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Töredi, D.; Mansour, J. K.; Jones, S. E.; Skelton, F.; McIntyre, A. The Impact of Minority Status on the Cross-Race Effect: A Critical Review [In Press]. *Perspectives on Psychological Science*

This article will be published in post-edited form at:
https://journals.sagepub.com/toc/PPS/0/0

The Impact of Minority Status on the Cross-Race Effect: A Critical Review

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Conflict Statement

The authors of this manuscript do not have conflicts of interest.

Data availability statement

The data of this study are openly available in Open Science Framework at osf.io/pgbk.

Funding statement

No funding was received for this manuscript.

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Meta-analyses have consistently demonstrated the robustness of the cross-race effect (CRE; i.e., better recognition of same-race faces compared to different-race faces). These analyses have unveiled variations in the dependent variables associated with the CRE across combinations of participant and target races (Lee & Penrod, 2022; Meissner & Brigham, 2001). However, the underlying factors driving these variations remain poorly understood. We posit that although the CRE is robust, its generalizability may be contingent on the specific racial groups compared, particularly when contrasting majority and minority racial groups. In this comprehensive review, we delve into the dynamics of the CRE across distinct racial groups and explore how minority status may influence research outcomes. We considered the manuscripts included in the latest meta-analyses of the CRE with a spotlight on minority status. We suggest that minority-race status may explain why many studies considering non-White participants do not show a CRE. The CRE might not be as robust as it appears to be because much of the research on the effect has focused on majority-race participants and minority-race faces. Going forward, researchers should consider incorporating measures relevant to the minority effect, fully crossing participant and target races, and studying a greater variety of races.

Keywords: cross-race effect, minority effect, review

Public Abstract

Individuals are more likely to correctly recognise a seen-before person as well as less likely to incorrectly say they recognise a person they have not seen before when they are of the same-race (compared to a different race). Research has consistently shown this is the case, a phenomenon known as the cross-race effect (CRE). The CRE is important because it increases the chances of wrongful conviction and failure to convict guilty individuals. However, the CRE may be more nuanced than is generally believed. We illustrate how research indicates that the CRE differs depending on the races involved, and that the minority-race status of the person making the recognition judgment matters. To ensure that consideration of the CRE by legal officials is appropriate, we need to ensure we have a clear understanding of the circumstances under which the CRE occurs.

The Impact of Minority Status on the Cross-Race Effect: A Critical Review

There have been more than 3302 individuals in the United States (i.e., US) and 115 individuals in Europe that have been wrongly convicted and subsequently exonerated (European Registry of Exonerations, 2024; National Registry of Exonerations, 2022). Nearly one third (27% in US 28% in Europe) of wrongful conviction cases involved unintentional eyewitness identification errors. One contributing factor to eyewitness errors is the Cross-Race Effect (CRE, i.e., cross-race bias, other-race bias, own-race bias, or other-race effect): The CRE can be defined as individuals recognising faces that belong to their own race better than faces of another race (also referred to as cross-race)[1].

The CRE has been extensively researched for over 50 years, including several meta-analyses (e.g., Anthony et al., 1992; Lee & Penrod, 2022; Meissner & Brigham, 2001). Lee and Penrod conducted the latest meta-analysis, which included 234 individual studies comprising 364 experimental comparisons, 747 effect sizes, and 24,937 participants. Before that, Meissner and Brigham conducted a widely cited meta-analysis on more than 30 years of research that involved 39 peer-reviewed articles. Both meta-analyses affirmed the robustness and reliability of the CRE (Lee & Penrod, 2022; Meissner & Brigham, 2001). Meissner and Brigham indicated that individuals were 1.38 times more likely to correctly identify someone of the same race than of different races and 1.50 times less likely to falsely identify someone of the same race than of different races. After 20 years, Lee and Penrod reported similar results, indicating that the CRE persists and is of comparable magnitude.

The two most recent meta-analyses of the CRE (Lee & Penrod, 2022; Meissner & Brigham, 2001) also assessed whether the CRE was reliable across racial groups. Meissner and Brigham reported that White participants demonstrated a significantly stronger CRE than

[1] Race refers to a group of humankind that has shared distinctive physical traits and can be understood as distinct from ethnicity, which is a population group comprised of individuals who have a shared cultural heritage or ancestry. However, typically in the CRE literature, it is used interchangeably with ethnicity, therefore, we will also take this approach.

Black participants in terms of discriminability (i.e., ability to differentiate seen-before and not seen-before individuals), mainly because White participants made considerable false alarms (i.e., identifications of innocent or not seen-before individuals) to other-race faces. This larger CRE for White participants was also observed in comparison with "Other" race group participants, especially because hits (i.e., identifications of the culprit or previously seen individual), false alarms, and response criterion (i.e., amount of evidence required to identify) estimates differed based on participant race.[2] Twenty years later, Lee and Penrod also reported that participant race moderates memory for same- versus different-race faces: White participants showed a significantly stronger CRE than non-White participants in terms of discriminability, false alarms, and response criterion. However, when Asian, Black, Hispanic, and "Other" race participants were analysed separately, participant race only moderated the CRE for Asian and White participants. White participants, compared to Asian participants, showed a larger CRE for discriminability, false alarms, and response criterion. Notably, Lee and Penrod also investigated discriminability for different participant and target race combinations. White participants showed a larger CRE for Hispanic than Black and Asian targets. Both Hispanic and Asian participants showed a larger CRE for Black than White targets, while Black participants showed a larger CRE for Asian than White and Hispanic targets. Furthermore, the Asian participants did not show a significant CRE for Hispanic faces (see Lee & Penrod's Table 4). The same was observed for Asian faces when viewed by Hispanic participants.

Despite participant race moderating the effect of target race on performance, the authors asserted that the CRE remains robust and reliable and suggested that multiple complex factors underlie its occurrence. Notably, the literature primarily comprises studies with White participants (59.1% in Lee & Penrod, 2022; 56% in Meissner & Brigham, 2001). In Lee and

[2] Discriminability was not significantly different for White and "Other" participants.

Penrod's meta-analysis 20% of the studies included had Asian, 12.4% Black, 4.9% Hispanic and 3.6% "Other" participants. This bias in participant demographics may have influenced their results. Consequently, the observed moderation raises doubts about the generalisability of the CRE. We contend that additional factors may influence the generalisability of the CRE to participant race groups, such as the minority-race status of the participants in their recruited country.

Therefore, although the CRE is robust (Lee & Penrod, 2022), its generalisability may hinge on the specific racial groups compared, especially when contrasting local numerically majority and minority racial groups. The CRE literature should thus account for systematic differences between societal and/or cultural groups based on their majority- or minority-race status within multicultural societies, as these may explain the CRE findings. This consideration is crucial as previous findings show that once wrongly identified, minority-race individuals are more likely to be convicted and receive harsher sentences (compared to majority-race individuals), which accounts for the overrepresentation of minority-race men in prisons (Faison et al., 2023; National Registry of Exonerations, 2024). As countries have grown more ethnically diverse since the 1990s (General Social Survey, 2023), it is plausible that cross-racial crime rates may increase in tandem with changes in diversity (Hipp, 2010; Wenger, 2019). Therefore, it is crucial that the CRE is investigated with consideration of minority-race status. Here, we use the term *minority effect,* deriving the name from social psychology research (for a review, see Simon et al., 2003), to refer to variations in the CRE that might be partially explained by whether a participant race group is considered a numerical minority in their society. In this review, we considered the minority-race status of participants as an additional factor to be considered when the reliability of the CRE across participant groups is examined. But, first, we discuss *why* we believe minority status may influence the CRE.

Why Would Minority Status Influence the CRE?

Two theoretical literatures provide insights into why minority-race status may influence the CRE: Theories of the CRE and theories from the broader social psychology literature.

Theories of the CRE

Three CRE hypotheses provide potential explanations for the minority effect: the perceptual expertise, social-cognitive, and integrative hypotheses (for a review, see Young et al., 2012).

The perceptual expertise hypothesis posits that due to greater exposure to same-race faces, individuals accumulate greater levels of perceptual expertise in processing them, leading to more efficient recognition (Meissner & Brigham, 2001). On the other hand, exposure to cross-race faces is lesser, leading to lower levels of perceptual expertise. Evidence exists both in support of (e.g., Hills & Lewis, 2006; MacLin & Malpass, 2001; Tanaka et al., 2004) and against (e.g., Hugenberg et al., 2007; Walker & Hewstone, 2006, 2008) this hypothesis.

Notably, some scholars refer to the role of interracial contact/exposure for effective facial perception as *the contact hypothesis* (e.g., Chiroro & Valentine, 1995; Ng & Lindsay, 1994). This is because, while the perceptual expertise hypothesis holds interracial contact as one of its primary assumptions, it is not the only hypothesis that suggests that interracial contact influences the CRE. The social-cognitive hypothesis and the integrative models (e.g., Levin, 2000; Hugenberg et al., 2010; discussed later) also take this position. While these hypotheses agree on the impact of contact, they differ in terms of how they posit that contact impacts recognition (i.e., enhancing perceptual expertise vs. the social importance of faces). Meta-analytic reviews of the CRE (Lee & Penrod, 2022; Meissner & Brigham, 2001; Singh et al., 2021) have consistently found that increased interracial contact is associated with a

smaller CRE. However, this association is not particularly strong, explaining approximately 2% of the variability in the magnitude of the CRE across samples[3]. This consistency supports the idea that there is a real, albeit small, relationship between contact and the CRE.

The contact hypothesis is compatible with the minority effect. That is, minority-race individuals are expected to experience relatively more contact with majority-race individuals than majority-race individuals would be expected to have with any one minority-race. Minority-race individuals often find themselves in environments where majority-race individuals are predominant—workplaces, educational institutions, and public spaces. Furthermore, the perceptual expertise hypothesis implies that minority-race individuals learn to perceptually discriminate majority-race faces because they learn perceptually distinguishable features through constant contact (Meissner & Brigham, 2001). This constant exposure is expected to drive minority-race individuals to become experts at distinguishing majority-race faces. However, the converse is not true for majority-race individuals who encounter minority individuals less frequently, leading to weaker perceptual expertise for cross-race (minority) faces.

The social-cognitive hypothesis adds another layer of understanding to how the minority effect could influence the CRE beyond interracial contact by emphasising the importance of social intergroup relationships to the cognitive processes involved in face recognition (Anthony et al., 1992; Levin, 2000). The social-cognitive hypothesis suggests that the CRE arises not only from reduced exposure to cross-race faces but also from differences in the processing of members deemed socially relevan, ingroup (one's same group) versus outgroup members (those belonging to a different group). According to this hypothesis, the CRE occurs because individuals process outgroup members using categorisation (i.e., processing members by their category-specific features such as race, sex,

[3] These reviews exclusively examined data from adult participants.

and age) which impairs their ability to distinguish cross-race faces, but process ingroup members via individuation (i.e., processing specific facial features) which leads to a greater ability to distinguish between members of the same group. Again, evidence supportive of (e.g., Bernstein et al., 2007; Shriver et al., 2008) and against (e.g., Rhodes et al., 2009, 2010) this hypothesis exists.

The social-cognitive hypothesis implies that for minority-race individuals, recognising and individuating majority-race faces is crucial for social navigation and survival in a society where majority-race individuals hold more power and influence (Sidanius & Pratto, 1999). This necessity should drive minority-race individuals to pay closer attention to the individuating features of majority-race faces, facilitating better recognition. In contrast, as majority-race individuals do not have the racially-driven social need for navigation in society, majority-race individuals may not feel the same pressure or necessity to recognise minority-race faces, leading to a disparity in other-race face recognition abilities.

Several *integrative models* combine components from the perceptual expertise hypothesis and the social-cognitive hypothesis to explain the CRE. For example, the categorisation-individuation model (CIM; Hugenberg & Sacco, 2008; Hugenberg et al., 2010) is one of the most widely studied integrative models which suggests that faces are categorised or individuated based on their deemed social relevance (ingroup vs. outgroup) and the motivation to individuate them. Since the social relevance and the motivation to individuate would be inherently low for outgroup faces but high for ingroup faces, the former would be categorised while the latter would be individuated, leading to a CRE. The CIM argues that increased interracial contact will enhance perceptual expertise by increasing attendance to the individuating features, which in turn can improve recognition, but only if there is sufficient motivation to do so. There is both supportive (e.g., Hugenberg et al., 2007) and unsupportive evidence (e.g., Cruz et al., 2023) for the CIM.

The CIM implies that differences in interracial contact and the subjective importance of faces for minority-race and majority-race individuals will affect the CRE as well as motivation (Hugenberg & Sacco, 2008; Hugenberg et al., 2010). That is, minority-race individuals should be more motivated to accurately differentiate majority-race faces because incorrectly recognising a majority face could lead to misunderstandings, social ostracism, or even legal repercussions (e.g., deportation; Crutchfield et al., 2010; Sidanius et al., 1994). This heightened motivation should ensure that minority individuals invest more cognitive resources in face recognition. Moreover, societal structures often place majority groups in positions of authority and control—for instance, 85% of the police officers of the Metropolitan Police Service UK are White (Workforce diversity in Metropolitan Police Service, 2021)—making accurate recognition essential for minorities to navigate social hierarchies and opportunities effectively and likely enhancing their motivation to recognise majority faces accurately.

Recently, Hinzman et al. (2022) expanded the CIM by proposing a framework that considers how a perceiver's stigmatized status, such as minority race status, influences face processing and memory. The authors suggested that minority individuals may not exhibit the CRE due to the chronic experience of stigma, which alters face processing in three key ways: (a) heightened expertise in recognizing dominant-group faces due to increased exposure or social necessity, (b) greater motivation to accurately recognize dominant-group faces for social navigation and acceptance, and (c) selective allocation of cognitive resources toward outgroup faces, driven by social, economic, or safety concerns. To our knowledge, Hinzman et al. were the first to incorporate minority race status into a theoretical CRE model. Our review extends their perspective by integrating additional theoretical and applied insights—some discussed within their framework, others not—and evaluating whether research findings support this theoretical approach.

Insights From Social Psychology

In addition to theoretical approaches to the CRE explaining how minority status might influence the CRE, several theories from the broader social psychology literature offer explanations as well.

Firstly, *social identity theory* (Tajfel & Turner, 1979; see Ellemers & Haslam, 2012 for a review) suggests that individuals derive a sense of identity and self-esteem from their group memberships. According to this theory, minority-race individuals are acutely aware of their minority status in a society dominated by majority-race individuals and strive to adjust their behaviours for navigating social interactions, accessing resources, and avoiding potential discrimination or conflict. It is plausible that minority-race individuals also place more subjective importance on the recognition of majority-race faces for the same reasons. Majority-race individuals, on the other hand, may not experience the same level of identity-based motivation to recognise minority faces, as their social environment predominantly comprises their own racial group. Therefore, it is possible that the heightened awareness of minority-race individuals can lead to increased cognitive vigilance and attention to majority-race faces, but not vice versa.

Secondly, *stereotype threat theory* (Steele & Aronson, 1995; see Pennington et al., 2016 for a review) suggests that the fear of confirming negative stereotypes about one's ingroup affects group members' behaviour and performance. For example, minority communities often have a heightened awareness of the behaviours and expectations of law enforcement officers, and this awareness can manifest in cautious and deferential behaviours during encounters to avoid conflict or harsh treatment (Joseph et al., 2022; Phinney & Chavira, 1995). It is plausible that minority-race individuals, aware of potential negative stereotypes of their race group, may be more motivated to recognise and individuate majority-race faces accurately to avoid miscommunication and to reinforce positive social

interactions. The absence of a similar stereotype threat for majority individuals in recognising minority faces may result in lower motivation and, thus, poorer recognition, leading to a minority effect on the CRE. However, a note is warranted that methodological critiques have raised concerns about publication bias and questionable research practices in this literature that may undermine conclusions based of this theory (e.g., Johns, Schmader, & Martens, 2005; Zigerell, 2017). Nevertheless, it warrants incorporation into our theoretical discussion as it remains relevant.

Another relevant framework to consider is *system justification theory* which suggests that individuals from disadvantaged groups may unconsciously support and justify existing social hierarchies, even when they are personally disadvantaged, in order to maintain cognitive consistency and psychological harmony with the existing social order (Jost & Banaji, 1994; Jost et al., 2004). Internalizing system-justifying beliefs can shape self-perceptions of disadvantaged groups, leading them to view their disadvantaged status as natural or justified (O'Brien & Major, 2005). This self-perception may influence cognitive and attentional processes, including face recognition (Hintzman et al., 2022). It is plausible that minority race status individuals, being socially disadvantaged, see the dominant outgroup, White majority race individuals, as superior, prototypical, or socially significant, and unconsciously prioritize encoding, processing, recognizing and/or individuating outgroup faces over their own. This phenomenon of outgroup prioritization is known as outgroup favoritism and may lead minority individuals to allocate greater cognitive resources to individuating majority-group faces, potentially weakening or reversing the CRE.

Finally, *social dominance theory* suggests that societies maintain hierarchies through social structures and that societal hierarchies are upheld by both institutional and individual actions that favour dominant groups (Sidanius & Pratto, 1999; see Pratto et al., 2006 for a review). For instance, this theory suggests that systemic policies in education, employment,

and law enforcement often disproportionately benefit majority groups, while on an individual level behaviours such as discrimination and prejudice further perpetuate inequalities. For this reason, minority-race individuals, being positioned lower in the social hierarchy, are more attuned to the behaviours and characteristics of those in the dominant group. For example, minority employees in the workplace may closely observe the communication styles, work habits, and social interactions of majority colleagues to better assimilate and avoid negative consequences like being overlooked for promotions or to avoid social exclusion. Similarly, it is plausible that recognising majority-race faces accurately may be a strategy for minority-race individuals to navigate and potentially elevate their social standing within a system that places them at a disadvantage. However, majority-race individuals, since they occupy higher strata of the social hierarchy, may not perceive a need to recognise minority faces with the same level of accuracy.

Beyond Contact: A Complex Interplay

In summary, minority-race individuals may recognise majority-race faces better than majority-race individuals recognise minority-race faces not only because of their frequent interactions with majority-race individuals but also because of a multifaceted need to adapt and thrive in a society centred around the majority-race. There may be a complex interplay of social, cognitive, and motivational factors that influences how the minority-race status of individuals affects their CRE. Although there is a theoretical basis for the consideration of the minority effect on the CRE, it has not yet been considered by existing meta-analyses or individual empirical studies (cf. Vingilis-Jaremko et al., 2020).

The Current Review

As discussed, the findings of recent meta-analyses revealed significant variations in the degree of the CRE that occurs for different participant-race/target-race combinations (Lee & Penrod, 2022; Meissner & Brigham, 2001). A cross-race recognition deficit occurs when

the race of the observer (participant) and the displayed face (target) interact to influence memory for that face (Meissner & Brigham, 2001). If the CRE generalised across races, this would appear graphically as a complete crossover interaction (Bothwell et al., 1989; Lindsay & Wells, 1985). Lee and Penrod observed the postulated crossover interaction in fewer than half of the studies they examined and found no crossover for some races they examined. However, the existing literature has not extensively considered why such differences may manifest and whether these differences may be attributable to the minority-race status of the participant races. Only one study known to the authors has directly tested whether participants' minority-race status moderates the relationship between participant race and the CRE: Vingilis-Jaremko and colleagues (2020).

In three consecutive experiments, Vingilis-Jaremko and colleagues (2020) investigated the CRE with White majority faces compared to minority-race ingroup and outgroup faces. In the first experiment, White, Black, and South Asian participants were presented with White and Black targets; in the second experiment, White, Black, and East Asian participants were presented with White and East Asian targets, and in the last experiment, East Asian participants were presented with East Asian and White targets, East Asian and Black targets, or Black and White targets. All three experiments found a CRE, regardless of participant or target group. Importantly, they did not find strong evidence of better recognition when participants had to recognise majority-race versus minority-race outgroup faces. Thus, these experiments were inconsistent with a minority effect on the CRE. However, the researchers reported an overall pattern of better recognition for majority- compared to minority-race outgroup faces. While this effect did not reach statistical significance in each separate study, the consistency of this trend across studies made it statistically significant when the results were combined in an internal meta-analysis. Despite these findings not providing direct support for the minority effect, we believe that the results

from their internal meta-analysis, along with the theoretical basis for it, mean the minority effect warrants further exploration.

To shed light on whether minority-race status explains additional variance in the CRE, we considered the findings from studies included in Lee and Penrod's (2022)[4] meta-analysis in terms of the participants' minority-race status[5] and whether a CRE was observed[6]. Furthermore, we conducted an online search using Lee and Penrod's (2022) search criteria to identify research published after 2021 (i.e., the cut-off for studies included in their meta-analysis). We identified 15 new studies that fit their criteria, but only three assessed the CRE with non-White adult participants for White faces (Burgund, 2021; Havard et al., 2023, Experiment 2; Simon et al., 2023). We discuss these findings in the literature review alongside the findings from the studies included in Lee and Penrod's meta-analysis. After we review the CRE literature on how minority-race status may influence the CRE, we critically analyse the evidence and highlight future research directions. Our aim was not to conduct a meta-analysis, but rather to review the literature. However, we did perform a meta-regression analysis on the effect sizes from the Lee and Penrod dataset to investigate whether minority race status influences the magnitude of the effect size. The details of this analysis can be found in the supplementary materials.

Is there a Minority Effect on the CRE?

This review discusses the CRE for three groups of participant races—Black, Asian, and "Other"—in relation to White target faces. The "Other" participant race group consists of Hispanic participants and those participant races that were coded as "Other" by Lee and Penrod (2022). Hispanic participants were coded as "Other" in this review because of the

[4] A list of studies is available at the project registration of Lee and Penrod's (2022) meta-analysis on the Open Science Framework (https://osf.io/sj2tg/)
[5] We determined the minority or majority status of participants by analysing the racial composition of the country from which each study's participants were recruited, as indicated in their national records. Below 15% was the criterion we used for minority status.
[6] We used $p < .05$ as our criterion.

limited number of studies available to consider (discussed more later). Finally, we discuss the CRE for the White majority race group in relation to all non-White target faces to underscore the influence of minority (cf. majority) status on face recognition.

Black Participants

In 2023, a meta-analysis that solely focused on White and Black race pairings conducted by Katzman and Kovera found White participants were better at distinguishing between guilty and innocent suspects when viewing White than Black targets, while Black participants showed no such advantage when viewing Black versus White targets. This further suggests the CRE is inconsistent across races. Interestingly, Whites and Blacks performed similarly at distinguishing between guilty and innocent cross-race suspects (i.e., discriminability). However, the overall performance for Black target faces was poorer than the White targets regardless of participant race, as Black participants did not demonstrate a same-race advantage. In line with these meta-analytic results, some studies have failed to find a CRE for Black participants, but found a CRE for White participants (e.g., Golby et al., 2001). Yet, others have found a crossover CRE (e.g., Dodson & Dobolyi, 2016).

Several studies have found a CRE with Black minority-race participants for White faces. For instance, Correll et al. (2011) found that Black and White participants from Chicago had similar magnitudes of a CRE, and each group was better at recognising same-race than cross-race faces. Similarly, Dodson and Dobolyi (2016) found that Black and White participants who were recruited online and who were US users of the recruitment platform exhibited the CRE. Likewise, Meissner et al. (2005) and Lampinen et al. (2015; Pilot Experiment) found that their Black participants from the US exhibited a CRE for White faces.

However, several other studies that recruited Black participants found similar recognition of Black and White faces (i.e., no CRE). For example, Havard (2023) found that

their Black participants from the United Kingdom (UK) and the US did not exhibit a CRE for White faces. Similarly, Ho and Pezdek (2016) and Nguyen and Pezdek (2017) reported similar discriminability for Black and White faces with Black participants living in the US. In these studies, White participants, who would be considered the majority-race in the UK and the US, exhibited a CRE for Black targets. Finally, finding that their White participants in Belgium exhibited a CRE but their Black participants did not, Dehon and Brédart (2001) suggested that their Black participants not only had more exposure to White faces in various settings but also noted that they were a minority-race in Belgium and that these factors could have affected their findings.

Therefore, the results are mixed in terms of whether a minority effect on the CRE exists. To recap, we coded the findings of studies included in Lee and Penrod's (2022) meta-analysis and two of the newly identified published studies that tested Black participants (i.e., Havard et al., 2023; Simon et al., 2023) with minority-race status for the CRE. Out of the studies included in the meta-analysis with Black participants and White target faces, 56.00% of the participants were coded as a minority-race in their recruited country. Out of these studies where Black participants were coded as a minority-race in their recruited country, 52.38% reported a robust CRE while 47.61% reported no CRE. An exploratory two-proportions z-test indicated no difference in the proportions of minority-race Blacks that did versus did not show a CRE, $z = 0.30$, $p = .75$. These mixed findings suggest that we should be more cautious about claiming that the CRE generalises to circumstances where the witness is a member of a minority-race and the perpetrator is a member of the majority-race (cf. majority witness, minority perpetrator).

Chiroro et al. (2008) further illustrates the need for caution; they wondered whether the CRE is location-dependent. They tested White and Black South Africans' ability to recognise White and Black faces from South Africa and the US. In South Africa, White

individuals are a minority-race group compared to Black individuals, whereas in most parts of the US it is the opposite. This study suggests that the recognition advantage for members of one's own group is ethno-geographically specific. White South Africans demonstrated a recognition advantage for White South African faces but not for White American faces; Black South Africans demonstrated a recognition advantage for Black South African faces but not for Black American faces. That the CRE showed a regional foundation in this study supports explanations that are based on social cognition rather than other factors (e.g., physiognomic differences).

We emphasise that an individual's minority-race status plays a pivotal role in shaping their intergroup interactions with the majority group (Pettigrew & Tropp, 2008). Therefore, minority-race status may account for some of the variation in Chiroro et al.'s (2008) findings and may impact the social cognitive processes that underlie the CRE. Notably, in Chiroro et al., White South Africans exhibited a CRE for Black South African faces despite being a minority in that country. We speculate this occurred because White individuals do not experience the minority effect in the same way as other racial groups, as they may face minimal negative stereotypes associated with their racial identity. As a result, they may be less influenced by the theorized mechanisms outlined earlier, even when numerically underrepresented.

In summary, minority-status Black participants only sometimes exhibit a CRE for White target faces. These mixed findings can potentially be explained by the level of contact Black participants have with White people, as they live in White-majority countries. But these findings could also be explained by the social-cognitive influences of being a minority-race (e.g., the need to belong, repercussions of being wrong). It is further plausible that the minority effect interacts with interracial contact to give rise to the CRE.

Asian Participants

A similar pattern is observed with minority Asian participants as with Black participants. While some have found a crossover CRE (e.g., Cavazos et al., 2019), others have not (e.g., Golby et al., 2001).

Several studies have found a CRE with Asian minority-race participants for White faces. For instance, Cavazos et al. (2019) investigated the CRE in two experiments with Asian and White participants and target faces. In their first experiment 50.84%, and in their second experiment 68.75%, of the Asian participants reported they were born and raised in Texas while most participants across experiments reported that their parents or grandparents were not born in the US. Cavazos et al. found that, in both studies, participants were better at recognizing same-race faces than cross-race faces. Therefore, there was a CRE for first-generation minority-race Asian participants in the US. Similarly, Walker and Tanaka (2003) found a CRE for both White and Asian participants. Their Asian participants, who were Asian international students studying in Canada or immigrants to Canada, exhibited better recognition of Asian than White faces. Along the same lines, Walker and Hewstone (2008) found a crossover CRE for their White and Asian participants who had lived for five or more years in the UK.

However, several other studies adopting minority-race Asian participants showed similar recognition of Asian and White faces (i.e., no CRE; e.g., Töredi et al., 2025). For example, Pezdek and Stolzenberg (2014) observed the CRE for White but not Asian participants living in the US. Similarly, Tanaka et al. (2004) found a CRE for White participants, but not for Asian participants living in Canada and who reported similar contact with White and Asian individuals. Furthermore, recently, Burgund (2021) found that while White participants exhibited a traditional CRE for Asian and Black faces, Asian participants only showed a CRE for Black faces and recognised White faces as well as Asian ones. White participants had greater contact with White than Asian and Black individuals, which did not

differ, while Asian participants had greater contact with Asian than White individuals, which was also greater than their contact with Black individuals. This suggests that contact influences the CRE because Asian participants recognised White faces better than Black ones in parallel with their interracial contact levels. However, equal recognition of White and Asian faces by Asian participants, despite lower contact with White individuals than Asian individuals, indicates that factors beyond contact likely influence the CRE. We suggest that an additional influence may be the minority-race status of the participants, and the social importance of recognising majority-race faces that comes with being a minority-race.

Several scholars have, within the same experiments, assessed the CRE of Asian participants raised in a White-majority country and Asian participants who recently immigrated to a White-majority country. These studies found a CRE for the latter but not for the former participants. For instance, Wan et al. (2015; Experiment 5) found a CRE for Eastern-raised Asian participants who had lived in Australia for an average of 17.2 months. However, Wan et al. did not find a CRE for their Western-raised Asian participants who had been born and raised in Australia as the first generation of their families. Similarly, Zhou et al. (2019) found a CRE for White faces from Eastern-raised Asian participants who had recently immigrated to Canada but not for Asian participants who were born and raised in Canada. The latter group showed similar recognition of White and Asian target faces. These authors also reported that Asian participants born in Canada had significantly more contact with White individuals compared to those who had recently immigrated to Canada, therefore their findings may be attributed to intergroup contact. Nonetheless, it is probable that the effects of intergroup contact significantly intersect with those arising from minority-race status.

To obtain a clearer idea of whether minority-race status impacts the CRE, it is important to consider the proportion of studies that recruited minority-race Asian participants

and did versus did not find a CRE for White target faces. When the studies included in Lee and Penrod's (2022) meta-analysis were considered, 40.62% of the featured Asian participants who viewed White faces were members of a minority-race in their respective countries. Out of those studies and the one newly published study that we identified (Burgund, 2021), 58.62% found a robust CRE, whereas 41.37% reported no CRE. An exploratory two-proportions z-test suggested no difference in the proportions that found versus did not find a CRE, $z = 1.31$, $p = .18$. Again, this suggests that the CRE may not be as robust as it has appeared to be when research has focused on majority-race witnesses.

The CRE found in the Asian participant studies could be partially explained by varying levels of contact, as some studies reported results from explicit contact measures. For instance, Walker and Tanaka (2003) found that self-reported interracial contact significantly predicted discrimination accuracy for Asian participants: greater contact was associated with better discriminability for both Asian and White faces. However, it is evident that contact alone cannot account for these findings as numerous studies involving minority-race Asian participants residing in predominantly White countries for extended periods did not find a CRE for White targets. For instance, Sangrigoli et al. (2005) reported that their participants had resided in France between a few months and 11 years but did not find a CRE. The years of residence described herein resembles that reported by O'Toole (1994), whose Asian participants had resided in the US from a year to 17 years and did exhibit a CRE. Hence, as discussed before, minority-race status seems to co-occur with varied levels of contact and possibly other variables (e.g., racial biases/attitudes, perceived social importance of the race group, media exposure), which may impact the CRE.

Hispanic and "Other" Race Participants

The CRE literature has centred on participants and targets from White, Asian, and Black racial groups. In Lee and Penrod's (2022) meta-analysis, only 8.5% of studies had

participants who were not White, Asian, or Black. Out of the studies that were included in their meta-analysis as "Other" race participants, 4.9% were Hispanic, and the rest were referred to as "Other" race participants. In this review, we were only interested in minority-race participants' recognition of majority-race faces in their recruited country. All of the studies that included Hispanic and "Other" race participants were conducted in the US, the UK, or Canada, which means they were conducted in White-race majority countries. However, only 25% of them assessed the CRE for White target faces. 86.3% of the remaining studies had "Other" race participants that we coded as minority-race. Unfortunately, this left us with only a handful of studies to review (n = 5).

Some studies that were included in the latest meta-analysis as "Other" race participants (Lee & Penrod, 2022) and later selected by us because they used participants that were coded as a minority-race and shown White target faces found a CRE for their "Other" race participants and White target faces (Doty, 1998; Jackiw et al., 2008). For instance, Jackiw et al. found a crossover CRE for White and First Nation participants/target faces in Canada. Others did not find a CRE (Gier et al., 2016; Gross, 2009; Vredeveldt et al., 2015, Experiment 1). For instance, in a study conducted in the US, Gross found that Hispanic participants recognised Hispanic and White faces equally well and better than Asian and Black faces, while White participants recognised White faces significantly better than Hispanic, Black, and Asian faces.

Furthermore, one of the studies included in the Lee and Penrod (2022) meta-analysis reported that bicultural Latinx-White participants displayed a CRE when primed as Latinx but did not exhibit it when primed as White (Marsh et al., 2016). This finding indicates that social factors influence the CRE. When we coded the studies from Lee and Penrod's (2022) meta-analysis that had Hispanic and "Other" race minority participants and White target faces for whether they found a CRE, 40% did while 60% did not. Again, we conducted an

exploratory two-proportions z-test and again found no difference in the proportions that did versus did not find the CRE, $z = 0.62$, $p = .52$. These findings have limited generalizability due to the limited number of studies for this group of participants and the small sample sizes in studies with participants categorised as "Other" (e.g., Doty, 1998).

Majority-Race Participants

To better appreciate the minority effect, it's essential to consider the proportion of studies where White participants showed a CRE for minority faces. In their meta-analysis, Lee and Penrod (2022) revealed a robust CRE across the literature in which 59.1% of the studies featured White majority samples. Their findings indicate that White participants exhibited a significantly stronger CRE than non-White participants on measures such as false alarms, discriminability, and response criteria. Moreover, they found no evidence of publication bias, suggesting minimal risk of a file drawer effect. These findings support our hypothesis for the existence of the minority effect. However, to better compare the proportions of the CRE findings with other participant race groups discussed in this review, we classified all studies in Lee and Penrod's (2022) meta-analysis that included White participants based on whether the participants were a majority race in their countries of recruitment. We did not restrict our coding to a particular target face race. Instead, we included all studies that assessed White majority participants' CRE for minority non-White target faces. In *all* studies with White participants, Whites were the majority race; 48% employed Black target faces, 46% employed Asian target faces, and 12% employed "Other" target faces. 93% of the studies with White majority participants found a CRE, while 6% did not. The exploratory two-proportions z-test comparing studies that did versus did not find a CRE indicated that these proportions differed significantly, $z = 17.53$, $p < .001$.

Discussion

The CRE has been extensively investigated in the US using White-Black pairings (e.g., Brigham & Malpass, 1985; Ellis et al., 1975; Jackiw, 2008; Luce, 1974), with most studies reporting at least a moderate effect size (Meissner & Brigham, 2001). Only a few studies have investigated the CRE in relation to non-White race faces; all non-White groups accounted for less than half the total sample in the latest metanalytic review of the CRE (Lee & Penrod, 2022). Moreover, very rarely has the CRE been studied with more than one outgroup target faces (faces of a different-race; e.g., Gross, 2009). Critically, there have been differences in whether the CRE is found for White and non-White participants. Meissner and Brigham (2001) reported that White participants demonstrated a significantly stronger CRE than Black participants. Twenty years later, Lee and Penrod also reported that participant race moderates the CRE; White participants (vs. Black, Asian, Hispanic, and Other participants) showed a greater CRE.

In this review, we focused on the studies included in the latest meta-analysis of the CRE (Lee & Penrod, 2022) in order to investigate whether the minority-race status of non-White participants could explain the mixed findings for the CRE with non-White participants. We first highlighted theories that may account for these findings. Theoretical approaches to the CRE suggest that the CRE of minority-race and majority-race individuals will differ because of differences in levels of interracial contact, subjective importance, and motivation to individuate. Broader social psychology theories imply that minority-race individuals place greater subjective importance on recognising majority-race faces because this is crucial for their social survival and fitting in, or to deter negative stereotypes and potential discrimination. Our review highlighted that, in the subset of studies from Lee and Penrod (2022) which included minority-race participants, 52% of the Black participants, 58% of the Asian participants, and 40% of the “Other” race participants exhibited a CRE; while 93% of the studies with White majority participants found a CRE. These percentages underscore that

while the minority-race status of participants may not solely explain the CRE, it is vital to consider.

We acknowledge that minority-race individuals typically have more interracial contact with majority-race faces than the reverse. This increased exposure likely contributes to the mixed findings. However, this factor alone cannot fully account for the disparities in conclusions from studies of the CRE. Given the limited support for the contact hypothesis for adult witnesses (i.e., that increased contact decreases the CRE; for a review, see Singh et al., 2021), other factors must also play a role. Several meta-analyses of the CRE (Lee & Penrod, 2022; Meissner & Brigham, 2001; Singh et al., 2021) draw the same conclusion that interracial contact consistently explains significant, albeit a small amount, of variance in the CRE (~2%). Chiroro and Valentine's (1995) rare study on the contact hypothesis, involving participants from multiple racial and cultural groups, also only partially supported the idea that increased cross-racial contact improves recognition abilities for cross-race faces. Therefore, the lack of a CRE in 48% of the studies with minority Black participants (Lee & Penrod, 2022) might not be solely explainable by the high contact levels of these participants with White faces. Interracial contact and minority-race status together have greater power to account for the CRE, although the latter may explain variance beyond the prior.

Based on our synthesis of the CRE literature, we argue that integrative models of the CRE provide a useful way to integrate interracial contact, social importance, and motivation as mechanisms of the CRE. This review highlights these factors not only as key mechanisms of the CRE but also as underlying influences on how minority-race status affects facial recognition. As such, extending what was theoretically suggested by Hinzman et al. (2022), we hypothesise that minority and majority race as social categorisations may impact social importance and motivation.

Our findings highlight the importance of studying the CRE across diverse racial groups and minority statuses, providing valuable insights for researchers in social cognition, memory, forensic or legal psychology, and intergroup relations. This review advances psychological science by moving beyond traditional contact-based explanations and emphasizing integrative models that incorporate interracial contact, social importance, motivation, and minority-group status. This perspective helps explain the recurring pattern of a diminished or absent CRE in the recognition of White faces by minority status individuals. Furthermore, we provided empirical evidence via synthesis that extends the recent theoretical framework proposed by Hinzman et al. (2022) by showing that existing empirical research on the CRE is consistent with the view Hinzman et al. theorized. The findings presented in this paper is particularly crucial considering the CRE has real-world impact, ranging from everyday social interactions between individuals (McKone et al., 2023) to failures of eyewitness recognition that may result in wrongful convictions (Scheck et al., 2003; Wells & Olson, 2001). Understanding the mechanisms driving the CRE can inform interventions to reduce racial biases in memory and recognition, such as in legal settings where cross-race misidentifications contribute to wrongful convictions. More broadly, these findings have implications for everyday social interactions and broader efforts to address racial bias in perception and decision-making (see Future Directions for further discussion).

A Note on Developmental Considerations

The CRE develops early in life (e.g., Ferguson et al., 2009) and is stable throughout the life of mono-racial children (e.g., Anzures et al., 2014). However, interracial contact during childhood, but not adulthood, has been found to reduce the CRE, indicating a potential sensitivity to natural social contact during childhood (McKone et al., 2019; Sangrigoli et al., 2005; Zhou et al., 2019). Sangrigoli et al. (2005) found that Korean adults who were adopted by White families between the ages of four and nine years (and on average 23 years previous)

demonstrated a reversed CRE, recognizing White faces more accurately than Korean faces. Therefore, one reason minority-race individuals may show a CRE in some cases but not others may be the time of minoritisation. Most CRE studies only assess *current* interracial contact, not the age when contact increased.

McKone et al. (2019) measured the CRE in adult participants and examined whether it correlated with their reported social contact at three age ranges: 5-12 years (primary school), 12-18 years (secondary school), and post-school as adults. The study was conducted in Australia in an area with diverse demographics: Eastern-raised Asian participants who moved to the West as adults, Western-raised Asian participants who were born in Australia, and Western-raised White participants. The CRE decreased as cross-race contact increased, particularly if that contact occurred before the age of 12 years. This finding demonstrates that the plasticity of face recognition for different face types is greater in childhood than in adulthood, indicating sensitivity to natural social contact during primary school ages. Therefore, minority-race status, along with increased social contact, may play a greater role during childhood than later in life.

These findings support the idea that the face processing system can be significantly altered by environmental and social factors, such as minority status, during early childhood. Numerous published studies investigating non-White children's CRE for White faces have reported a lack of a CRE (De Heering et al., 2010; Feinman & Entwisle, 1976; Fioravanti-Bastos et al., 2014; Havard et al., 2017; McKone et al., 2019; Pezdek & Stolzenberg, 2014; Sangrigoli et al., 2005; Tan et al., 2012; Tham et al., 2017; cf. De Heering et al., 2010). For example, Cross, Cross, and Daly (1971) found that White children from homogeneous neighbourhoods in the US had a larger CRE than White children from heterogeneous neighbourhoods, although Black children from homogeneous and heterogeneous neighbourhoods in the US recognised White and Black faces equally well. Similarly, Walker

and Hewstone (2006) found that White students in the UK who attended racially homogeneous schools recognised White faces better than Asian faces, whereas Asian students in the UK who attended racially homogeneous schools similarly recognised White and Asian faces. Thus, although Asian students had limited contact with White students—likely because most interactions occurred at school and within their Asian families—there was no CRE. This result suggests that the minority-race status of the Asian students may have enhanced their ability to recognise White faces despite their minimal contact with White faces.

Overall, the findings from research with children support the idea that minority status during childhood, along with interracial contact, may impact the CRE in childhood and adulthood. To ensure systematic inclusion of studies in a similar manner to Lee and Penrod, we did not review studies involving children. However, future research should consider whether the presence and/or magnitude of the CRE varies for minority-race children, with consideration of their immigration status and in different countries with varying majority/minority status groups. Our review suggests these factors may play a role.

Limitations and Future Directions

We limited our review of articles to match the inclusion criteria of Lee and Penrod (2022)'s meta-analyses. We did so to minimise potential experimenter biases during our literature review. However, this choice led to some limitations.

First, Lee and Penrod only included published journal articles. Researchers may have difficulty publishing failures to find a CRE; therefore, a file drawer effect may be affecting the picture of the CRE for non-White participants. Several unpublished dissertations and conference presentations report failing to find the CRE with non-White participants asked to identify White target faces (e.g., Hilliar, 2011; Sporer, 1999). For instance, in an unpublished study by Sporer (1999), German participants showed a CRE for Turkish faces, while Turkish

participants living in Germany showed equal performance for both groups of faces. A similar finding was later found with child witnesses in a published study; Austrian participants showed a CRE for Turkish faces while Turkish participants living in central Europe (mainly Austria) showed equal performance for both groups of faces (Sporer et al., 2007). Therefore, publication bias is a relevant consideration when considering the robustness of the CRE for minority-race participants.

Moreover, most of the studies that were included in the latest meta-analysis and this review did not measure or report minority status or detailed demographics (e.g., the years spent in resident country, longest-lived country, birth country). We reviewed the literature considering minority status based on the recruitment country of the participants as reported by the publication and national demographic reports from those respective countries. We also used any demographics reported to infer the minority status of participants. However, as noted, a certain time period may be necessary for interracial contact or social factors to influence the cognitive processes of minority-race individuals. For example, recently immigrated compared to born-and-raised immigrants show differences in their CRE (e.g., Zhou et al., 2019). Therefore, in studies where participant demographics are not reported, it is impossible to infer whether participants were international freshman students at White-majority universities or minorities who had been living in that country for a prolonged time. Future researchers should report detailed participant information.

Future Directions

Given the reflections above, our first recommendation is for the CRE to be studied across a much wider variety of participant groups. The limited number of studies that have examined the CRE with non-White participants limited this review, as well as previous meta-analyses, to draw conclusions about whether the CRE is generalisable. Despite the prevalence of White majorities in numerous countries, and countries becoming more ethnically diverse

since the 1990s (General Social Survey, 2023), the investigation of diverse majority-minority racial combinations is pertinent. Researchers should move beyond studying just the three races (White, Black, and East Asian) commonly investigated. Future research should especially focus on Middle Eastern and South Asian minorities in multiracial urban Western centres as these groups often comprise a larger minority than Black and/or East Asian individuals (e.g., 9.3% South Asian, 4% Black, 0.7% East Asian minority individuals in England and Wales; Office for National Statistics UK, 2021) but are rarely studied in relation to the CRE (but see Stelter et al., 2023). Additionally, in immigration camps, where individuals are detained while their immigration status is being processed, crimes can occur among the diverse racial groups present (Amuedo-Dorantes et al., 2021). Eyewitnesses in such situations may participate in identification procedures and the CRE may occur. In such cases, the stress and unfamiliar environment of detention camps may exacerbate the difficulty of the identification task, leading to a higher likelihood of the CRE.

Given that gender is a fundamental social category shaping interactions and cognitive processing (e.g., Maccoby, 1988), and that it has been shown to mitigate the CRE (Marsh et al., 2023), future research should examine how minority race status and gender interact to influence face recognition. Research suggests that men and women experience racial bias differently, with minority men often facing heightened criminalization and social threat perceptions, while minority women may navigate a complex interplay of racial and gender stereotypes (e.g., intersectional invisibility; Purdie-Vaughns & Eibach, 2008). These differing experiences could affect how individuals allocate cognitive resources in face recognition, potentially leading to gendered variations in the CRE among minority groups. Future research should explore whether minority-race status influences CRE differently for men and women, considering factors such as differential exposure to outgroup faces, social motivation, and stereotype-based cognitive processing.

Localization bias refers to the tendency to treat findings from Western, predominantly White-race majority countries as universal norms (Castro Torres & Alburez-Gutierrez, 2022). Uskul et al. (2024) recently highlighted this bias, compounded by disproportionate sampling from Western populations, as a key factor limiting the generalizability of psychological research. We argue that this bias may also contribute to the perception of the CRE as robust, even though findings from minority samples remain underexplored and this review suggests that minority status may influence the CRE. Lee and Penrod (2022) found that 59.1% of CRE studies involved White participants, with the non-White studies often lacking sufficient diversity beyond Black and East Asian participants. Our re-coding of the studies with White participants has further shown that these studies were conducted predominantly in WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries. Therefore, we emphasize the need for scholars to critically examine how localization bias may shape their interpretations of CRE findings and recommend more diverse and inclusive research approaches.

We encourage CRE researchers to consider systematic differences between societal and/or cultural groups due to their majority or minority status within multicultural societies as additional predictors of in-group/out-group differences. Furthermore, the minority/majority status of participants should be recorded and considered as a covariate in analyses (similar to Gross et al., 2009; Vingilis-Jaremko et al., 2020). This would aid in drawing firmer conclusions about the mechanisms underlying the CRE as well as any minority effect and how it may differ from the influence of contact. In this review, we highlighted *the potential* for a minority effect beyond the influence of contact, but this hypothesis warrants direct empirical investigation. Although we acknowledge the practical challenges involved in conducting data collection with varied race groups that are a minority or non-minority within the same sample (e.g., higher sample size requirements, difficulty recruiting from some

groups) and those with varying interracial contact levels, we argue that doing so would provide valuable insights into the generalisability of the CRE literature.

Conclusion

In conclusion, this literature review is the first to actively explore the possibility that the minority-race status of participant race groups studied in the CRE literature might be affecting the detection of, magnitude of, and general acceptance of the CRE as a robust phenomenon. Minority-race status may explain why many studies considering non-White witnesses do not find a CRE. However, approximately half of the time, when non-White witnesses are of a minority race, the CRE is found. Therefore, both contact and minority-race status are likely contributing to recognition accuracy. This review highlighted for us that the CRE might not be as robust as it appears to be because so much of the research has focused on majority-race participants and minority-race targets. We highlighted future directions that will help researchers to address these limitations: by incorporating measures relevant to the minority effect, fully crossing participant and target races, and studying a greater variety of races. There is a crucial need for these gaps to be filled to enhance our understanding of the CRE.

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Supplementary Materials

We conducted several linear regression analyses on the effect sizes (*gav*) for discriminability in studies included in Lee and Penrod's (2022) meta-analysis, using minority-race status as a fixed effect to assess whether effect size magnitude varied by minority-race status. The analysis revealed no significant differences in effect sizes for minority and majority Black participants, $z = 0.71$, $p = .48$, $OR = 1.24$. Among minority Black participants, the mean effect size was 1.00 for those exhibiting a CRE and 0.26 for those who did not. The magnitude of effect sizes was bigger when Asian participants were not minorities than when they were, $z = 2.14$, $p = .03$, $OR = 0.56$. Expectedly, minority Asian participants had a higher mean effect size while showing a CRE (0.53) compared to not showing a CRE (-0.22). Unfortunately, a meta-regression for "Other" race participants was not possible due to the limited number of effect sizes.