“They all look the same?” Participant Ethnicity Moderates the Cross-Race Effect on Judgments of Learning

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**Author Note**

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**Abstract**

The Cross-Race Effect (CRE) refers to the repeated finding that individuals are better at recognizing faces belonging to members of their own racial or ethnic group. While this effect has been widely studied on facial recognition, fewer studies have explored whether judgments of learning (JOLs) are sensitive to this pattern. In two experiments, Black and Caucasian participants studied faces depicting high-typicality same and other-race targets (Experiment 1) or a mix of high and low-typicality faces for each target type (Experiment 2) while making JOLs. Across experiments, we replicated the CRE on recognition, as participants were better at recognizing and showed greater discriminability for same-race faces. Importantly, the CRE pattern extended to JOLs. However, this pattern was moderated by participant ethnicity, as only Black participants’ JOLs were sensitive to the CRE. For Caucasian participants, JOLs did not differ between same and other-race targets, regardless of whether targets were high or low typicality. Findings from racial attitude questionnaires suggest that this pattern may have resulted from differing levels of racial prejudice between participant groups and Caucasian participants’ motivations to appear non-prejudiced. These findings suggest that while JOLs can be sensitive to the CRE pattern, participants’ beliefs and stereotypes likely influence their efficacy.

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Human faces convey a wealth of social information. The encoding and subsequent processing of this information influences decision-making and drives individuals’ general behavior (see Bruce & Young, 2012, for review). Although people are exceptionally well-versed at recognizing faces, several factors influence the accuracy of facial recognition, including attractiveness (Shepherd & Ellis, 1973), age (Anastasi & Rhodes, 2005; Rhodes & Anastasi, 2012), gender (Wright & Sladden, 2003), and, relevant to the present study, the race/ethnicity of the target face (Malpass & Kravits, 1969; see Shapiro & Penrod, 1986). However, across these factors, a common pattern emerges where individuals are typically better at recognizing ingroup members' faces than outgroup members (i.e., the ingroup memory advantage; see Herzmann & Curran, 2013).

In the present study, we focus specifically on the Cross-Race Effect (CRE or *own-race bias*), which refers to the robust finding that individuals are more accurate when identifying faces belonging to their own racial or ethnic ingroup compared to other-race faces (Malpass & Kravitz, 1969). Given the broad impact of racial perceptions on social-cognitive processes (e.g., stereotyping and prejudice; see Cosmides, Tooby, & Kurzban, 2003, for review), the ingroup memory advantage has been commonly studied through the lens of the CRE. Often, these studies have compared facial recognition between Black and Caucasian adults. However, this effect is not limited to this specific comparison, as the CRE has been shown to replicate using ethnically diverse samples of adults (Meissner & Brigham, 2001) and children (Corenblum & Meissner, 2006). Additionally, Meissner and Brigham (2001) analyzed findings from 91 independent samples that found both correct recognition and discriminability (i.e., participants’ ability at test to discern between previously presented and new targets) were greater for same versus other-race faces, demonstrating the robustness of the CRE, regardless of specific ingroup versus outgroup comparisons. As such, the CRE generalizes across a variety of contexts.

Understanding the specific factors that contribute to the CRE is critical, given the potential consequences of misremembering an individual. While misremembering a face may lead to embarrassment in social situations, more serious consequences can occur in legal settings. For example, the justice system makes extensive use of eyewitness memory, and jury decisions are often directly influenced by eyewitness accounts. Factors influencing the accuracy of eyewitness memory may have severe consequences if victims falsely identify an individual as having perpetrated a crime. Consistent with this notion, the Montana Innocence Project estimates that upwards of 40% of wrongful convictions result from biased cross-racial identification (Montana Innocence Project, 2024). Additionally, several legal cases illustrate the importance of understanding the CRE. In a notable example, Terance Garner, a 16-year-old African-American, was falsely identified by a Caucasian victim as the perpetrator of an armed robbery and shooting. Based on this erroneous cross-racial eyewitness identification and suggestive questioning by law enforcement, Garner was tried and ultimately convicted on counts of armed robbery, kidnapping, and attempted murder (see Terence Garner- National Registry of Exonerations,2012 for more details). However, approximately four years after the trial, new evidence emerged and, following national attention, Garner was granted a new trial. The case was ultimately dismissed, with the prosecution publicly stating that they no longer believed Garner was guilty (Grine & Coward, 2014). Given the occurrences of this and similar cases, understanding the mechanisms behind the CRE is imperative for promoting the well-being and freedom of individuals.

Considering the societal implications of the CRE, previous work has explored various social and cognitive factors that may underlie this effect and methods to reduce this perceptual bias. Several hypotheses suggest that the CRE is strongly linked to the degree of interaction individuals have with ethnic outgroup members (see Young, Hugenberg, Bernstein, & Sacco, 2012, for review). A holistic processing account, within the context of social contact, suggests that individuals encode own-race faces while using a higher degree of integration for individual facial features that are particularly relevant for differentiating between ethnic ingroup members compared ethnic outgroup members (Tanaka, Kiefer, & Bukach, 2004). Accordingly, the fewer experiences individuals have with outgroup members, the less expertise they should demonstrate when encoding and differentiating between multiple outgroup faces.

Another possibility for the role of social contact as a mechanism of the CRE is represented by face space models, which posit that perceptual expertise for faces results from a finely tuned visual system (Valentine, 1991). These models rely on the degree of contact in one’s social environments to provide expertise in encoding and differentiating between faces. Assuming greater levels of social contact with people in one’s racial ingroup, these visual systems are thought to provide a clearer mental representation of own-race faces (Stelter et al., 2023). However, despite extensive testing, few studies have identified social contact as the main driver of this perceptual bias (see Meissner & Brigham, 2001; also see Wong, Stephen, & Keeble, 2020), and a recent meta-analysis conducted by Singh, Mellinger, Earls, Tran, Bardsley, and Correll (2022) found only a weak meta-analytic effect of interracial contact on the CRE (*r* = -.15). Notably, McKone et al. (2019) found that increased social contact only reduced the CRE in children under the age of 12. Collectively, degree of social contact appears to have a slight influence on the CRE, though increased social contact during early developmental periods may improve memory for outgroup members. Taken together, it is unlikely that social contact alone can fully account for the CRE as few causal links have yet to be established.

Separately, *social categorization* accounts also propose that the CRE reflects inherent differences in how ingroup and outgroup faces are processed. However, unlike social contact accounts, social categorization accounts make no specific claims regarding the role of intergroup contact. Instead, these accounts posit that since differences in facial structures provide highly salient markers of ethnic group membership, they can be readily used to categorize individuals as being ingroup or outgroup members (see Sporer, 2001). Based on these accounts, the CRE occurs because ingroup faces are inherently processed more individually, which facilitates later recognition. However, outgroup faces are more likely to be encoded based on broad, category-defining features, which are less beneficial for later recognition (see Marsh, 2021). Previous work by Bernstein, Young, and Hugenberg (2007) supports this account, as the authors demonstrated that memorial benefits for ingroup faces persisted even after controlling for participants’ experience with target outgroup members. Additionally, findings from Meissner, Brigham, and Butz (2005) suggest that ingroup faces are more deeply encoded versus outgroup faces, as own-race faces showed both greater hit-rates (i.e., correct recognition) and fewer false-alarms (i.e., false recognition) versus other-race faces (see also Herzmann, Ogle, & Curran, 2022).

Because social categorization accounts propose that the CRE is linked to perceptions of salient features which can be used to identify ingroup members, other studies have tested this account by manipulating prototypicality. Commonly, these studies have compared participants’ memory for racially ambiguous faces (e.g., low-typicality faces) in which ethnic group membership is unclear. For example, Pauker, Weisbuch, Ambady, Sommers, and Ivcevic (2009) tested recognition of same, other-race, and racially ambiguous faces and found that memory costs for cross-race faces extended to racially ambiguous faces (Experiment 1). However, these costs were lessened when participants were explicitly instructed to encode racially ambiguous individuals as belonging to one’s ingroup (Experiment 2), providing additional support for a social categorization account. More recently, Marsh (2021) found that while the CRE extends to racially ambiguous faces, this effect was often moderated by participants’ own race. Furthermore, priming ambiguous faces as belonging to a specific ethnic group differentially moderated the CRE for various participant groups. Thus, while the CRE has been extended to racially ambiguous faces, both the demographic characteristics of the participants and the perceived ethnicity of the target face can influence the CRE.

**The Cross-Race Effect and Judgments of Learning**

As noted above, there has been extensive research focused on explaining the CRE’s specific memory patterns. However, other work has begun to explore whether metacognitive processes are also sensitive to the CRE. Metacognition refers to individuals’ awareness of their cognitions and is generally studied in terms of monitoring (i.e., assessing one’s learning or knowledge) and control (i.e., regulating one’s behavior; see Nelson & Narens, 1990; Schwartz & Metcalf, 2017, for reviews). To investigate these processes, researchers have individuals judge various aspects of the learning process. Several metacognitive judgment tasks have been developed, which differ based on the point in the learning process in which they are elicited and/or the specific metacognitive process they are designed to assess (see Rhodes, 2016). Metacognitive judgments can be elicited at encoding (i.e., prospective judgments) to assess predictions of future memory performance (e.g., Judgments of Learning; JOLs; Arbuckle & Cuddy, 1969; Koriat, 1997; see Rhodes & Tauber, 2011). Prospective judgments can be contrasted with retrospective judgments, which are provided at retrieval and involve participants reflecting on specific aspects of their in-the-moment experiences at test (e.g., retrospective confidence judgments; Mitchum & Kelley, 2010; Robey Dougherty, & Buttaccio, 2017).

Because the CRE has important implications for eyewitness memory, previous studies using metacognitive judgments in this context have primarily focused on the relationship between recognition and retrospective confidence ratings (e.g., Corenblum & Meissner, 2006; Dodson & Dobolyi, 2016; Horry & Wright, 2008; Nguyen, Pezdeck, & Wixted, 2017). As a result, fewer studies have used prospective judgments like JOLs to explore whether participants are aware of the CRE at encoding, often by assessing changes in JOL accuracy (e.g., Hourihan, Benjamin, & Lui, 2012; Palma, Vieira, Cruz, & Mata, 2024; Rhodes, Sitzman, & Tauber, 2013). These studies have also differed in the level of JOL accuracy they have explored. For example, Hourihan et al. (2012) assessed the CRE on *relative accuracy*, which refers to the extent to which JOLs can correctly distinguish between remembered and non-remembered items and is commonly measured using Goodman-Kruskal gamma correlations (*G*; Goodman & Kruskal, 1954). In contrast, other work has emphasized *absolute accuracy* (e.g., Rhodes et al., 2013, which refers to the overall correspondence between JOLs and memory and can be assessed through mean analyses (i.e., comparisons of mean memory and mean JOLs) or visualized via calibration plots (see Maxwell & Huff, 2021). Both accuracy types are independent and thus may have differing levels of sensitivity to the CRE.

Overall, previous studies have found inconsistent results across both levels of JOL accuracy. For example, Hourihan et al. (2012) had participants provide JOLs while studying same and other-race faces prior to completing an old/new recognition test. Overall, the authors found a CRE pattern on recognition which extended to relative JOL accuracy (i.e., relative accuracy was greater for same versus other-race targets). However, follow-up studies have been largely unable to reproduce this pattern, with most showing no changes in relative accuracy between same and other-race targets (e.g. Palma et al., 2024). Other studies have demonstrated mixed findings on absolute accuracy, with some showing no CRE effect (i.e., equivalent mean JOLs for same and other-race targets; e.g., Rhodes et al., 2013) and others showing a CRE pattern on JOLs (i.e., higher JOLs for same vs. other-race targets; e.g. Smith, Stinson, & Prosser, 2004). Thus, the CRE likely does not influence relative accuracy, though findings appear mixed regarding its effect on absolute accuracy.

Finally, recent findings from Palma et al. (2024) suggest that JOLs may be particularly useful for understanding the relationship between racial ambiguity and the CRE. Per Koriat’s (1997) cue utilization framework, individuals base the magnitude of their JOLs on both intrinsic cues (i.e., properties inherent to the stimuli being encoded) and extrinsic cues (e.g., factors pertaining to the context in which encoding occurs). Racial ambiguity likely reflects a specific type of intrinsic cue, as if ingroup faces are more fluent at encoding, participants would likely use this information when making their JOLs (i.e., Caucasian participants would be expected to assign higher JOLs for faces displaying prototypical Caucasian features and lower JOLs for faces displaying prototypical Black features). Consistent with this account, Palma et al. recently demonstrated that both JOLs and retrospective confidence judgments are sensitive to differences in racial categories and prototypicality. Thus, in addition to assessing whether the CRE extends to participants’ metacognitive processes, JOLs may simultaneously provide insights regarding the effects of racial ambiguity on the CRE.

**The Present Study**

Although the CRE has been widely studied within the context of recognition memory, fewer studies have directly assessed whether JOLs are sensitive to this effect. As such, the present study tested for changes in mean JOLs when participants studied high typicality same and other-race faces. In doing so, we sought to replicate previous findings showing that relative accuracy is not sensitive to the CRE while also exploring whether participants’ mean JOLs would be sensitive to this effect (i.e., higher JOLs for same versus other race targets). Following the design of Hourihan et al. (2012), we report Goodman-Kruskal gamma correlations (Goodman & Kruskal, 1954) as a measure of relative accuracy, which provide an ordinal measure of the association between JOLs and recognition (see Nelson, 1984; Higham & Higham, 2018, for reviews). In addition to *G* comparisons, we also compare changes in mean JOLs to assess whether participants are aware of the CRE at encoding. Finally, because Palma et al. (2024) recently demonstrated that participants’ JOLs are sensitive to racial typicality, Experiment 2 included typicality as an additional variable of interest.

Because studies investigating typicality effects on JOLs have primarily relied on Caucasian samples (e.g., Palma et al., 2024, Experiments 1-4), each experiment included direct comparisons between Black and Caucasian samples. Although robust CRE patterns have been found with multiple racial/ethnic groups (see Lee & Penrod, 2022), it is possible that cultural differences or differences in stimuli (e.g., distinctiveness of Black vs. Caucasian faces) could influence JOLs or recognition. Moreover, because JOLs are influenced by beliefs about memory, they may also be sensitive to participants’ attitudes or prejudices towards other-race individuals (i.e., Caucasian individuals may be hesitant to assign low JOLs to Black targets out of fear of being viewed as prejudiced). As such, each experiment included a set of racial attitude measures which were completed following the recognition test, which allowed us to explore whether participants’ attitudes influenced their JOLs. To our knowledge, the present study is the first to include these measures when exploring the CRE on JOLs.

**Experiment 1**

The goals of Experiment 1 were twofold. First, we sought to replicate the CRE pattern on recognition memory using a sample of Black and Caucasian participants. Second, we tested the extent to which participants’ JOLs would be sensitive to this memory pattern. All participants provided JOLs while studying a series of same and other-race faces, allowing us to assess whether any potential CRE patterns observed on recognition would extend to their JOLs, and whether this effect would potentially differ between Black and Caucasian participants. We anticipated that the CRE would extend to mean JOLs for two reasons. First, because the social categorization account posits that the CRE emerges from differences in how ethnic ingroup and outgroup faces are processed, JOLs would likely be sensitive to these differences, since JOLs are generally sensitive to processing fluency (see Hertzog, Dunlosky, Robinson, & Kidder, 2003). Second, if participants hold a belief that ingroup faces are easier to remember, their JOLs would similarly be expected to be higher. Therefore, we anticipated that participants would assign higher JOLs to same-race faces and lower JOLs to other-race faces. Regarding relative JOL accuracy, Hourihan et al. (2012) demonstrated that relative accuracy was greater for same-race faces. However, later studies have largely been unable to replicate this effect (see Palma et al., 2024). As such, we anticipated that *G* would not differ between same and other-race targets.

Finally, because JOLs capture information regarding beliefs about memory (see Mueller & Dunlosky, 2017), all participants completed a series of questionnaires assessing their attitudes toward other-race individuals and their motivations to appear non-prejudiced immediately after the recognition test. By including these additional assessments, we were able to test for a link between intergroup attitudes and memory processes while also assessing whether attitudes toward ethnic outgroup members influenced participants’ JOLs for other-race targets.

**Method**

**Participants**

We recruited 119 participants from two sources to complete Experiment 1. First, 92 undergraduate students were recruited from Midwestern State University. An additional 27 undergraduates were recruited from Jackson State University (see Table 1 for participant characteristics). Participant ethnicity was determined via self-report, and only participants who self-identified as Black or Caucasian were eligible for participation. The data were screened for low recognition rates (≤ 5%, which suggested a failure to attend to stimuli at encoding) and JOLs that anchored on scale extremes (e.g., all 0 or 100, which suggested a failure to attend to the JOL task instructions). No participants were omitted based on these criteria. Our final sample contained responses from 59 Black participants and 60 Caucasian participants and was based on a priori power analysis conducted with *G\*Power* 3.1 (Faul, Erdfelder, Buchner, & Lang, 2009), which suggested that 90 participants would be necessary to detect small-to-medium main effects/interactions (*d* ≥ 0.30; *α* = .05; 1 - *β* = .80). However, data collection was increased to account for additional variability that was anticipated due to Experiment 1 being conducted online. All participants were native English speakers.

**Materials**

***Stimuli.*** Eighty colored photographs were selected from the Chicago Face Database (CFD; Ma, Correll, & Wittenbrink) as served as stimuli. All photographs were 611 x 430 pixels in resolution, 240 dpi, and 24-bit. Of these photographs, 40 depicted faces of Black male and female individuals, while the remaining 40 depicted Caucasian male and female faces. Across target ethnicity and gender, only neutral faces were selected. All faces were rated as having high prototypicality for their respective ethnic group. Additionally, when selecting faces, we controlled for age, typicality, and perceived attractiveness (see Appendix Table C1 for stimuli properties) [[1]](#footnote-1). Finally, an additional five Black and five Caucasian faces were randomly selected from the CFD to serve as non-tested primacy and recency buffers.

***Study Lists and Recognition Test*.** The selected faces were equally split into two lists of 40 faces, with the constraint that each list contained 20 Black faces and 20 Caucasian faces and that for each race, an equal number of male and female faces were selected (e.g., 10 Caucasian male faces, 10 Caucasian female faces, etc.). Next, five randomly selected buffer faces were added to the beginning and end of each list. Because participants only studied one of the two lists, the same primacy and recency buffers were utilized for each study lists. Finally, an 80-item old/new recognition test was created by combining items from both lists (i.e., all items minus buffers). As such, this test presented participants with 40 previously studied Black and Caucasian faces alongside 40 Black and Caucasian faces from the non-studied list. Two versions of the study were created, which counterbalanced studied and non-studied faces.

***Racial Attitude Measures*.** The Modern Racism scale (MRS; McConahay, 1986) and the Internal/External Motivation to Respond Without Prejudice scales (IMS/EMS; Plant & Devine, 1998) scales were used to assess individual differences in intergroup attitudes. The initial MRS consisted of ten items that assessed explicit, negative racial attitudes (e.g., If a Black individual were put in charge of me‚ I would not mind taking advice and direction from him or her). Because race perception studies often focus extensively on negative attitudes toward minority group members, Caucasian participants are often questioned regarding their attitudes toward other races/ethnicities. To our knowledge, few face-processing studies have measured Black participants’ explicit racial attitudes concerning Caucasian individuals. We therefore added an alternative version of the MRS assessing Attitudes Towards Whites (MRS-W*)* scale, which was created by changing the target race of the 10 MRS items (now termed MRS-B; e.g., If a White individual were put in charge of me‚ I would not mind taking advice and direction from him or her; see Brigham, 1993, for a similar procedure). For both measures, participants responded using a 5-point Likert scale (“strongly disagree” to “strongly agree”).

Next, the IMS/EMS was chosen as a proxy validation measure for the scores obtained by the MRS-B/MRS-W scales. The IMS/EMS measures motivations to appear non-prejudiced, with five items assessing external motivations (e.g., “I try to hide any negative thoughts about Black people in order to avoid negative reactions from others”) and five assessing internal motivations (e.g., “I attempt to act in nonprejudiced ways toward Black people because it is personally important to me”). Like the MRS items, IMS/EMS responses were made via a 5-point Likert scale. Finally, we included a simple social contact scale consisting of one item (e.g., “How many hours a week do you spend with members of a different ethnicity”). For completeness, racial attitude measures have been made available in Appendix B.

**Procedure**

Experiment 1 was conducted online using Collector (Garcia & Kornell, 2015), a free, open-source platform for running web-based psychology experiments. Following informed consent, participants completed a brief demographics questionnaire, which assessed their gender identity, self-reported ethnicity, and age. Next, participants received the encoding task instructions. Specifically, participants were told that they would be studying a series of faces and that their memory for each face would later be tested. Participants were additionally instructed to provide JOLs for each face, which were elicited using a 0 to 100 scale. JOLs were framed as the probability of correctly identifying each face on a later test (0 = “I WILL NOT remember”; 100 = “I WILL Remember”), and participants were encouraged to use the full range of the scale when making their JOLs. After receiving the JOL instructions, participants immediately began the study task, which presented them with 50 faces, which included 10 primacy/recency buffers and a mix of 40 high-typicality Caucasian and Black faces. Faces were randomized for each participant, with the exception that each list began and ended with the five pre-selected buffer items.

After completing the JOL/study phase, participants immediately began a 2-minute filler task in which they alphabetized the 50 US States. Next, participants completed an 80-item forced-choice recognition test, which presented them with each of the 40 previously studied faces, as well as an additional 40 new faces that served as non-studied control items. Control faces were matched on the characteristics of the previously studied faces, and participants were required to determine whether a presented face had been previously studied (“OLD”) or not studied at encoding (“NEW”). Faces were presented in a randomized order for each participant.

Finally, following the recognition test, participants completed the MRS, IMS/EMS, and contact scales, which were presented in a randomized order. After completing the final questionnaire, participants were debriefed. The total experiment took approximately 30 minutes to complete.

**Results**

For all analyses, significance was set at *p* < .05. We report partial eta-squared (*ηp*2),and Cohen’s *d* effect sizes for all significant analyses of variance (ANOVAs) and *t*-tests. Additionally, all non-significant main effects/interactions are supplemented via a Bayesian estimate of the strength of evidence supporting the null hypothesis (see Masson, 2011; Wagenmakers, 2007). Termed *p*BIC, this value provides a probability estimate of the null hypothesis being retained. Importantly, because *p*BIC values are sensitive to sample size, this estimate provides increased confidence in any reported null effects. For transparency, all *R* code and data files used in the following analyses have been made available via OSF https://osf.io/jgkc9/.

**Recognition**

Table 2 reports mean hits, false alarms, and *d'* values for Black and Caucasian participants split by participant and target ethnicity. First, a 2 (Participant Ethnicity: Black vs. Caucasian) × 2 (Target Ethnicity: Black vs. Caucasian) mixed measures ANOVA was used to test for a CRE pattern on hit rates. Overall, no effect of Participant Ethnicity was detected, *F*(1, 117) < 1, *MSE* = .05, *p* = .96, *p*BIC = .92), and the effect of Target Ethnicity was similarly non-significant, *F*(1, 117) < 1, *MSE* = .01, *p* = .59, *p*BIC = .90. However, a significant Participant Ethnicity × Target Ethnicity interaction confirmed the presence of the CRE on hit rates, *F*(1, 117) = 14.27, *MSE* = .01, *ηp*2 = .09. Post-hoc testing revealed that for Black participants, correct recognition of Black targets exceeded hits for Caucasian Targets (.79 vs, .73; *t*(58) = 2.89, *SEM* = .02, *d* = 0.34). This pattern inverted for Caucasian participants, such that hits for Caucasian targets were significantly greater than hits for Black targets, (.79 vs. .74; *t*(58) = 2.42, *SEM* = .02, *d* = 0.30).

Next, we analyzed false alarms using the same design reported above. Overall, no effect of Participant Ethnicity was detected, *F*(1, 117) = 1.41, *MSE* = .04, *p* = .24, *p*BIC = .84. However, this model yielded a significant effect of Target Ethnicity, as collapsed across participants, false alarms were greater for Black versus Caucasian targets (.17 vs. .13; *F*(1, 117) = 13.06, *MSE* = .01, *ηp*2 = .10. Importantly, this model yields a significant interaction, *F*(1, 117) = 11.94, *MSE* = .01, *ηp*2 = .11. Post-hoc testing indicated that this interaction was primarily driven by Caucasian participants having greater false alarm rates for Black versus Caucasian targets (.20 vs. 13; *t*(59) = 4.05, *SEM* = .02, *d* = 0.44). For Black participants, false alarms did not differ as a function of Target Ethnicity (.13 vs. .13; *t*(58) < 1, *SEM* = .01, *p* = .86).

Finally, following the design of Hourihan et al. (2012), we tested for changes in discriminability (*d′*) as functions of Participant Ethnicity and Target Ethnicity. We computed *d′* values in *R* using the *psycho* package (Makowski, 2018), and extreme scores were corrected based on Hautus’s (1995) guidelines. Overall, mean *d′* did not differ between Black and Caucasian participants, *F*(1, 117) < 1, *MSE* = .1.31, *p* = .57, *p*BIC = .90. However, collapsed across participants, *d′* was greater for Caucasian versus Black targets (2.02 vs. 1.86; *F*(1, 117) = 6.24, *MSE* = 0.23, *p* = .01, *ηp*2 = .05), and, importantly, the Participant Ethnicity × Target Ethnicity interaction was significant, *F*(1, 117) = 27.95, *MSE* = 0.23, *ηp*2 = .19). Starting with Black participants, mean *d′* was greater for Black targets versus Caucasian targets (2.07 vs. 1.89; *t*(58) = 2.06, *SEM* = 0.09, *p* = .04, *d* = 0.21), while for Caucasian participants, the inverse pattern was observed, such that mean *d′* was greater for Caucasian targets relative to Black targets (2.14 vs. 1.65; *t*(59) = 5.31, *SEM* = 0.09, *d* = 0.55. Thus, the CRE pattern observed on hits readily extended to discriminability.

**JOLs**

Next, we assessed whether the CRE patterns observed on recognition would extend to mean JOLs and *G* (see Tables 3 and 4). First, mean JOLs were analyzed using a 2 (Participant Ethnicity: Black vs. Caucasian) × 2 (Target Ethnicity: Black vs. Caucasian) mixed measures ANOVA. Mean JOLs for all targets did not differ between Black and Caucasian participants; *F*(1, 117) < 1, *MSE* = 744.11, *p* = .75, *p*BIC = .91. However, a significant effect of Target Ethnicity indicated that participants produced higher JOLs for Black versus Caucasian targets (52.80 vs. 48.38; *F*(1, 117) = 17.15, *MSE* = 69.02, *ηp*2 = .13) and, additionally, the Participant Ethnicity × Target Ethnicity interaction was significant, *F*(1, 117) = 16.86, *MSE* = 69.02, *ηp*2 = .13. Follow-up testing revealed that this interaction was driven by Black participants assigning higher JOLs to Black targets versus Caucasian targets (54.67 vs. 45.36; *t*(58) = 5.34, *SEM* = 1.69, *p* < .001, *d* = 0.40). For Caucasian participants, JOLs did not differ between Caucasian and Black targets (51.19 vs. 51.19; *t*(59) < 1, *SEM* = 1.40, *p* = .98, *p*BIC = .92). Thus, although the CRE pattern observed on recognition extended to JOLs, this effect was moderated by participant ethnicity.

Turning to relative JOL accuracy, we next computed each participant’s mean *G* between JOLs and recognition separately for Black and Caucasian targets, which were then analyzed using the same design reported above. Overall, mean *G* did not differ as functions of Participant Ethnicity or Target Ethnicity and the interaction was non-significant, *F*s ≤ 1.25, *p*s ≥ .27, *p*BICs ≥ .85. Thus, while the CRE was partially reflected in participants JOLs, this pattern did not extend to JOL accuracy.

**Racial Attitude Measures**

Finally, we tested for differences in racial attitudes between Black and Caucasian participants and tested for correlations between each measure and JOLs for cross-race targets. Table 5 displays descriptive statistics for the MRS-B/MRS-W, IMS/EMS, and self-reported hours of inter-racial contact, and all correlations are provided in Table 6. Overall, Black participants reported higher negative racial attitudes based on their MRS scores compared to Caucasian participants (3.55 vs. 1.96; *t*(116) = 18.02, *SEM* = 0.09, *d* = 3.32). Additionally, Caucasian participants provided higher IMS (4.34 vs. 4.04) and EMS scores (2.80 vs. 2.34; *t*s ≥ 2.04, *d*s ≥ 0.38), suggesting that compared to Black participants, Caucasian participants were more likely to be motivated to appear non-prejudiced. Hours of inter-racial contact, however, did not differ between groups (29.82 vs. 29.22; *t*(64) < 1, *SEM* = 10.20, *p* = .95, *p*BIC = .89). Finally, no significant correlations were detected between JOLs and racial attitude measures (*r*s ≤ .23, *p*s ≥ .08).

**Discussion**

Experiment 1 sought to replicate the CRE using a sample of Black and Caucasian participants and assess whether JOLs are sensitive to this memory bias. Overall, we replicated the standard CRE memory pattern, as for both Black and Caucasian participants, hits were greater for same versus cross-race targets. Signal detection analyses revealed that this memory pattern similarly extended to discriminability. Thus, participants’ memory was more accurate for same-race targets compared to other-race targets. Interestingly, JOL CRE patterns were moderated by participant ethnicity. For Black participants, the CRE readily extended to JOLs, as their JOLs for Black targets exceeded JOLs for Caucasian targets. However, for Caucasian participants, JOLs did not differ as a function of target race. Findings from our racial attitude measures suggest that this pattern may be partially attributed to differences in racial biases and motivations to appear less prejudiced, a point we expand upon in the General Discussion. Finally, consistent with previous findings (e.g., Palma et al., 2024), the CRE pattern did not extend to relative JOL accuracy.

Because the CRE pattern on JOLs was moderated by participant ethnicity in Experiment 1, Experiment 2 aimed to replicate this pattern using a new sample. Additionally, because racial ambiguity has been found to affect the magnitude of the CRE (e.g., Cassidy et al., 2017; Marsh, 2021) and influence JOLs (e.g., Palma et al., 2024), we also manipulated the racial typicality of the target faces to assess these effects on both facial recognition and JOLs. With the exception of Palma et al. (2024), studies using JOLs to investigate the CRE have not manipulated the typicality of target faces. Moreover, while Palma et al. explored typicality effects on JOLs, the authors largely relied on samples of Caucasian participants. As such, Experiment 2 provided an additional test of typicality effects on Black and Caucasian participants’ JOLs while further exploring the role of racial attitudes on JOLs.

**Experiment 2**

Experiment 2 sought to replicate previously observed CRE patterns on JOLs for high typicality targets using a new sample of Black and Caucasian participants. Additionally, because typicality has been shown to influence JOLs (e.g., Palma et al., 2024), participants in Experiment 2 studied a mix of high and low typicality targets for each racial group, rather than solely studying high typicality targets as in Experiment 1. Overall, we expected to replicate CRE patterns observed on recognition of high typicality targets in Experiment 1. However, because racial typicality is thought to influence the magnitude of the CRE (Locke et al., 2005; Cassidy et al., 2017; Marsh, 2021), we expected to replicate Cassidy et al.’s (2017) finding that faces with low typicality features (e.g., racially ambiguous faces) produce a higher magnitude CRE. Regarding JOLs, we expected that the CRE would extend to JOLs, though it was unclear whether the effect would again be moderated by participant ethnicity. Additionally, if JOLs capture the ease with which faces are encoding, any observed CRE effects on JOLs should be reduced for low-typicality versus high-typicality targets. Finally, like Experiment 1, we similarly explored the link between racial attitudes and the CRE.

**Method**

**Participants**

We recruited 157 participants from Prolific (www.prolific.co) who completed Experiment 2 online and were compensated at a rate of $4.50/per half hour. Recruitment was restricted to participants who self-identified as Caucasian or Black based on Prolific’s pre-screening tools and, additionally, all participants were required to have completed at least a high school level education or equivalent (see Table 1 for sample characteristics). Responses were screened using the same procedure described in Experiment 1, and no participants were excluded. Our final analyses contained responses from 79 Caucasian participants and 78 Black participants. This sample size was based on an a priori power analysis conducted with *G\*Power 3.1* which suggested that 138 participants would be needed to detect small main effects and interactions (*d*s ≥ 0.20; *α* = .05; 1 - *β* = .80), though like the previous experiment, we increased data collection to account for additional variability from online testing.

**Materials and Procedure**

Experiment 2 used the same general procedure as Experiment 1, with the following exceptions. First, the 40 Caucasian and Black faces with the highest typicality ratings from Experiment 1 were paired with 40 low-typicality Caucasian and Black faces (see Appendix Figure A1). Like the previous experiment, faces were split into two equal study lists, with the constraint that each list contained 10 high-typicality Black and Caucasian faces and 10 low-typicality Black and Caucasian faces. As a result, each list contained 40 faces. Consistent with Experiment 1, lists were matched on gender and attractiveness, and high/low typicality subsets were similarly matched between lists (see Appendix Table C2). Participants were again randomly presented with one study list, with both the studied and counterbalanced lists being used to create the recognition test. Like the previous experiment, Experiment 2 took approximately 30 minutes to complete.

**Results**

**Recognition**

Table 7 reports mean hits, false alarms, and *d'* for Black and Caucasian participants as functions of target ethnicity and target typicality. To test for the presence of CRE memory patterns on correct recognition, hits were initially analyzed separately for high and low typicality targets via a pair of 2 (Participant Ethnicity: Black vs. Caucasian) × 2 (Target Ethnicity: Black vs. Caucasian) mixed ANOVAs. Starting with high typicality targets, hits did not differ as functions of Participant Ethnicity or Target Ethnicity, *F*s ≤ 2.45, *p*s ≥ .11, *p*BICs ≥ .78. However, this model yielded a significant interaction, *F*(1, 155) = 8.23, *MSE* = .02, *ηp*2 = .05. Follow-up testing revealed that for Caucasian participants, hits for same-race targets exceeded hits for other race targets (.78 vs. 74; *t*(78) = 2.25, *SEM* = 0.02, *d* = 0.22). For Black participants, the difference between same and other-race targets was marginal (.82 vs. .78; *t*(77) = 1.84, *SEM* = 0.04, *p* = .06, *p*BIC= .62). Next, for low typicality targets, the main effect of Participant Ethnicity was similarly non-significant, *F*(1, 155) < 1, *MSE* = .06, *p* = .80, *p*BIC = .93. However, across participant groups, hits were greater for Black versus Caucasian targets (.75 vs. .71; *F*(1, 155) = 6.82, *MSE* = .02, *ηp*2 = .04). The Participant Ethnicity × Target Ethnicity interaction was marginally significant, *F*(1, 155) = 6.82, *MSE* = .02, *p* = .07, *p*BIC *=*.70. A series of planned follow-up tests confirmed that for Caucasian participants, hits did not differ between low typicality same and other-race targets (.73 vs. .74; *t*(78) < 1, *SEM* = 0.02, *p* = .61, *p*BIC= .89). However, for Black participants, hits for same-race targets exceed other-race targets (.75 vs. .69; *t*(77) = 3.50, *SEM* = 0.02, *d* = 0.32). Thus, when typicality was low, Black but not Caucasian participants demonstrated a CRE pattern.

Regarding false alarms for high typicality targets, no differences occurred as a function of participant ethnicity, *F*(1, 155) < 1, *MSE* = .06, *p* = .32, *p*BIC = .88. However, collapsed across participants, false alarms were greater for Black targets compared to Caucasian Targets (.20 vs. .14; *F*(1, 155) = 15.51, *MSE* = .02, *ηp*2 = .09). Additionally, the Participant Ethnicity × Target Ethnicity was significant, *F*(1, 155) = 9.09, *MSE* = .02, *ηp*2 = .06. Follow-up testing revealed that this interaction was primarily driven by Caucasian participants having higher false alarms for Black targets compared to Caucasian targets (.23 vs. .13; *t*(78) = 4.59, *SEM* = 0.02, *d* = 0.61). For black participants, false alarms did not differ between same and other-race targets (.17 vs. 15; *t*(77) < 1, *SEM* = 0.02, *p* = .55, *p*BIC= .88). For low typicality targets, all main effects and interactions were non-significant, *F*s < 1, *p*s ≥ .33, *p*BICs ≥ .92.

Finally, we assessed changes in mean *d'*. Starting with high typicality targets, significant main effects of Participant Ethnicity and Target Ethnicity emerged, *F*s ≥ 4.02, *η*p2s ≥ .03. Importantly, this model yielded a significant interaction, *F*(1, 155) = 22.80, *MSE* = 0.30, *ηp*2 = .13, and follow-up testing confirmed the presence of CRE patterns. Starting with Black participants, *d’* was marginally higher for Black targets relative to Caucasian targets (1.95 vs. 1.82; *t*(77) = 1.88, *SEM* = 0.07, *p* = .06, *p*BIC= .61). For Caucasian participants, this pattern inversed, such that mean *d’* was significantly higher for Caucasian targets versus Black targets (1.88 vs. 1.43; *t*(78) = 4.56, *SEM* = 0.10, *d* = 0.57). For low typicality targets, no effect of Participant Ethnicity was observed, *F*(1, 155) < 1, *MSE* = 1.04, *p* = .54, *p*BIC *=*.89, though the main effect of Target Ethnicity and interaction were significant, *F*s ≥ 4.03, *η*p2s ≥ .03. Follow-up testing indicated that this interaction reflected Black participants having significantly higher *d’* for Black versus Caucasian targets (1.92 vs. 1.66; *t*(77) = 3.03, *SEM* = 0.09, *d* = 0.29). For Caucasian participants, *d’* did not differ between same or other-race targets (1.72 vs. 1.72; *t*(78) < 1, *SEM* = 0.10, *p* = .97, *p*BIC= .90).

**JOLs**

Tables 3 and 4 reports mean JOLs for high and low typicality targets as functions of Participant Ethnicity, Target Ethnicity, and Target Typicality. We first tested whether the CRE pattern extended to mean JOLs for high and low typicality targets before testing for differences in resolution. Starting with high typicality targets, Black participants provided higher JOLs compared to Caucasian participants (54.27 vs. 48.56; *F*(1, 155) = 5.12, *MSE* = 500.00, *ηp*2 = .03), Black targets received higher JOLs compared to Caucasian targets (54.44 vs. 48.36; *F*(1, 155) = 30.91, *MSE* = 96.38, *ηp*2 = .17), and, importantly, the interaction was significant *F*(1, 155) = 58.36, *MSE* = 96.38, *ηp*2 = .27. Follow-up testing indicated that for Black participants, mean JOLs for high typicality same-race targets greatly exceeded their JOLs for other-race targets (61.58 vs. 46.97; *t*(77) = 7.92, *SEM* = 1.88, *d* = 0.82. However, for Caucasian participants, the difference between JOLs for same and other-race targets failed to reach significance (49.73 vs. 47.40; *t*(78) = 1.87, *SEM* = 1.25, *p* = .07, *p*BIC = .61).

For low typicality targets, the effect of Participant Ethnicity was non-significant, *F*(1, 155) = 1.20, *MSE* = 524.57, *p* = .27, *p*BIC = .87. However, mean JOLs were greater for Black targets relative to Caucasian targets (54.81 vs. 50.22; *F*(1, 155) = 30.28, *MSE* = 55.56, *ηp*2 = .16), and the interaction was significant, *F*(1, 155) = 13.86, *MSE* = 55.56, *ηp*2 = .08. Follow-up *t*-tests indicated that for low typicality targets, Black participants mean JOLs were greater for same versus other-race targets (57.82 vs. 50.09; *t*(77) = 5.68, *SEM* = 1.39, *d* = 0.46). For Caucasian participants, however, the no difference was detected as a function of target ethnicity when JOLs were elicited on low typicality targets (50.35 vs. 51.85; *t*(78) = 1.51, *SEM* = 1.00, *p* = .13, *p*BIC = .74)

Regarding resolution, mean *G* was greater for high typicality Caucasian targets compared to high typicality Black targets (.23 vs. .08; *F*(1, 155) = 6.50, *MSE* = .27, *ηp*2 *=*.04), however, no effect of Participant Ethnicity or interaction were detected, *F*s < 1, *p*s ≥ .39, *p*BICs ≥ .90. For low typicality targets, *G* was marginally greater for Caucasian versus Black targets (.24 vs. .14; *F*(1, 155) = 3.60, *MSE* = .21, *p =*.06, *p*BIC = .67). However, like high typicality targets, all other main effects/interactions were non-significant, *F*s < 1, *p*s ≥ .74, *p*BICs ≥ .92.

**Racial Attitude Measures**

Finally, like Experiment 1, we again tested for differences in racial attitudes between Black and Caucasian participants and additionally assessed correlations between each measure and JOLs for high and low-typicality other-race targets. Descriptive statistics for each racial attitude measure are reported in Table 5, and Table 8 reports all correlations. Consistent with our findings in Experiment 1, Black participants reported higher negative racial attitudes compared to Caucasian participants based on MRS scores (3.64 vs. 1.59; *t*(154) = 22.38, *SEM* = 0.09, *d* = 3.56). Additionally, Black participants reported more hours of inter-racial contact compared to Caucasian participants (26.94 vs. 13.51; *t*(127) = 3.28, *SEM* = 4.13, *d* = 0.57). IMS and EMS scores, however, did not differ between groups, *t*s ≤ 1.67, *p*s ≥ .10, *p*BICs ≥ .75. Interestingly, hours of inter-racial contact negatively correlated with Black participants’ JOLs for high and low typicality Caucasian targets (*r*s ≥ .39). All other correlations with JOLs, however, were non-significant, *r*s ≤ .16, *p*s ≥ .15.

**Discussion**

Experiment 2 sought to replicate CRE patterns observed on recognition and JOLs in Experiment 1 using a new sample of participants while also testing the effects of racial typicality on these patterns. Overall, we replicated recognition patterns observed in Experiment 1, further demonstrating the robustness of the CRE. Moreover, the magnitude of the CRE was greater for Black participants when studying low-typicality faces, suggesting that faces lower in racial typicality are more prone to this effect. Interestingly, higher racial prejudice scores from Black participants suggest that prejudice may further moderate the relationship between typicality and the CRE. Cassidy et al. (2017) observed this pattern with Caucasian participants, and our patterns are consistent with their findings, as Black participants reported greater levels of racial prejudice versus Caucasian participants in Experiment 2.

Additionally, the CRE pattern again extended to mean JOLs and, like the previous experiment, this pattern was only observed on Black participants’ JOLs. Furthermore, this effect was greater for high typicality targets. This pattern is consistent with social-cognitive accounts of the CRE and suggests that Black targets may have been processed more fluently than Caucasian targets. However, for Caucasian participants, mean JOLs did not differ between same and other-race targets, irrespective of target typicality. As such, we replicated findings from Experiment 1 showing that participant ethnicity may be a moderating factor when exploring CRE patterns on JOLs. Additionally, like Experiment 1, participants’ relative accuracy did not differ between same and other-race targets. Taken together, our findings in Experiment 2 are consistent with Experiment 1 while providing further evidence that typicality can influence the magnitude of participants’ JOLs

Finally, we again observed differences in racial attitude measures. Like Experiment 1, Black participants reported higher levels of racial prejudice compared to Caucasian participants. This suggests that Caucasian participants more readily attempted to appear non-prejudiced when providing their JOLs, which may also explain their relatively low MRS scores. Moreover, because JOLs also capture beliefs about memory, this finding may partially explain why the CRE pattern did not extend to Caucasian participants’ JOLs, as they may have tempered their JOLs to appear non-prejudiced (i.e., assigning equivalent JOLs across target ethnicities so as not to appear to favor one group over the other).

**General Discussion**

The present study sought to replicate the CRE on facial recognition while testing whether JOLs would be sensitive to this memory bias. In doing so, we compared memory for high typicality same and other-race targets (Experiment 1) and high/low typicality targets (Experiment 2). Based on previous research, we anticipated that participants would assign higher JOLs for same-race faces and that the magnitude of this effect would bet greater when participants elicited JOLs for high typicality targets (e.g., Palma et al., 2024). Finally, both experiments included a set of questionnaires assessing racial prejudice and motivations to appear unprejudiced, since these factors have sometimes been shown to influence the magnitude of the CRE on recognition memory (Ferguson, Rhodes, Lee, & Sriram, 2001; Walker & Hewstone, 2006; see Young et al., 2012).

In Experiment 1, we replicated the CRE on facial recognition, as hits for same-race targets exceeded hits for other-race targets for both Black and Caucasian participants. However, although this effect extended to JOLs, it was moderated by participant ethnicity. Starting with Black participants, JOLs for same-race faces exceeded JOLs for other-race faces, a pattern consistent with previous research (e.g., Palma et al., 2024; Smith et al., 2004). However, this pattern, did not extend to Caucasian participants’ JOLs, even though the CRE was observed on recognition memory with this participant group. Next, Experiment 2 replicated these findings while also extending them to include high and low typicality targets. The CRE on JOLs was again moderated by participant ethnicity, and importantly, the CRE pattern on Black participants’ JOLs was reduced for low typicality targets. These findings provide additional evidence that participants are aware of the CRE, as this pattern is reflected in their metacognitive judgments. Additionally, the finding that the CRE is greater for high typicality targets is consistent with previous research suggesting that the typicality can moderate this effect.

Our finding that the CRE pattern partially extended to JOLs and that these patterns were sensitive to changes in typicality is also consistent with social contact and categorization accounts of the CRE (e.g., Bernstein et al., 2007; Valentine, 1991). Per these accounts, ingroup faces appear more fluent and thus are encoded more deeply, producing a memory advantage for same-race faces. While the present study was not specifically designed to test the specific mechanisms underlying the CRE, we note that JOLs are sensitive to encoding fluency. Our observation that Black participants provided higher JOLs for same versus other-race targets suggests that these targets may have been easier to process at encoding. Similarly, our finding in Experiment 2 that the CRE was greater for high typicality targets is similarly consistent with this account as, per social categorization accounts, high typicality same-race targets should be easier to encode relative to low-typicality same-race targets, while the inverse should be observed for other-race targets. Our findings in Experiment 2 support this account, as Black participants’ JOLs for low-typicality Caucasian targets exceeded their JOLs for high-typicality Caucasian targets (50.09 vs. 46.97; *t*(77) = 2.60, *SEM* = 1.22, *d* = 0.17). However, given that these patterns did not extend to Caucasian participants, more work is needed to fully explore the degree to which the CRE extends to JOLs.

While our finding that the CRE did not extend to Caucasian participants’ JOLs is surprising, we note that in addition to being sensitive to processing fluency, JOLs are also influenced by participants’ beliefs about how memory works and, importantly, potential external biases. Importantly, external factors such as racial prejudice and stereotyping have been shown to influence the magnitude of category competition for facial typicality (e.g., Cassidy et al., 2017). For this reason, each experiment included a set of scales which measured participants’ beliefs about outgroup members (e.g., MRS; IMS/EMS). Although no correlations were detected between JOLs and the racial attitude scales, we note that across experiments, Black participants reported higher MRS scores versus Caucasian participants, suggesting higher levels of reported racial prejudice. Additionally, Caucasian participants provided higher IMS/EMS ratings, suggesting a greater need to appear unprejudiced.

Taken together, our findings suggest that JOLs are sensitive to the CRE, though the effect appears to be moderated by participant ethnicity. However, we note that the moderating effects of participant ethnicity on may have been driven by differing racial attitude levels. Specifically, Caucasian participants may have inflated their JOLs for Black targets, leading to JOLs which were similar across target ethnicities. However, because the present study did not explicitly ask participants to explain the reasoning behind their JOLs for Black and Caucasian targets, more work is needed to fully explore this account. Finally, although mean JOLs reflected the CRE pattern for Black participants, this effect was not observed when measuring relative JOL accuracy. Across experiments, we found no differences in relative accuracy between participant groups. As such, our findings add to a growing body of literature suggesting that relative JOL accuracy is not sensitive to this CRE (see Palma et al., 2024; but see also an earlier study Hourihan et al., 2012, which reported greater relative accuracy for same-race targets).

Regarding our observed CRE pattern on recognition, our finding that the magnitude of the CRE on recognition memory was greater for Black participants when studying low-typicality targets is consistent with previous work by Cassidy et al. (2017), who reported that groups with higher levels of racial prejudice demonstrated greater category competition for low typicality targets. This finding further suggests that racial prejudice may influence how typical or atypical a face is perceived to be, subsequently affecting recognition memory. Consistent with recent investigations of the CRE, these patterns imply that a baseline of differential recognition exists (see Herzmann et al., 2022), such that the automatic nature of social categorization and attitudes towards outgroups can greatly influence the encoding and retrieval of conspecific faces. As noted above, Black participants scored higher on the racial prejudice scale and simultaneously showed lower levels of motivation to hide any prejudice relative to Caucasian participants. Considering our finding that JOLs are sensitive to the CRE, the present study provides additional support for a social categorization account of the CRE.

Additionally, we note that differences in ethnic demographics between recruitment sites may have also contributed to this effect. For example, in Experiment 1, we recruited participants from universities in which the population were either majority Caucasian (i.e., as of Fall 2022, Black students comprised 14.7% of the student body at Midwestern State University) or majority Black (i.e., as of Fall 2022, Black students made up 94.4% of the total student body at Jackson State University). In Experiment 2, we used Prolific to recruit a wider range of potential participants, though 60.10% our participants reported living in the United Kingdom, which is majority Caucasian. Thus, although high levels of inter-racial contact have been proposed as a method for mending the CRE (see Singh et al., 2020), the quality of this contact may be particularly important, as high quality inter-racial contact would be more likely to encourage greater intergroup cohesion. Consistent with this notion, our simplified social contact scale did not show any significant correlations with mean JOLs, suggesting that the quantity of social contact alone might not be sufficient to influence the CRE. Thus, the nature and quality of interracial contact appear to be critical determinants of this effect.

Finally, while the present study utilized JOLs to provide additional insights regarding the CRE, future research should consider combining inferential techniques with more methodologically stringent manners to untangle the potential causes of this effect. Recent investigations have made use of fMRI and electroencephalographic tools to uncover the cognitive and biological processes facilitating the differential recognition of faces. For instance, facial processing is often tied to networks of face-selective brain regions such as the Fusiform Face Area (FFA) and the Occipital Face Area (OFA; see Kanwisher, McDermott, & Chun, 1997; Gauthier, Skudlarksi, Gore, & Anderson, 2000, for reviews). Since the discovery of these regions’ involvement in facial processing, recent work using biological methods to investigate the CRE have revealed differences in FFA activity levels when participants view same- and other-race targets, and have generated potential interventions for this recognition bias. For instance, Farmer et al. (2020) found that Caucasian participants’ levels of FFA activity for Black targets matched Caucasian targets only after increasing the amount of either individuation or positive social contact. Considered alongside the present study, social categorization processes are likely to be influenced by similar processes, which would likely be detectable via JOLs. Ultimately, however, more work is needed to fully explore this account.

**Conclusion**

Previous studies investigating the CRE with metacognitive judgments have often focused on changes in JOL accuracy or retrospective confidence ratings. In the present study, we expand upon previous work by exploring whether participants’ JOLs are sensitive to this memory pattern. Across experiments, we replicated the general CRE pattern on recognition memory in using samples of Black and Caucasian participants. Additionally, we replicated previous findings showing that although mean JOLs are sensitive to the CRE, this effect does not extend to relative JOL accuracy. However, although the CRE was observed on recognition memory for both Black and Caucasian participants, only Black participants’ JOLs were sensitive to this effect. Importantly, the magnitude of the CRE on JOLs was greater for high versus low typicality targets (Experiment 2), suggesting that same-race targets may be easier to encode and providing additional evidence that racial typicality moderates this the CRE on JOLs. Finally, responses to a series of racial attitude questionnaires suggested that Caucasian participants’ motivations to appear non-prejudiced may partially explain the lack of CRE pattern on their JOLs. Taken together, our findings suggest that the CRE on JOLs reflects a complex interplay between encoding fluency, beliefs about memory, and racial attitudes. Ultimately, more research is needed to fully explore this topic.

**Declarations**

**Data Availability Statement**

Study materials, data files, and *R* code used for analyses have been made available via OSF and can be accessed at: https://osf.io/jgkc9/. None of the experiments were pre-registered.

**Compliance with Ethical Practices**

The reported studies were approved by the Institutional Review Board at Midwestern State University (Protocol #23110904). All participants provided informed consent prior to participating in the experiments. The authors report no conflicts of interest.

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Table 1.

*Sample characteristics for participants in Experiments 1 and 2.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment | Recruitment Site | Ethnicity | *n* | *M* Age | % Female |
| Ex 1. | Midwestern State University | Black | 32 | 20.73 (5.02) | 87.88 |
|  |  | Caucasian | 60 | 20.40 (4.42) | 73.33 |
|  | Jackson State University | Black | 27 | 21.22 (1.52) | 88.89 |
| Ex 2. | Prolific | Black | 78 | 33.19 (7.76) | 57.69 |
|  |  | Caucasian | 79 | 34.72 (9.34) | 55.70 |

*Notes*: Parentheses denote *sd*. All participants recruited from Jackson State University self-identified as Black.

Table 2.

*Mean Hits, False Alarms, and d'* *as Functions of Target Ethnicity and Participant Ethnicity in Experiment 1.*

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | Target Ethnicity | Black Participants | Caucasian Participants |
| Hits | Black | .79 (.04) | .74 (.04) |
|  | Caucasian | .73 (.05) | .79 (.03) |
| False Alarms | Black | .13 (.03) | .20 (.04) |
|  | Caucasian | .13 (.03) | .13 (.04) |
| *d'* | Black | 2.07 (0.21) | 1.65 (0.24) |
|  | Caucasian | 1.89 (0.22) | 2.14 (0.22) |

*Note*: Parentheses indicate 95% *CI*s

Table 3.

*Mean JOLs as Functions of Target Ethnicity and Participant Ethnicity in Experiments 1 and 2.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Target Ethnicity | Target Typicality | Black | Caucasian |
| Ex. 1 | Black | High | 54.45 (5.59) | 51.19 (4.58) |
|  | Caucasian | High | 45.53 (5.78) | 51.19 (4.59) |
| Ex. 2 | Black | High | 61.58 (3.60) | 47.41 (4.15) |
|  | Caucasian | High | 46.97 (3.71) | 49.73 (3.80) |
|  | Black | Low | 57.82 (3.50) | 51.85 (3.92) |
|  | Caucasian | Low | 50.09 (3.92) | 50.35 (4.25) |

*Note*: Parentheses indicate 95% *CI*s. All targets in Experiment 1 were high typicality based on the Chicago Face Database (Ma et al., 2015).

Table 4.

*Mean Goodman-Kruskal as Functions of Target Ethnicity and Participant Ethnicity in Experiments 1 and 2.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Experiment | Target Ethnicity | Target Typicality | Black | Caucasian |
| Ex. 1 | Black | High | .16 (.12) | .19 (.12) |
|  | Caucasian | High | .26 (.10) | .23 (.12) |
| Ex. 2 | Black | High | .11 (.10) | .06 (.10) |
|  | Caucasian | High | .21 (.11) | .23 (.13) |
|  | Black | Low | .15 (.11) | .26 (.11) |
|  | Caucasian | Low | .14 (.11) | .23 (.09) |

*Note*: Parentheses indicate 95% *CI*s. All targets in Experiment 1 were high typicality based on the Chicago Face Database (Ma et al., 2015).

Table 5.

*Descriptive Statistics for Racial Attitude Measures and Hours of Cross-Race Contact for Black and Caucasian Participants in Experiments 1 and 2.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment | Participant Ethnicity | Measure | *M* (± 95% *CI*) | Min. | Max. |
| Ex. 1 | Black | MRS | 3.55 (0.14) | 2.30 | 4.60 |
|  |  | EMS | 2.34 (0.24) | 1.00 | 4.60 |
|  |  | IMS | 4.04 (0.23) | 1.60 | 5.00 |
|  |  | Contact | 29.22 (16.31) | 0.00 | 168.00 |
|  | Caucasian | MRS | 1.96 (0.10) | 1.20 | 2.90 |
|  |  | EMS | 2.80 (0.22) | 1.00 | 5.00 |
|  |  | IMS | 4.34 (0.17) | 2.6 | 5.00 |
|  |  | Contact | 29.82 (11.26) | 0.00 | 112.00 |
| Ex. 2 | Black | MRS | 3.64 (0.11) | 2.60 | 4.80 |
|  |  | EMS | 2.33 (0.21) | 1.00 | 5.00 |
|  |  | IMS | 4.26 (0.18) | 1.20 | 5.00 |
|  |  | Contact | 26.94 (7.33) | 0.00 | 168 |
|  | Caucasian | MRS | 1.59 (0.14) | 1.00 | 4.40 |
|  |  | EMS | 2.59 (0.21) | 1.00 | 5.00 |
|  |  | IMS | 4.42 (0.19) | 1.20 | 5.00 |
|  |  | Contact | 13.51 (3.66) | 0.00 | 70.00 |

*Notes*: MRS = Modern Racism Scale; Contact = hours of cross-race contact per week; EMS = External Motivation Scale; IMS = Internal Motivation Scale

Table 6.

*Correlations Between Mean JOLs and Racial Attitude Measures in Experiment 1.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Participant Ethnicity | Measure | JOL | MRS | Contact | EMS |
| Black | MRS | .23 | -- |  |  |
|  | Contact | .13 | .29 | -- |  |
|  | EMS | .12 | -34\* | -.13 | -- |
|  | IMS | -.05 | .08 | .24 | .17 |
| Caucasian | MRS | .13 | -- |  |  |
|  | Contact | -.02 | -.05 | -- |  |
|  | EMS | .02 | .21 | -.09 | -- |
|  | IMS | .02 | -.51\* | .13 | .03 |

*Notes*: “JOL” column denotes JOLs for cross-race targets; MRS = Modern Racism Scale; Contact = hours of cross-race contact per week; EMS = External Motivation Scale; IMS = Internal Motivation Scale; \* = *p* < .05

Table 7.

*Mean Hits, False Alarms, and d'* *as Functions of Target Ethnicity, Target Typicality, and Participant Ethnicity in Experiment 2.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | Target Ethnicity | Target Typicality | Black Participants | Caucasian Participants |
| Hits | Black | High | .82 (.04) | .74 (.04) |
|  | White | High | .78 (.04) | .78 (.04) |
|  | Black | Low | .76 (.04) | .74 (.04) |
|  | White | Low | .69 (.05) | .73 (.04) |
| False Alarms | Black | High | .17 (.05) | .24 (.04) |
|  | White | High | .15 (.04) | .12 (.03) |
|  | Black | Low | .12 (.04) | .13 (.03) |
|  | White | Low | .13 (.03) | .13 (.03) |
| *d'* | Black | High | 1.95 (0.19) | 1.43 (0.19) |
|  | White | High | 1.82 (0.19) | 1.88 (0.16) |
|  | Black | Low | 1.92 (0.21) | 1.72 (0.17) |
|  | White | Low | 1.66 (0.19) | 1.73 (0.17) |

*Note*: Parentheses indicate ±95% *CI*s.

Table 8.

*Correlations Between Mean JOLs and Racial Attitude Measures in Experiment 2*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Participant Ethnicity | Measure | JOL H | JOL L | MRS | Contact | EMS |
| Black | JOL L | .84\* | -- |  |  |  |
|  | MRS | .11 | .07 | -- |  |  |
|  | Contact | -.39\* | -.44\* | .02 | -- |  |
|  | EMS | .07 | .10 | -.12 | -.01 | -- |
|  | IMS | .04 | .04 | .18 | .14 | .02 |
| Caucasian | JOL L | .87\* | -- |  |  |  |
|  | MRS | -.02 | -.07 | -- |  |  |
|  | Contact | -.14 | -.16 | -.04 | -- |  |
|  | EMS | .08 | .17 | .04 | -.01 | -- |
|  | IMS | .16 | .18 | -.74\* | -.02 | .03 |

*Notes*: “JOL” columns denotes JOLs for cross-race targets; H = high prototypicality targets; L = low prototypicality targets; MRS = Modern Racism Scale; ATB = Attitudes Toward Blacks Scale; Contact = hours of cross-race contact per week; EMS = External Motivation Scale; IMS = Internal Motivation Scale; \* = *p* < .05

**Appendix A**

**Stimuli**

**A group of people with blue arrows

Description automatically generated**

Figure A1*:* Sample stimuli of high and low typicality targets. Faces and typicality ratings were taken from the CFD (Ma et al., 2015). Typicality values in this example ranged from 1.12- 4.56.

**Appendix B**

**Scales**

**B1. Modern Racism Scale**

This scale contains 10 items adapted from McConahay (1986). In addition to using the original items to assess Caucasian participant’s attitudes toward Black individuals, we also modified these items to assess Black participants attitude toward Caucasian individuals. All responses were made using a 1 (Strongly Disagree) to 5 (Strongly Agree) scale.

1. If a Black (White) individual were put in charge of me‚ I would not mind taking advice and direction from him or her.
2. If I had a chance to introduce Black (White) visitors to my friends and neighbors‚ I would be pleased to do so.
3. I would rather not have Black (White) individuals live in the same apartment building I live in.
4. I would probably feel somewhat self-conscious dancing with a Black (White) individual in a public place.
5. I would not mind it at all if a Black (White) family with about the same income and education as me moved in next door.
6. I think that Black (White) people look more similar to each other than White (Black) people do.
7. Generally, Black (White) individuals are not as smart as White (Black) individuals.
8. I get very upset when I hear White (Black) individuals make prejudicial remarks about Black (White) people.
9. I worry that in the next few years I may be denied my application for a job or a promotion because of preferential treatment given to Black (White) people.
10. It would not bother me if my new roommate was Black (White).

**B2: Internal/External Motivation to Respond Without Prejudice Scales**

This scale contains 10 items adapted from Plant and Devine (1998) assessing participants’ motivations to appear non-prejudiced. Items 1-5 measure internal motivations (IMS), while items 6-10 measure external motivations (EMS). All responses were made using a 1 (Strongly Disagree) to 5 (Strongly Agree) scale.

1. I attempt to act in nonprejudiced ways toward Black people because it is personally important to me.
2. According to my personal values, using stereotypes about Black people is not OK.
3. I am personally motivated by my beliefs to be nonprejudiced toward Black people.
4. Because of my personal values, I believe that using stereotypes about Black people is wrong.
5. Being nonprejudiced toward Black people is important to my self-concept.
6. I try to hide any negative thoughts about Black people in order to avoid negative reactions from others.
7. If I acted prejudiced toward Black people, I would be concerned that others would be angry with me.
8. I attempt to appear nonprejudiced toward Black people in order to avoid disapproval from others.
9. I try to act nonprejudiced toward Black people because of pressure from others.
10. Because of today's PC (politically correct) standards I try to appear nonprejudiced toward Black people.

**Appendix C**

**Stimuli Characteristics**

Table C1.

*Summary Statistics for Attractiveness, Perceived Age, and Perceived Typicality as Functions of Target Ethnicity and Gender for Faces Presented in Experiment 1.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Target Ethnicity | Gender | Variable | *M* (*SD*) | Min. | Max. |
| Black | Female | Attractiveness | 3.45 (0.83) | 2.16 | 4.89 |
|  |  | Age | 26.90 (4.81) | 18.32 | 38.07 |
|  |  | Typicality | 3.71 (0.34) | 3.00 | 4.51 |
|  | Male | Attractiveness | 3.46 (0.64) | 2.38 | 4.85 |
|  |  | Age | 28.71 (7.61) | 18.48 | 46.58 |
|  |  | Typicality | 3.79 (0.36) | 3.25 | 4.56 |
| Caucasian | Female | Attractiveness | 3.60 (0.82) | 2.00 | 5.09 |
|  |  | Age | 30.00 (6.74) | 19.91 | 50.43 |
|  |  | Typicality | 3.35 (0.61) | 2.54 | 4.39 |
|  | Male | Attractiveness | 3.03 (0.69) | 1.73 | 4.13 |
|  |  | Age | 27.27 (6.83) | 18.73 | 42.76 |
|  |  | Typicality | 3.32 (0.48) | 2.52 | 4.26 |

*Note*: Participants in Experiment 1 only studied high-typicality faces. Ratings were derived from the Chicago Face Database (Ma et al., 2015). The full stimuli set has been made available at https://osf.io/jgkc9/.

Table C2.

*Summary Statistics for Attractiveness, Perceived Age, and Perceived Typicality as Functions of Target Ethnicity, Typicality Group, and Gender for Faces Presented in Experiment 2.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Target Ethnicity | Typicality Group | Gender | Variable | *M* (*SD*) | Min. | Max. |
| Black | High | Female | Attractiveness | 3.36 (.80) | 2.24 | 4.89 |
|  |  |  | Age | 26.94 (4.36) | 21.34 | 36.10 |
|  |  |  | Typicality | 3.90 (0.29) | 3.39 | 4.51 |
|  |  | Male | Attractiveness | 3.64 (0.53) | 2.81 | 4.56 |
|  |  |  | Age | 31.70 (9.29) | 19.07 | 46.58 |
|  |  |  | Typicality | 4.03 (0.26) | 3.69 | 4.56 |
|  | Low | Female | Attractiveness | 3.56 (1.10) | 2.43 | 5.31 |
|  |  |  | Age | 34.16 (11.27) | 22.61 | 47.76 |
|  |  |  | Typicality | 1.76 (0.41) | 1.12 | 2.25 |
|  |  | Male | Attractiveness | 2.96 (0.82) | 2.11 | 4.58 |
|  |  |  | Age | 31.34 (6.96) | 21.65 | 41.26 |
|  |  |  | Typicality | 1.72 (0.23) | 1.35 | 2.15 |
| Caucasian | High | Female | Attractiveness | 3.65 (0.78) | 2.41 | 5.09 |
|  |  |  | Age | 30.23 (9.30) | 19.91 | 50.43 |
|  |  |  | Typicality | 3.86 (0.43) | 3.16 | 4.39 |
|  |  | Male | Attractiveness | 3.08 (0.74) | 1.73 | 4.08 |
|  |  |  | Age | 31.20 (7.18) | 23.07 | 42.76 |
|  |  |  | Typicality | 3.67 (0.37) | 3.17 | 4.26 |
|  | Low | Female | Attractiveness | 2.89 (0.80) | 1.72 | 4.00 |
|  |  |  | Age | 32.15 (7.23) | 23.56 | 44.76 |
|  |  |  | Typicality | 1.70 (0.30) | 1.12 | 2.02 |
|  |  | Male | Attractiveness | 2.69 (0.67) | 1.89 | 4.12 |
|  |  |  | Age | 29.09 (4.22) | 21.12 | 34.07 |
|  |  |  | Typicality | 1.86 (0.31) | 1.25 | 2.22 |

*Notes*: Ratings were derived from the Chicago Face Database (Ma et al., 2015).

1. Because perceived attractiveness can influence recognition memory for faces (Li et al., 2019), we assessed whether attractiveness differed between faces as functions of target ethnicity and target gender. A 2(Target Ethnicity: Black vs. Caucasian) × 2(Target Gender: Male vs. Female) revealed no significant effects or interaction, *F*s ≤ 3.04, *p*s ≥ .09, *p*BICs ≥ .65. [↑](#footnote-ref-1)