Monitoring and Control of Learning Own-Race and Other-Race Faces

MATTHEW G. RHODES1*, DANIELLE M. SITZMAN2 and CHRISTOPHER A. ROWLAND1

1Department of Psychology, Colorado State University, USA
2Department of Psychology, Eastern Washington University, USA

Summary: The own-race bias refers to the finding that individuals are better able to recognize faces of the same race or ethnicity compared with faces of another race or ethnicity. The current study examined whether the own-race bias was also evident in participants’ predictions of memory performance and their self-regulation of learning. In three experiments, participants studied own-race and other-race faces and predicted the likelihood of recognizing each face on a future test. Experiment 1 showed that participants provided similar predictions for own-race and other-race faces, despite superior recognition of own-race faces. Experiments 2 and 3 permitted participants to control their study of faces and revealed better self-regulation of learning for own-race relative to other-race faces. Collectively, these experiments suggest that the own-race bias may partially reflect a metacognitive deficiency, as participants are less able to effectively self-regulate learning for other-race faces. The implications of these findings are discussed. Copyright © 2013 John Wiley & Sons, Ltd.

AN OWN-RACE BIAS IN THE MONITORING AND CONTROL OF LEARNING FACES

A number of factors influence the accuracy of face recognition (Shapiro & Penrod, 1986), with these influences relevant in a variety of contexts. For example, there is substantial social value in being able to identify the face of a familiar individual. As well, the determinants of face recognition are crucial in the context of the justice system, which is still largely reliant on eyewitnesses as a significant source of information in investigating crimes (see Wells, Memon, & Penrod, 2006, for a review). The perils of relying on eyewitnesses have been well documented. For example, the Innocence Project (Scheck, Neufeld, & Dwyer, 2000; see also the Innocence Project: http://www.innocenceproject.org/) comprises a group of lawyers who seek to assist prisoners in cases where innocence may be proven through DNA testing. As of June 2013, the group had assisted 307 prisoners in obtaining their exoneration and release. In approximately 75% of these cases, mistaken eyewitness identification has been the key factor leading to a wrongful conviction. Thus, it is imperative that science develop a complete understanding of those factors that influence face recognition.

The current paper focuses on a factor that has a powerful influence on the accuracy of face recognition, the finding that recognition memory is superior for in-group relative to out-group faces. For example, memory is better for faces of one’s own gender (e.g., Wright & Sladden, 2003), age (Rhodes & Anastasi, 2012), species (Diamond & Carey, 1986), or sexual orientation (Rule, Ambady, Adams, & Macrae, 2007). Perhaps the most widely investigated example of this phenomenon is the own-race bias, the finding that memory for faces of one’s own race or ethnicity is frequently superior to memory for faces of another race or ethnicity (Malpass & Kravitz, 1969; Meissner & Brigham, 2001, for a review). Indeed, the own-race bias appears to be a common element in the eyewitness misidentifications documented by the Innocence Project. For example, within the Innocence Project database (http://www.innocenceproject.org/know/Browse-Profiles.php), we identified 55 cases of mistaken eyewitness identification that included information about the race of the victim and perpetrator. Of these 55 cases, the vast majority (43 or 78% of the total cases we identified) involved a victim and perpetrator of a different race. Such data suggest that understanding those factors that influence the own-race bias is of significant applied and theoretical importance.

To date, the vast majority of work on the own-race bias has examined candidate explanations for the effect that reflect mechanisms operating primarily at encoding (but see, e.g., Horry & Wright, 2008; Marcon, Susa, & Meissner, 2009). For example, the own-race bias may reflect acquired perceptual expertise (e.g., Rhodes, Brake, Taylor, & Tan, 1989) for own-race faces or categorization of a face that begets different forms of encoding depending on whether the face is deemed to be part of an in-group or out-group (e.g., Hugenberg, Young, Bernstein, & Sacco, 2010; Sporer, 2001). However, the potential role of participants’ understanding and awareness of their learning has received little attention as a contributing factor to the own-race bias. We examined this metacognitive factor in the experiments reported.

Metacognition and the own-race bias

Researchers interested in our awareness of our own cognition (i.e., metacognition) frequently distinguish between those processes related to assessing one’s learning (monitoring) and the self-regulation of learning based on information gleaned from monitoring (control; see, e.g., Nelson & Narens, 1990). For example, suppose an individual is witnessing an ongoing crime (e.g., a store being looted). This individual may be better prepared to remember details of the event if he or she can form an accurate online understanding of what has or has not been learned (i.e., monitoring). Such monitoring can then inform the self-regulation of learning (i.e., control), such as the decision to change one’s view in order to better

A common method of studying one’s awareness of their own learning, undertaken in the experiments reported, is to solicit predictions of memory performance (for reviews, see Koriat, 2007; Rhodes & Tauber, 2011), often via judgments of learning (JOLs) made immediately after the presentation of an item or following a delay (e.g., Arbuckle & Cuddy, 1969; Koriat, 1997; Rhodes & Castel, 2008). For example, in a typical experiment, participants are presented with memoranda, such as faces, one-at-a-time. Immediately after the presentation of a face, participants are prompted to make a JOL of the likelihood of later recognizing that face. Finally, after making JOLs for each face, participants are given a recognition test for the studied items. JOLs may then be assessed based on the correspondence between memory predictions and memory performance (i.e., absolute accuracy) or based on the degree to which JOLs distinguish between what is and what is not recognized (i.e., relative accuracy).

Theoretical frameworks characterizing metacognition assume that monitoring, such as that measured by JOLs, directly influences control processes (Nelson, 1996; Nelson & Narens, 1990). For example, Rhodes and Castel (2009) had participants listen to and make JOLs for words presented at a quiet or loud volume, followed by a judgment of whether the item necessitated additional study. The results showed that participants regarded loud words as more memorable than quiet words (i.e., loud words elicited higher JOLS than quiet words) despite the fact that there was no influence of volume on recall. In addition, participants more frequently chose to restudy quiet words, which were regarded as less memorable. Thus, monitoring influenced restudy choices independent of actual memory performance, suggesting a causal role for metacognitive processes in self-regulated learning (cf., Metcalfe & Finn, 2008).

Given the critical role of monitoring in self-regulated learning, it is imperative that memory predictions (i.e., one’s awareness of their own learning) are accurate. Although prior work has documented a number of discrepancies between participants’ JOLs and actual memory performance (e.g., Benjamin, Bjork, & Schwartz, 1998; Kornell & Bjork, 2009; Kornell, Rhodes, Castel, & Tauber, 2011; Rhodes & Castel, 2008; 2009), little is known about the efficacy of memory predictions for own-race and other-race faces (but see Hourihan, Benjamin, & Liu, 2012). More importantly, no prior investigation has examined how participants regulate (i.e., control) their learning of own-race and other-race faces.

We addressed this issue in the current study, guided by a theoretical framework which posits that awareness and control over learning influence the own-race bias. Such a metacognitive account assumes that the own-race bias results in part because limited awareness of the effect hinders optimal control over learning. For example, consider an individual who regards other-race faces as equally memorable as own-race faces. Given control over their own learning (e.g., the opportunity to study faces for as long as necessary to maximize learning), this individual will not engage in behaviors that might improve performance (e.g., studying other-race faces longer than own-race faces). Thus, a metacognitive account assumes that monitoring and control behaviors have a direct influence on learning. In contrast, an alternative account would assume that awareness and self-regulation of learning have little impact on the own-race bias. From this perspective, the own-race bias reflects only the efficacy of processes chronically engaged at encoding. By extension, providing control over learning should have little or no influence on the own-race bias.

Although a variety of studies have examined retrospective confidence judgments for own-race and other-race faces made after a recognition decision (e.g., Corenblum & Meissner, 2006; Horry & Wright, 2008; Meissner, Brigham, & Butz, 2005; Wright, Boyd, & Tredoux, 2001, 2003), to our knowledge, only two studies have examined predictions of memory performance for own-race and other-race faces made during or after encoding. Smith, Stinson, and Prossor (2004) had participants watch a video of a crime committed by an own-race or other-race perpetrator. Immediately following the video, participants indicated their confidence, on a 1–9 scale (with higher values indicating higher levels of confidence), that they would be able to identify the perpetrator in a line-up and also the clarity of their memory for the perpetrator. An own-race bias was present, and participants reported greater confidence that they would be able to identify an own-race perpetrator and greater clarity in their future memory for an own-race perpetrator. Thus, based on these global judgments, participants regarded own-race faces as more memorable than other-race faces. Hourihan et al. (2012) reported data on relative accuracy for own-race and other-race faces. In particular, Asian and Caucasian participants studied own-race and other-race faces and provided a JOL for each face on a 1–9 scale (with higher values indicating greater confidence in recognizing a face). Their results showed a robust own-race bias in recognition for both groups of participants and for relative accuracy for Caucasian participants (i.e., their judgments better predicted memory for Caucasian than Asian faces). However, Asian participants showed only a trend for an own-race bias in relative accuracy.

Collectively, prior work (Hourihan et al., 2012; Smith et al., 2004) suggests that predictions of memory performance may be somewhat sensitive to the own-race bias. However, a number of issues remain unresolved. First, neither prior study permits an examination of absolute accuracy (i.e., the overall correspondence between predictions and performance). To do so, predictions must be solicited using a scale that matches the scale to be used for measuring performance. We did this in the experiments reported by asking participants to assess the probability that they could successfully recognize a face on a future test and then assessed the probability that recognition was correct. More importantly, no prior work has attempted to link awareness of one’s own learning to the self-regulation of learning for own-race and other-race faces. This is crucial, as any account suggesting that metacognition influences the own-race bias must demonstrate that awareness of performance has consequences for learning.

The current study

In the current study, we report three experiments that sought to examine the relationship between metacognition and
memory for own-race and other-race faces. In Experiment 1, participants studied own-race and other-race faces, made JOLs for each face, and were then given a recognition memory test. Following from prior work (Hourihan et al., 2012; Smith et al., 2004), we anticipated that participants would exhibit superior memory for own-race compared with other-race faces. Our primary focus was on the absolute and relative accuracy of memory predictions. In Experiments 2 and 3, we examined the influence of monitoring on control over learning. Accordingly, participants in Experiment 2 were given the option to self-pace their encoding of each face, and in Experiment 3, participants were permitted to choose a subset of faces to receive additional study, and these choices were either honored or dishonored (Kornell & Metcalfe, 2006). If the own-race bias is characterized by faulty metacognition, then participants should exhibit less optimal control when learning own-race compared with other-race faces. Importantly, such control should have a direct impact on learning outcomes (i.e., recognition accuracy). In contrast, if metacognition has little or no influence on the own-race bias, then learning outcomes should be independent of the accuracy of predictions.

EXPERIMENT 1

Participants in Experiment 1 studied 48 faces (24 Black, 24 White), made JOLs for each face, and then were given a 2-alternative forced-choice (2AFC) recognition test. Of interest was the relative and absolute accuracy of predictions for own-race and other-race faces. If predictions are sensitive to the own-race bias, then they should differ and discriminate between own-race and other-race faces.

Method

Participants

Thirty-two White participants (25 female; $M_{age} = 18.88, SD = 1.74$) from Colorado State University participated in the experiment for partial course credit. The use of only White participants in this and subsequent experiments reflects the ethnic diversity of Colorado State University. According to the 2011–2012 Colorado State University Fact Book (http://www.ir.colostate.edu/factbook-fb.aspx), of 22,300 undergraduates enrolled at the university, 17,247 self-identify as White (77.34%) and 464 self-identify as Black (2.08%).

Materials

Materials consisted of photographs of 51 White and 51 Black college-aged individuals, comprising an equal number of males and females, taken from a set used by Meissner et al. (2005). All photographs were edited such that only the neck and head were showing on a white background. The faces were randomly divided into two sets of 48 faces (24 Black, 24 White) that served equally often as either study items or foils and were presented equally often on the left or right side of the screen for the 2AFC recognition test. The remaining four faces (2 Black, 2 White) served as primacy and recency buffers during the study phase and as targets or foils during the practice recognition test.

Procedure

Participants were first informed that they would study Black and White faces one-at-a-time and make JOLs in anticipation of a later test. Prior to explaining how JOLs would be made, participants were shown an example of a test trial, with two faces (which were not subsequently studied or tested) appearing side-by-side. Participants were then instructed that after each face was presented, they would indicate the likelihood that they could correctly later recognize that face in the context of a foil. Judgments were made on a scale from 50% to 100%, with a low point of 50% given that chance responding would result in 50% accuracy on a 2AFC recognition test (see Nomi, Rhodes, & Cleary, 2013, for a similar procedure).

Studied faces were presented at a 2-second rate in a uniquely randomized order for each participant. Immediately following a studied face, participants were given 5 seconds to enter their JOL using a keyboard provided for this purpose. JOLs were made without the studied face present. Once all 48 faces (and four buffer faces) had been studied, participants engaged in a 5-minute distracter task consisting of solving simple arithmetic problems. Following the distracter task, participants were given instructions for the test phase. They were informed that they would be shown two faces, side-by-side, one of which had been studied and one of which was new. Participants were instructed to indicate which face was studied by pressing the 1 key if the left face was studied and the 2 key if the right face had been studied. Next, once a recognition decision had been made, participants were instructed to rate their confidence that the answer was correct on a scale from 50 to 100%. (As in the JOL phase, 50% represented the low point on the scale given that chance responding would result in 50% accuracy.) Prior to beginning the test phase, participants were given two test trials (with studied items taken from the buffers). Following this practice phase, they were presented with 48 pairs of faces in a uniquely randomized order for each participant. Recognition decisions and confidence judgments were self-paced.

Results and discussion

Figure 1 presents mean JOLs (black bars) and the mean percentage of faces correctly recognized (white bars) as a function of the race of the face. Because the false alarm rate is always the inverse of the hit rate in 2AFC recognition, all measures of recognition accuracy refer to the hit rate. We
first examined the absolute accuracy of JOLs, followed by analyses of resolution. Given that confidence ratings were tangential to our focal interests, they are reported in the Appendix and not analyzed any further. The alpha level for all statistical tests was set to .05.

**Absolute accuracy**

Following conventions used widely in the metamemory literature, absolute accuracy was analyzed by creating a ‘Measure’ factor (e.g., Nomi et al., 2013; Zimmerman & Kelley, 2010). Thus, JOLs and memory performance were analyzed in a 2 (Measure: prediction, recognition) × 2 (Race of Face: Black, White) repeated-measures analysis of variance (ANOVA). Results showed a marginally significant effect of Measure, such that, overall, recognition (M = 74.22; SE = 1.62) numerically exceeded JOLs (M = 70.48; SE = 1.22), F(1, 31) = 3.24, p = .082, η²_p = .10. A main effect of Race of Face was present, F(1, 31) = 13.03, p = .001, η²_p = .30, qualified by a reliable Race of Face × Measure interaction, F(1, 31) = 7.01, p = .013, η²_p = .18. Follow-up tests showed that JOLs did not reliably differ for Black compared with White faces, F(1, 31) = 1.92, p = .176, η²_p = .06. In contrast, recognition was reliably better for White compared with Black faces, F(1, 31) = 11.27, p = .002, η²_p = .27. Thus, although a reliable own-race bias was present for recognition, participants’ JOLs were less sensitive to the race of the face.

**Relative accuracy**

We examined the relative accuracy of JOLs by calculating nonparametric gamma correlations (Nelson, 1984) between JOLs and recognition for Black and White faces. Gamma ranges from –1.0 to 1.0 with positive values indicating that faces that were subsequently recognized were given higher JOLs than faces that were not subsequently recognized. Analyses of individual correlations showed that gamma correlations reliably differed from zero for White faces (G = 0.19; SE = 0.07), t(31) = 2.59, p = .014, but not for Black faces (G = 0.03; SE = 0.06), t < 1. Further analyses showed that the magnitude of gamma correlations did not reliably differ for Black versus White faces, F(1, 31) = 2.75, p = .107, η²_p = .08. Thus, resolution did not reliably differ based on the race of the face.

**Discussion**

Results from Experiment 1 indicated that participants were generally insensitive to the own-race bias. This was most evident in measures of absolute accuracy with participants reporting almost identical JOLs for Black and White faces. In terms of relative accuracy, participants exhibited a trend for better discrimination among own-race than other-race faces (cf., Hourihan et al., 2012), but gamma correlations were not reliably different for Black and White faces. In all, such data suggest that participants’ predictions of memory performance do not capture the differences in accuracy produced by the own-race bias.

**EXPERIMENT 2**

Experiment 1 showed that participants’ JOLs were insensitive to the own-race bias. A key implication of these data is that deficient monitoring may detract from optimal control over learning. We examined this possibility in Experiment 2 by permitting participants to control learning. To that end, Experiment 2 was identical to Experiment 1 with the exception that participants were permitted to self-pace study during the encoding phase. Prior work suggests that participants frequently allocate the most study time to items regarded as the least well learned (e.g., Dunlosky & Hertzog, 1998; Thiede & Dunlosky, 1999; Son & Metcalfe, 2000; but see Metcalfe & Kornell, 2005; Ariel, Dunlosky, & Bailey, 2009). Thus, if participants are sensitive to the own-race bias, they should allocate more study time to Black compared with White faces. However, if participants regard White and Black faces as equally memorable, then study time should not differ based on the race of the face studied.

We also note that including a measure of self-paced study time addresses a potential alternative explanation for our results. That is, one might argue that equivalency in JOLs was evident because participants engaged in socially desirable responding. By this view, participants were aware that Black and White faces were not equally memorable but did not want to publicly endorse this belief, leading to similar JOLs. Self-paced study time is a much more subtle measure and would likely not be susceptible to such strategic responding.

**Method**

**Participants**

Thirty-two White participants (22 female; \( M_{\text{age}} = 18.91 \), \( SD = 1.47 \)) from Colorado State University participated in the experiment for partial course credit.

**Materials and procedure**

The materials used and procedure were identical to Experiment 1 with one exception. Participants were given instructions to self-pace their study as follows:

Please study each face for as long as you feel that you need to (but no longer) so that you will be able to remember it later. After you are finished studying a face, press the spacebar to continue to the next one.

The amount of time allocated to study each face was recorded from the onset of the study item to the time when the space bar was pressed to terminate the study.
Results and discussion

Mean JOLs (black bars) and the mean percentage of faces correctly recognized (white bars) as a function of the race of the face are depicted in Figure 2. We first examine the absolute accuracy of JOLs, followed by analyses of resolution and study time.

Absolute accuracy

Judgments of learning and memory performance were analyzed in a 2 (Measure: prediction, recognition)×2 (Race of Face: Black, White) repeated-measures ANOVA. Recognition accuracy ($M = 78.26; SE = 1.44$) did not reliably exceed JOLs ($M = 75.02; SE = 1.72$). $F(1, 31) = 2.86, p = .101, \eta^2_p = .08$. A main effect of Race of Face was present, $F(1, 31) = 9.63, p = .004, \eta^2_p = .24$, but the Race of Face×Measure interaction was not reliable, $F(1, 31) = 2.72, p = .109, \eta^2_p = .08$. Given our a priori interest in the pattern of data for recognition and JOLs, follow-up tests were conducted on these measures. Overall, JOLs were numerically higher for White compared with Black faces, although the difference was only marginally significant, $F(1, 31) = 3.75, p = .062, \eta^2_p = .11$. Also, recognition was reliably better for White compared with Black faces, $F(1, 31) = 6.75, p = .014, \eta^2_p = .18$. Thus, an own-race bias was present for recognition, with JOLs showing a trend against a null effect of race.

Relative accuracy

Analyses of individual correlations showed that gamma did not reliably differ from zero for Black ($G = -0.02; SE = 0.04, t < 1, p = .11$). Relative accuracy ($F(1, 31) = 2.85, p = .101, \eta^2_p = .08$). With regard to recognition accuracy, gamma correlations between study time and recognition accuracy were not reliably greater than zero for either Black faces ($G = -0.002; SE = 0.04$) or White faces ($G = -0.02; SE = 0.06, t < 1.0, p = .11$). Gamma did not reliably differ between Black and White faces, $F(1, 31) = 0.04$.

Study time

We compared how long participants chose to study White faces versus Black faces by calculating median study times for each participant and averaging these medians. (The results are identical if means are analyzed.) Overall, there was no reliable difference between the median amount of time participants studied Black faces ($M = 6004.86; SE = 545.33$) compared with White faces ($M = 6012.19; SE = 576.40$), $F(1, 31) = 1$. Thus, participants’ study times did not disclose any differences in perceived memorability of own-race and other-race faces.

Gamma correlations were also calculated to examine the association between study times and JOLs as well as accuracy on the recognition test. With regard to JOLs, the gamma correlation between study time and JOLs did not reliably differ from zero for Black faces ($G = -0.02; SE = 0.04, t < 1, but did differ from zero for White faces ($G = -0.11; SE = 0.04$), $r(31) = 2.94, p = .006$. The moderate, negative correlation for White faces indicates that lower JOLs were allocated to faces given longer study times (cf., Koriat, 2008). A follow-up test showed that gamma did not reliably differ between White and Black faces, $F(1, 31) = 2.85, p = .101, \eta^2_p = .08$. With regard to recognition accuracy, gamma correlations between study time and recognition accuracy were not reliably greater than zero for either Black faces ($G = -0.002; SE = 0.04$) or White faces ($G = -0.02; SE = 0.06, t < 1.0, p = .11$).

Discussion

Data from Experiment 2 were largely consistent with data from Experiment 1. In particular, participants’ JOLs were generally insensitive to the race of the face, apparent in measures of absolute and relative accuracy. This insensitivity to differences in memory performance for own-race and other-race faces was manifested in study behavior. Specifically, participants allocated the same amount of study time to own-race and other-race faces. Such findings, using a more subtle measure (i.e., self-paced study time) than JOLs, argue against the possibility that participants provided similar JOLs for Black and White faces in the interest of engaging in socially desirable responding.

Instead, these data provide some indication of the consequences of poor metacognition with respect to recognition of same-race and other-race faces. That is, if one was aware that other-race faces were less memorable than own-race faces, one might allocate more study time to other-race faces. Without such awareness, participants in Experiment 2 were unable to strategically allocate resources at encoding to the less memorable Black faces. We further explored self-regulation of study for own-race and other-race faces in Experiment 3 using a different method.

EXPERIMENT 3

Experiments 1 and 2 indicated that participants were generally unaware that own-race and other-race faces are differentially memorable, with Experiment 2 showing this manifest in the self-regulation of study behavior. In particular, participants in Experiment 2 allocated the same amount of study time to Black and White faces. Thus, it appears that deficient metacognitive monitoring during encoding may in part contribute to the own-race bias. However, study time allocation provides indirect evidence for the consequences of deficient metacognitive monitoring. We sought to provide more direct evidence for this in Experiment 3.

As noted previously, most metacognitive frameworks presume that monitoring has a causal influence on behavior (e.g., Nelson & Narens, 1990). By extension, learning should be best when the learner has full control over what will or will not be studied. One method of testing this assumption is to...
permit the learner to make study choices (e.g., identifying what items necessitate additional study) and then to either honor or dishonor these choices. For example, Kornell and Metcalfe (2006; see also Kimball, Smith, & Muntean, 2012; Tullis & Benjamin, 2012, for a similar methodology) had participants answer a series of general knowledge questions followed by feedback on their answers. Participants were instructed to indicate whether they would like to see the answer to the question presented again at a later time and were also informed that they could only select half of the items for later study. Of greatest relevance to Experiment 3, some participants were permitted to restudy the questions they had selected for further study (honor condition), while others were required to restudy the questions that had not been selected for further study (dishonor condition). If people can effectively use monitoring to allocate items for additional study, then performance should be best when restudy choices are honored versus dishonored. Indeed, Kornell and Metcalfe (2006) reported that performance on a final test was superior when study choices had been honored rather than dishonored. Thus, based on several similar experiments using this method, they concluded that ‘…people consistently learned more when they were allowed to control their study than when they were not’ (p. 620).

In Experiment 3, we adopted Kornell and Metcalfe’s (2006) procedure in order to determine whether the own-race bias was ameliorated when participants could control their study. Specifically, participants in Experiment 3 studied Black and White faces, presented this time in successive blocks, each comprising Black or White faces, rather than intermixed in a single list. Within each block, participants made JOLs and, after each face, were instructed to choose whether that face should receive additional study. Participants made restudy decisions under the constraint that exactly half of the faces should be chosen for restudy. Prior to a 2AFC recognition test, participants either restudied the faces chosen for additional study (honor condition) or restudied each of the faces that were not chosen for additional study (dishonor condition). If participants can effectively use monitoring to self-regulate learning, then performance should be best when study choices are honored rather than dishonored. Results from Experiments 1 and 2 showed that participants had little awareness that other-race faces are less likely to be remembered than own-race faces. Consequently, honoring or dishonoring study decisions may have little impact on subsequent recognition performance. However, participants may be better at determining which faces do or do not warrant additional study for own-race faces. For example, the relation between study time and JOLs exceeded zero only for own-race faces in Experiment 2. Thus, if participants exert more effective control over study for own-race compared with other-race faces, then honoring study decisions should be more beneficial for own-race relative to other-race faces.

Participants

Thirty-two White participants (17 female; \(M_{\text{age}} = 19.44, SD = 1.24\)) from Colorado State University participated in the experiment for partial course credit.

MATERIALS AND PROCEDURE

The materials used and procedure were identical to Experiment 1 with several significant exceptions. First, faces were presented in blocks of 24 faces of the same race, followed by a restudy phase, with the next block of faces (of a different race) subsequently presented for study and restudy. Thus, a participant might study a block of 24 Black faces, engage in restudy for half of those faces, and then study a block of 24 White faces, followed by restudy of half of those faces. The assignment of faces to blocks was counterbalanced such that half of the participants studied Black faces in the first block and half studied White faces in the first block.

Faces were presented one-at-a-time during the study phase at a 4-second rate, and JOLs were solicited in a manner that was identical to Experiment 1. In addition, immediately after a JOL was made, participants were asked to indicate whether they wanted to restudy that face. Participants were informed that they could only choose 12 faces (out of 24 possible) for restudy and that a counter would be provided to help them track the number of faces remaining to be selected for restudy. Specifically, the instructions stated that

The goal of this task is for you to remember the faces as well as possible on a final test. Therefore, I would like you to judge whether you would like the opportunity to study each face again before the memory test. If you would like the opportunity to study the face again later to help you remember it before the test, press <1> for “yes”. If you would not like the opportunity to study the face again later before the test, press <2> for “no”. For each set of faces, you have to choose half of the faces to restudy. For example, you will study a set of 24 faces. You must choose 12 of those faces to restudy. There will be a counter on the right side of the screen to tell you how many faces you have chosen to restudy and how many faces there are left in the study phase.

Participants were shown two practice faces prior to starting the study phase to familiarize them with the procedure. Restudy choices were self-paced with participants reminded to make a choice after 8 seconds had elapsed. For a particular block, all choices were honored with all choices dishonored for the other block. Given that blocks were composed of faces of one race, the honor/dishonor manipulation varied by race. Thus, for half of the participants, choices for Black faces were honored, whereas those for White faces were dishonored with the opposite true for the remaining half of the participants. In addition to counterbalancing the race of the face assigned to the block (i.e., block 1 and block 2), the block of faces that was honored was also counterbalanced across participants.

Following the study and restudy phase, participants were tested on all studied faces. Test faces were presented in blocks, such that faces studied in block 1 were tested in the
first block and faces studied in block 2 were tested in the second block. Doing so ensured that the retention interval between study/restudy of a face and the recognition test was largely equivalent. All other aspects of the test procedure were identical to Experiment 1.

Results and discussion

Participants in Experiment 3 were required to select half of the items presented for restudy and half to receive no restudy. At times, participants exhausted their allotment for choices before the study block was finished. For example, suppose a participant studying 24 Black faces had selected 12 items for restudy among the first 18 items studied. The participant would continue making restudy choices, but the algorithm used by the program would allot the remaining six items to the ‘no restudy’ bin. Thus, those remaining six ‘no restudy’ choices were forced and may not reflect a participant’s true belief about whether an item merits restudy. Following Kornell and Metcalfe (2006), we included all such choices in the analyses reported. Given that these forced choices may diverge from the participant’s intention, including such data should actually serve to work against optimal control and thus provide a conservative test of whether participants can properly exercise control over learning. As well, additional analyses that either excluded all forced choices (excluding 310 of 1536 trials or 20.18% of all trials) or excluded forced choices that were inconsistent with the participant’s choice (excluding 107 of 1536 trials or 6.97% of all trials) resulted in no significant departures from the pattern of data reported.

Given our primary interest in the efficacy of study choices, we focus solely on data directly related to those choices. Thus, we first examined the magnitude of JOLs for items that were or were not chosen for restudy and the relation between study choices and JOLs. Next, we assessed accuracy for study choices that were or were not honored for Black and White faces, respectively.

Item selection—JOLs

Figure 3 shows JOLs for faces selected and not selected for restudy as a function of the race of the face. If participants seek to restudy those items that have not been well learned, then they should provide lower JOLs for items selected for restudy than items not selected for restudy. A 2 (Study Choice: selected, not selected) × 2 (Race of Face: Black, White) repeated-measures ANOVA confirmed that, overall, JOLs for faces selected for restudy ($M = 70.41; SE = 1.10$) were reliably lower than JOLs for faces not selected for restudy ($M = 78.85; SE = 1.43$), $F(1, 31) = 22.06, p < .001, \eta^2_g = .42$. The effect of Race of Face was not reliable, $F < 1$, nor was the Race of Face × Study Choice interaction, $F < 1$. Consistent with these data, the gamma correlation between the decision to select an item for restudy and JOLs was significantly less than zero for Black ($G = −0.54; SE = 0.10$), $t(30) = 5.56, p < .001$, and White ($G = −0.59; SE = 0.09$) faces, $t (31) = 6.54, p < .001$. Thus, participants allocated more study time to items given lower JOLs. However, the magnitude of gamma correlations did not differ between Black and White face, $F < 1$. Thus, participants used a similar algorithm to choose which item to restudy for Black and White faces, selecting items that had been given low JOLs.

Recognition for honored and dishonored choices—Black faces

We next examined correct recognition separately for Black and White faces as a function of whether particular study choices were honored or dishonored.\(^4\) Data for Black faces (Figure 4a) were analyzed in a 2 (Honor Condition: honor, dishonor) × 2 (Study Choice: selected, not selected) mixed-factor ANOVA with Honor Condition as between-subjects factor. Overall, Black faces not selected for restudy were better recognized ($M = 84.38; SE = 1.91$) than faces selected for restudy ($M = 78.39; SE = 2.41$), $F(1, 30) = 4.40, p = .044, \eta^2_g = .13$. With no main effect of Honor Condition, $F < 1$. Importantly, these findings were qualified by a reliable Study Choice × Honor Condition interaction, $F(1, 30) = 15.38, p < .001, \eta^2_g = .34$.

In order to unpack this interaction, we examined data for those faces selected and those not selected for restudy. For selected items, if metacognition is sensitive to learning, performance should be better when choices are honored rather than dishonored. That is, if an item is deemed to require additional study, then dishonoring that choice should result in poorer recognition than if the choice to restudy is honored. Indeed, planned comparisons demonstrated that recognition of Black faces was reliably better if the choice to restudy a face was honored ($M = 83.85; SE = 2.34$) than dishonored ($M = 72.92; SE = 4.20$), $t(30) = 2.27, p = .030$, Cohen’s $d = 0.80$. With regard to faces not selected for restudy, if metacognition is sensitive to learning, then such faces should result in similar levels of performance regardless of whether that choice is honored or dishonored. That is, if an item is already mastered, then additional study, as would happen if a choice to not restudy an item was dishonored, should provide little benefit to memory.

\(^4\) Our focal interest was in the impact of control processes on recognition for own-race (White) and other-race (Black) faces. Accordingly, analyses are reported separately for own-race and other-race faces. However, we also conducted an omnibus analysis of correct recognition in Experiment 3 via a 2 (Honor Condition: Black Faces Honored, White Faces Honored) × 2 (Study Choice: selected, not selected) mixed-factor ANOVA with Honor Condition as between-subjects factor. Although several main effects and lower-order interactions were evident, these were subsumed by a reliable triple interaction of Honor Condition, Study Choice, and Race of Face, $F(1, 30) = 76.22, p < .001, \eta^2_g = .72$. The analyses reported can be viewed as describing this interaction.

![Figure 3. Mean judgments of learning (JOLs) in Experiment 3 for faces that were or were not selected for restudy. Error bars represent the standard error of the mean](image-url)
Recognition for honored and dishonored choices—White faces

Correct recognition of White faces (Figure 4b) was likewise analyzed in a 2 (Honor Condition: honor, dishonor) × 2 (Study Choice: selected, not selected) mixed-factor ANOVA with Honor Condition as between-subjects factor. Overall, White faces selected not to receive restudy were better recognized ($M = 88.02; SE = 2.08$) than faces selected for restudy ($M = 81.77; SE = 2.10$), $F(1, 30) = 7.50$, $p = .010$, $\eta_p^2 = .10$, with no main effect of Honor Condition, $F(1, 30) = 1.42$, $p = .243$, $\eta_p^2 = .05$. These findings were qualified by a reliable Honor Condition × Study Choice interaction, $F(1, 30) = 13.33$, $p = .001$, $\eta_p^2 = .31$. As in the analysis of recognition for Black faces, in follow-up analyses, we examined data for those faces selected and those not selected for restudy. Regarding faces selected for restudy, recognition was better when a decision to restudy a face was honored ($M = 88.02; SE = 2.63$) than dishonored ($M = 75.52; SE = 3.27$), $t(30) = 2.98$, $p = .006$, Cohen’s $d = 1.05$. Thus, participants were well aware of which White faces required additional study and dishonoring that choice impaired recognition. For faces not selected for restudy, there was no reliable difference in memory performance when the choice to not restudy a face was honored ($M = 85.94; SE = 3.01$) or dishonored ($M = 90.10; SE = 2.87$), $t(29) = 1.00$, $p = .325$. That is, in contrast to Black faces, participants were aware of which White faces had been mastered, ensuring that there was little additional benefit to recognition when the choice to not restudy a face was dishonored.

Discussion

Experiment 3 demonstrated the consequences of metacognitive insensitivity for recognition of own-race and other-race faces when participants were permitted to choose which faces were selected for restudy. If participants are aware of those faces that do or do not necessitate additional study, then honoring those choices should improve memory performance and dishonoring those choices should hinder memory performance. Our results showed that honoring study choices led to optimal learning for own-race faces but not other-race faces. In particular, for own-race (White) faces, recognition was improved when restudy choices were honored but remained unchanged when the choice to not restudy a face was dishonored. In contrast, for other-race (Black) faces, honoring restudy choices improved recognition performance, but dishonoring the choice to not restudy a face changed performance. That is, Black faces not selected for restudy actually warranted additional study; thus, dishonoring this choice and requiring additional study improved performance. Importantly, as shown in Figure 3, Black and White faces not selected for additional study elicited essentially identical JOLs, suggesting that these groups of faces were deemed equally memorable. Such findings suggest that the own-race bias may partially reflect a metacognitive deficiency that hinders self-regulated learning. Thus, participants may fail to appreciate which other-race faces require additional study, impairing memory performance when participants are permitted to control learning.

GENERAL DISCUSSION

The current study examined metacognitive awareness of the own-race bias and the impact of such awareness on memory for own-race and other-race faces. Specifically, participants studied own-race and other-race faces and made a JOL prior to a recognition test (cf., Hourihan et al., 2012; Smith et al., 2004). Overall, participants in all three experiments provided similar JOLs for Black and White faces, despite consistent differences in memory performance. To more precisely characterize our findings, we examined these data in a small-scale fixed-effects meta-analysis across the three experiments reported (only data for recognition and JOLs for items not restudied in Experiment 3 were included). Overall, recognition was reliably more accurate for own-race relative to other-race faces ($d = 0.49$; CI95: 0.26, 0.72), yielding a medium effect size in Cohen’s (1988) classification system. In contrast, there was a small, but reliable, effect for participants to provide slightly higher JOLs to own-race faces ($d = 0.13$; CI95: 0.02, 0.24). These data indicate that JOLs were far less sensitive to the impact of race than is warranted by actual recognition performance. Accordingly, although there was a small elevation in predictions for White faces, memory predictions were largely insensitive to the own-race bias.

A critical assumption of research in metacognition (e.g., Nelson, 1996; Nelson & Narens, 1990) is that awareness of one’s own learning (i.e., monitoring) has a causal influence on
self-regulation of learning (i.e., control processes). Thus, a potential consequence of metacognitive insensitivity to the own-race bias is that participants will not exert optimal control of study behaviors. We found partial support for a deficit in control. Specifically, when participants in Experiment 2 were permitted to self-pace study, they allocated the same amount of time to study own-race and other-race faces. Given that other-race faces were less likely to be remembered, a more advantageous strategy may have been to allocate additional study time to such faces. In Experiment 3, participants were afforded the opportunity to restudy half of the faces presented, with these choices either honored or dishonored. If study choices are optimal, then honoring these choices should result in better subsequent memory performance than dishonoring choices (cf., Kornell & Metcalfe, 2006). It was in this capacity that an own-race bias in metacognitive judgments was evident. Specifically, when items were not selected for restudy, participants benefitted when the restudy choice was dishonored for Black (other-race) faces (Figure 4a). That is, although participants made a choice indicating that a face did not necessitate additional study, recognition was superior when this choice was dishonored for Black faces. In contrast, memory for White faces did not reliably benefit when the choice to not restudy a face was dishonored. Given that participants similarly provided higher JOLs for items not selected versus selected for restudy for Black and White faces, we suggest that this is indicative of faulty monitoring of other-race faces, to the detriment of recognition of such faces. Taken together, these data highlight a role for metacognition in the own-race bias. Future work should endeavor to expand on these findings using other methods of assessing control processes. For example, although we constrained our participants to select half of the faces in a study block for restudy, choices might differ were they unconstrained or were participants able to select from a mixed list of faces.

We note that our findings differ from several other studies reporting substantial differences in metacognitive accuracy for own-race and other-race faces. For example, Smith et al. (2004) found that participants correctly regarded own-race faces as more likely to be identified in a line-up task. As well, Hourihan et al. (2012) reported that Caucasian, but not Asian, participants exhibited an advantage in relative accuracy for own-race faces that had been given JOLs prior to an item recognition test. In contrast to these findings, JOLs in the current study were not more accurate (both in terms of absolute and relative accuracy) for own-race faces. Several elements of our experiments differ from prior reports. Most notably, a 2AFC recognition test was used, whereas other studies used either a line-up task (Smith et al., 2004) or an item recognition test (Hourihan et al., 2012). It is possible that the nature of the recognition test used in the current study does not support strong levels of relative accuracy. For example, Nomi et al. (2013) also used a 2AFC recognition test and instructed participants to make JOLs for faces that differed in their emotional expression. Their data showed that relative accuracy did not differ from chance. In the current experiments, it is possible that participants had difficulty studying a single item and anticipating the degree to which it would be distinguishable from a foil that was not present when the prediction was made. Future work may benefit from directly comparing these two methods of testing. We also note that the experiments reported tested only White participants because of the nature of the population sampled. The specific faces used have previously produced an own-race bias for both Black and White participants (Bennett-Day, 2007; Meissner et al., 2005), and thus, we do not believe our findings reflect item effects. Nevertheless, future work should seek to further generalize these findings across populations that permit one to examine crossover interactions.

Overall, our findings suggest that limited awareness of the own-race bias (i.e., poor monitoring) may have a cascade of effects on the self-regulation of memory, potentially to the detriment of face recognition. This has substantial implications in arenas such as the justice system, which is still largely reliant on eyewitnesses as an important form of evidence (Wells et al., 2006). Indeed, the majority of false convictions appear to be linked in some manner to faulty eyewitness testimony (Scheck et al., 2000), with a large percentage of these cases involving mistaken cross-race identification. Our data indicate that people may have little awareness of differences in memory for own-race and other-race faces. Consequently, they may be less likely to exert optimal control over encoding (e.g., change their view of a suspect) that might support later recognition. From this perspective, metacognition is inextricably linked with the likelihood that a face, be it an own-race or other-race face, is later remembered.

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REFERENCES


APPENDIX

Mean confidence judgments for correct and incorrect recognition decisions and mean gamma correlations between confidence and accuracy by race of face in Experiments 1–3.

<table>
<thead>
<tr>
<th>Race of face</th>
<th>Correct confidence</th>
<th>Incorrect confidence</th>
<th>Gamma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>75.94 (1.33)</td>
<td>68.97 (2.20)</td>
<td>0.39 (0.05)</td>
</tr>
<tr>
<td>White</td>
<td>78.23 (1.30)</td>
<td>65.86 (1.73)</td>
<td>0.53 (0.05)</td>
</tr>
<tr>
<td>Experiment 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>79.39 (1.49)</td>
<td>70.46 (1.91)</td>
<td>0.39 (0.05)</td>
</tr>
<tr>
<td>White</td>
<td>81.18 (1.41)</td>
<td>67.36 (2.16)</td>
<td>0.56 (0.04)</td>
</tr>
<tr>
<td>Experiment 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>83.06 (1.34)</td>
<td>70.26 (1.59)</td>
<td>0.55 (0.05)</td>
</tr>
<tr>
<td>White</td>
<td>85.78 (1.33)</td>
<td>68.12 (2.06)</td>
<td>0.63 (0.07)</td>
</tr>
</tbody>
</table>

Note: Correct confidence refers to confidence following a correct judgment of a face as previously studied. Incorrect confidence refers to confidence following the mistaken endorsement of a lure as studied. Gamma refers to the relationship between confidence and accuracy. Standard errors of the mean are in parentheses.