-visible ingroup/outgroup status. For other-race faces, however, the motivation afforded by another form of ingroup categorization may be sufficient to offset categorization by visual cues such as race, leading to greater configural processing for ingroup than for outgroup members.

Our findings also extend recent work by Hehman, Mania, and Gaertner (2010), who examined the effects of race and university categorization on recognition memory. Hehman et al. used a modified face-recognition paradigm where Black and White faces were spatially grouped at encoding by race or university affiliation to equate the salience of the two dimensions. Their results demonstrated that when target faces were grouped by race, participants recognized more same-race than other-race faces, irrespective of university affiliation. When target faces were grouped by university, however, participants recognized more ingroup than outgroup faces, irrespective of race. The authors explained their results in terms of the common ingroup identity model (Gaertner & Dovidio, 2000), whereby a shared category dimension can offset the influence of a non-shared dimension—at least as long as the dimensions are equally salient. Our research adds to that of Hehman et al. by providing evidence for what happens when the processing context sets two potential categorization dimensions in competition (and where one is more visibly salient): When same- and other-race faces are encountered in a mixed context (Experiment 1), racial and non-racial forms of categorization interact to guide encoding.

Three caveats warrant mention. First, we relied solely on inversion effects as evidence for the role of configural processing. There is some controversy regarding whether inversion effects are underpinned solely by disruption to configural processes (without affecting feature coding), and whether configural processes may still be used even when faces are inverted. Sekuler, Gaspar, Gold, and Bennett (2004), for example, provided evidence that non-linear processing of face features (which they took as the hallmark of configural processing) took place both when faces were upright and when they were inverted, though inverted faces were processed less efficiently (see also Gaspar, Bennett, & Sekuler, 2008). However, even if configural information is not completely lost when faces are inverted (Sekuler et al., 2004), a relative loss of efficiency for configural relative to featural information would render the processing of inverted faces more dependent on feature-based representations. This would fit with our finding that other-race faces categorized as outgroup members (and presumed to depend more on feature-based coding) showed a reduced inversion effect relative to the same faces categorized as ingroup (presumed to depend on configural processing).

Second, it is important to note that all of our participants were White. A complete test of the other-race effect would require us to examine the performance of non-White participants. Crossover interactions in same-race and other-race face processing as a function of participant race, however, are not always observed (e.g., Lindsay, Jack, & Christian, 1991; Tanaka et al., 2004). This has been attributed to the fact that non-White participants are typically familiar with White faces (and more familiar with White faces than White participants are with non-White faces). Any attempt to replicate the current findings with non-White participants would need to take into account this confounding factor.

Finally, we note that the vast majority of our participants were female. Navarrete, McDonald, Molina, and Sidanius (2010) recently proposed that different psychological systems underpin intergroup bias for women and men, with women motivated by sexual coercion fears and men motivated by aggression and dominance motives. Whether these differing motives would have different outcomes for face processing is unclear. Indeed, just as fearful and angry expressions capture attention (Vuilleumier, 2002), it would seem plausible that both fear and dominance motivation should motivate attention, particularly to outgroup faces. Moreover, to the best of our knowledge, there is no evidence for gender differences in same- versus other-race face processing in general, nor is there evidence in the available literature to suggest that perceiver sex moderates the finding that face inversion is more disruptive to the processing of same-race than other-race faces. Together, these factors suggest that our findings are unlikely to be subject to gender differences. Nonetheless, this remains an empirical question that should be subjected to future scrutiny.

Conclusion

The current research demonstrated that the relative impact of non-racial ingroup/outgroup categorization on the encoding of same-race and other-race faces depends critically on context. Other-race face processing is sensitive to non-racial ingroup/outgroup status regardless of racial context, but the sensitivity of same-race face processing to the same cues depends on the racial context in which targets are encountered; for same-race faces, non-racial ingroup/outgroup status exerts influence primarily in intra-racial contexts. We suggest that pre-existing (race) and newly generated group (university affiliation) categorizations can interact to modulate face encoding, and that processing of other-race faces is more sensitive to the availability of alternative ingroup/outgroup dimensions than is the processing of same-race faces.

References

Brigham, J. C., Bennett, L. B., Meissner, C. A., & Mitchell, T. L. (2007). The influence of race on eyewitness memory. In R. Lindsay, D. Ross, J. Read, & M. Toglia (Eds.), *Handbook of eyewitness psychology: Memory for people* (pp. 257—281). Mahwah, NJ: Lawrence Erlbaum Associates.

Brigham, J. C., & Malpass, R. S. (1985). The role of experience and contact in the recognition of faces of own- and other-race persons. *Journal of Social Issues*, *41*, 139—155.

Diamond, R., & Carey, S. (1986). Why faces are not so special: An effect of expertise. *Journal of Experimental Psychology: General*, *115*, 107—117.

Eberhardt, J. L., Davies, P. G., Purdie-Vaughns, V. J., & Johnson, S. L. (2006). Looking deathworthy: Perceived stereotypicality of Black defendants predicts capital-sentencing outcomes. *Psychological Science*, *17*, 383—386.

Empirisoft Corporation (2006). *MediaLab and Direct RT v2006 [Computer software].* New York: Author.

Gaertner, S. L., & Dovidio, J. F. (2000). *Reducing intergroup bias: The common ingroup identity model.* Philadelphia: Psychology Press.

Gaspar, C. M., Bennett, P. J., & Sekuler, A. B. (2008). The effects of face inversion and contrast-reversal on efficiency and internal noise. *Vision Research*, *48*, 1084—1095.

Goldstein, A. G., & Chance, J. E. (1985). Effects of training on Japanese face recognition: Reduction of the other-race effect. *Bulletin of the Psychonomic Society*, *23*, 211—214.

Hancock, K. J., & Rhodes, G. (2008). Contact, configural encoding and the other-race effect in face recognition. *British Journal of Psychology*, *99*, 45—56.

Hehman, E., Mania, E. W., & Gaertner, S. L. (2010). Where the division lies: Common ingroup identity moderates the cross-racial recognition effect. *Journal of Experimental Social Psychology*, *46*, 445—448.

Hugenberg, K., & Corneille, O. (2009). Holistic processing is tuned for in-group faces. *Cognitive Science*, *33*, 1173—1181.

Hugenberg, K., & Sacco, D. F. (2008). Social categorization and stereotyping: How social categorization biases person and perception in face memory. *Social and Personality Psychology Compass*, *2*, 1052—1072.

Levin, D. T. (1996). Classifying faces by race: The structure of face categories. *Journal of Experimental Psychology. Learning, Memory, and Cognition*, *22*, 1364—1382.

Levin, D. T. (2000). Race as a visual feature: Using visual search and perceptual discrimination tasks to understand face categories and the cross-race recognition deficit. *Journal of Experimental Psychology: General*, *129*, 559—574.

Lindsay, D. S., Jack, P. C., & Christian, M. A. (1991). Other-race face perception. *The Journal of Applied Psychology*, *76*, 587—589.

Maurer, D., Le Grand, R., & Mondloch, C. J. (2002). The many faces of configural processing. *Trends in Cognitive Sciences*, *6*, 255—260.

Meissner, C. A., & Brigham, J. C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law*, *7*, 3—35.

Meissner, C. A., Brigham, J. C., & Butz, D. A. (2005). Memory for own- and other-race faces: A dual-process approach. *Applied Cognitive Psychology*, *19*, 545—567.

Michel, C., Caldara, R., & Rossion, B. (2006). Same-race faces are perceived more holistically than other-race faces. *Visual Cognition*, *14*, 55—73.

Michel, C., Corneille, O., & Rossion, B. (2007). Race categorization modulates holistic face encoding. *Cognitive Science*, *31*, 911—924.

Michel, M., Corneille, O., & Rossion, B. (2009). Holistic face encoding is modulated by perceived face race: Evidence form perceptual adaptation. *Visual Cognition*, *18*, 434—455.

Michel, M., Rossion, B., Han, J., Chung, C., & Caldara, R. (2006). Holistic processing is finely tuned for faces of one's own race. *Psychological Science*, *17*, 608—615.

Minear, M., & Park, D. C. (2004). A lifespan database of adult facial stimuli. *Behaviour Research Methods, Instruments, & Computers*, *36*, 630—633.

Navarrete, C. D., McDonald, M. M., Molina, L. E., & Sidanius, J. (2010). Prejudice at the nexus of race and gender: An outgroup male target hypothesis. *Journal of Personality and Social Psychology*, *98*, 933—945.

Rhodes, G., Brake, S., Taylor, K., & Tan, S. (1989). Expertise and configural encoding in face recognition. *British Journal of Psychology*, *80*, 313—331.

Sangrigoli, S., & de Schonen, S. (2004). Effect of visual experience on face processing: A developmental study of inversion and non-native effects. *Developmental Science*, *7*, 74—87.

Sekuler, A. B., Gaspar, C. M., Gold, J. M., & Bennett, P. J. (2004). Inversion leads to quantitative, not qualitative, changes in face processing. *Current Biology*, *14*, 391—396.

Shriver, E. R., Young, S. G., Hugenberg, K., Bernstein, M. J., & Lanter, J. R. (2008). Class, race, and the face: Social context modulates the cross-race effect in face recognition. *Personality and Social Psychology Bulletin*, *34*, 260—274.

Tanaka, J. W., Kiefer, M., & Bukach, C. M. (2004). A holistic account of the own-race effect in face recognition: Evidence from a cross-cultural study. *Cognition*, *93*, B1—B9.

Thompson, P. (1980). Margaret Thatcher: A new illusion. *Perception*, *9*, 483—484.

Vuilleumier, P. (2002). Facial expression and selective attention. *Current Opinion in Psychiatry*, *15*, 291—300.

Yin, R. K. (1969). Looking at faces upside down. *Journal of Experimental Psychology*, *81*, 141—145.

Young, A. W., Hellawell, D., & Hay, D. C. (1987). Configurational information in face perception. *Perception*, *16*, 747—759.