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# The impact of value-directed remembering on the own-race bias ☆

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ABSTRACT

Learners demonstrate superior recognition of faces of their own race or ethnicity, compared to faces of other races or ethnicities; a finding termed the own-race bias. Accounts of the own-race bias differ on whether the effect reflects acquired expertise with own-race faces or enhanced motivation to individuate own-race faces. Learners have previously been motivated to demonstrate increased recall for highly important items through a value-based paradigm, in which item importance is designated using high (vs. low) point values. Learners receive point values by correctly recalling the corresponding items at test, and are given the goal of achieving a high total point score. In two experiments we examined whether a value-based paradigm can motivate learners to differentiate between other-race faces, reducing or eliminating the own-race bias. In Experiment 1, participants studied own- and other-race faces paired with high or low point values. High point values (12-point) indicated that face was highly important to learn, whereas low point values (1-point) indicated that face was less important to learn. Participants demonstrated increased recognition for high-value own-race (but not other-race) faces, suggesting that motivation alone is not enough to reduce the own-race bias. In Experiment 2, we examined whether participants could use value to enhance recognition when permitted to self-pace their study. Recognition did not differ between high-value own- and other-race faces, reducing the own-race bias. Such data suggest that motivation can influence the own-race bias when participants can control encoding.

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## 1. Introduction

Almost a half-century of research has demonstrated that recognition memory is superior for faces from an in-group relative to out-groups. For example, memory is better for faces of one's own gender (e.g., Wright & Sladden, 2003), age (Rhodes & Anastasi, 2012), or species (Diamond & Carey, 1986). The most well-documented example of this phenomenon is the own-race bias, the finding that faces of one's own race or ethnicity are better remembered than faces of another race/ethnicity (Malpass & Kravitz, 1969; see Meissner & Brigham, 2001).[1] The effect is robust across varied populations, having been found in children (Pezdek, Blandon-Gitlin, & Moore, 2003; Sangrigoli, Pallier, Argenti, Ventureyra, & de Schonen, 2005), college students (Bernstein, Young, & Hugenberg, 2007; Hehman, Mania, & Gaertner, 2010), and older adults (Brigham & Williamson, 1979), as well as across racial and cultural groups (Kassin, Ellsworth, & Smith, 1989).

Theoretical accounts of the own-race bias typically emphasize either acquired *perceptual expertise* (Hills & Lewis, 2006), or *social cognitive* mechanisms (Pauker et al., 2009; Sporer, 2001). The perceptual expertise account holds that individuals have more extensive experience or contact with members of their own race relative to other racial groups or ethnicities. Such contact facilitates the development of perceptual expertise that supports face recognition for own-race compared with other-race faces. Consequently, individuals are poorer at differentiating other-race faces in contrast to effective differentiation of own-race faces (Chiroro et al., 2008; Lucas, Chiao, & Paller, 2011; Rhodes, Brake, Taylor, & Tan, 1989; Rhodes, Jeffery, Taylor, Hayward, & Ewing, 2014).

Social-categorization accounts hold that own-race and other-race faces are processed as in-group versus out-group members, respectively (Hugenberg & Sacco, 2008; Levin, 2000). The product of this categorization is that people are motivated to think categorically about other-race faces and individuate (i.e., differentiate) members of their own race (Hehman et al., 2010; Hourihan, Fraundorf, & Benjamin, 2013; Shriver, Young, Hugenberg, Bernstein, & Lanter, 2008). For example, Hehman et al. (2010) had college students study own-race and other-race faces of individuals grouped either by the university putatively attended (the participant's university or a rival university) or by race. When faces were grouped by race, participants exhibited an own-race bias, demonstrating better memory for own-race than other-race faces. However, when faces were grouped by university, participants exhibited

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[1] Chiroro, Tredoux, Radaelli, and Meissner (2008) have argued that the specific term own-race bias should be replaced by the more general term *in-group face recognition advantage*. Although we agree in principle with this label, we use the term *own-race bias* so as to clearly link our experiments with the wider literature examining recognition for own- and other-race faces.

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superior recognition for faces of individuals from their own university, regardless of race. Indeed, the own-race bias was eliminated when faces were grouped by university affiliation (see also Bernstein et al., 2007). One potential explanation is that categorizing faces as part of an in-group based on university affiliation motivated participants to individuate other-race faces and thus minimized the own-race bias. In further support of a social cognitive account, Hourihan et al. (2013) had participants study racially ambiguous computer-generated faces, composed of 50% own-race and 50% other-race features. Participants only demonstrated the own-race bias when faces were labeled as either own-race or other-race faces at study. Such findings could not be accommodated by a perceptual-expertise account, which would hold that differences in expertise (and thus recognition) should be manifest regardless of the particular group a face was assigned to (but see Rhodes, Lie, Ewing, Evangelista, & Tanaka, 2010).

A corollary of a social cognitive account is that when learners are motivated to learn a face they will be less likely to exhibit the own-race bias. Motivation to learn other-race faces has been manipulated using several different methods (Ackerman et al., 2006; Barkowitz & Brigham, 1982; Hugenberg, Miller, & Claypool, 2007; Shriver & Hugenberg, 2010; Tullis, Benjamin, & Liu, 2014; Young & Hugenberg, 2012). Shriver and Hugenberg (2010; see also Ratcliff, Hugenberg, Shriver, & Bernstein, 2011) had participants study own-race and other-race faces, paired with either high-power (e.g., doctor) or low-power (e.g., janitor) job titles. Results from a subsequent recognition test showed that the own-race bias was reduced for high-power relative to low-power other-race faces. Shriver and Hugenberg suggested that participants were motivated to attend to faces associated with high-power job titles and thus individuated those faces, attenuating the own race bias.

The general influence of motivation on memory has been widely studied and suggests that individuals can often effectively regulate their learning as a function of the importance of information (Ariel, Dunlosky, & Bailey, 2009; Castel, Balota, & McCabe, 2009; Castel, Benjamin, Craik, & Watkins, 2002; Castel, Farb, & Craik, 2007; Castel et al., 2011; Castel, Lee, Humphreys, & Moore, 2010; Castel, Murayama, Friedman, McGillivray, & Link, 2013; Castel, Rhodes, McCabe, Soderstrom, & Loaiza, 2012; Madan & Spetch, 2012; McGillivray & Castel, 2011; Soderstrom & McCabe, 2011; for a review see Castel, 2008). For example, Castel et al. (2007) had learners study words paired with either positive (+16) or negative (−16) point values, which they would receive for correctly recalling a studied word at test. These points added up toward a total score and learners were given the goal of achieving a high total point score. Learners recalled more positive, high-value words than words paired with negative values, demonstrating selective recall of the most important information (Castel et al., 2002, 2007, 2009, 2010, 2011; DeLozier & Dunlosky, 2014; Watkins & Bloom, 1999).

Such data suggest that value, or reward, might similarly motivate learners to differentiate (and thus enhance) memory for other-race faces, reducing or eliminating the own-race bias. Accordingly, a motivational account would hold that memory could be enhanced for high-value other-race (as well as own-race) faces, potentially reducing or eliminating the own-race bias. We note that in order to reduce or eliminate the own-race bias for high-value faces, any enhancement in memory must be greater for other-race relative to own-race faces. That is, if the own-race bias in part reflects less motivation to attend to other-race faces, then designating some faces as high value should selectively increase attention to such faces, enhancing recognition. Alternatively, an account contingent only on expertise would suggest that the own-race bias would remain, even for high-value faces. That is, if participants were unable to bring effective encoding strategies to bear when learning other-race faces, even when motivated (as when faces are of high value), then recognition should remain superior for own-race relative to other-race faces.

We examined these predictions in two experiments in which participants studied own- and other-race faces. The value of each face was manipulated by pairing the face with either a high (12) or low (1) point value. Higher values indicated greater value (Castel et al., 2002) or increased importance of later recognizing the faces paired with those values. For each face correctly recognized, learners received the point value paired with that face, which accumulated to a total point score. Participants were given the goal of achieving a high total point score. We anticipated that learners would show enhanced recognition for high-value relative to low-value faces. Of crucial interest was whether this enhancement in memory would eliminate the own-race bias. If this were the case, high-value Black faces should be correctly recognized as frequently as high-value White faces.

## 2. Experiment 1

### 2.1. Method

#### 2.1.1. Participants

Forty White participants from Colorado State University participated in this experiment for partial course credit in Introductory Psychology. The use of only White participants in each experiment reflects the ethnic diversity of Colorado State University. According to the 2013–2014 Colorado State University Fact Book (http://www.ir.colostate.edu/factbook-fb.aspx), of 22,565 undergraduates enrolled at the university, 16,779 self-identify as White (74.36%) and 471 self-identify as Black (2.09%).

#### 2.1.2. Design

A 2 (Test item: old or new) × 2 (Race of face: Black or White) × 2 (Point value: 1 or 12) within-subjects design was used.

#### 2.1.3. Materials and procedure

Participants studied 64 faces, consisting of 32 White faces and 32 Black faces of young adults taken from a set used by Meissner, Brigham, and Butz (2005). Each face was edited to show only the face and neck, presented on a white background. No distinctive cues (e.g., jewelry, hair accessories, or clothing) were present. Faces were presented in blocks by race, such that each block consisted of equal numbers of male and female faces[2] (cf Rhodes, Sitzman, & Rowland, 2013). Each face was presented individually for 4 s, concurrently with a value of 1 or 12, which indicated how important that item was to remember. Participants were given instructions as follows:

> In the following task you will see faces presented one-at-a-time in the center of the screen. Please do your best to remember them, such that if given a face you would be able to remember whether or not you had seen that face before. Each face will be paired with a point value (either 1 or 12) that you will see in green just below each face. You don't need to remember this value. Instead, the point value indicates how important it is to remember the face when you are tested later. For example, if you recalled 10 faces, 8 with values of 10 and 2 with values of 1, then your score would be 82. Thus, it is most important to recall the faces paired with the highest point value, although recalling any face will enhance your score.

After all study items of one race were presented, participants were given a recognition test. The recognition test consisted of 32 studied faces and 32 lures taken from the same set. Participants were given 4 s to make a recognition decision and identify a face as either "old" (previously-studied), or "new" (never-before-studied), until all faces from that block were presented. The second block repeated this procedure with faces from the other race. Faces were counterbalanced such that each face was presented an equal number of times as a studied face or lure. Faces were also counterbalanced by Block such that, across participants, faces were presented equally often in the first or second

[2] Note that a blocked format was used to increase the magnitude of the ORB (see Meissner & Brigham, 2001), and thus the potential for amelioration. However, we anticipate that the same findings would emerge given a mixed study list.

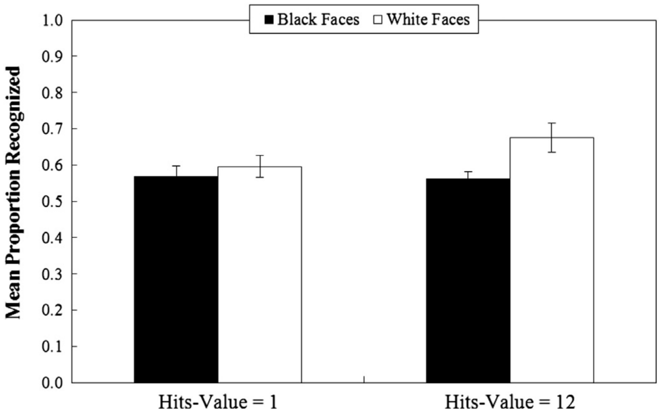


**Fig. A.1.** Mean proportion of items correctly recognized as a function of value and race of the face in Experiment 1. Error bars represent the standard error of the mean.

**Table A.1**
Means and standard error for discriminability (d′) and response criterion (C) for Experiments 1 and 2.

| Race of face | d′ | C |
|---|---|---|
| *Experiment 1* | | |
| Black | | |
| Value 1 | 0.78 (0.11) | 0.18 (0.08) |
| Value 12 | 0.72 (0.12) | 0.21 (0.06) |
| White | | |
| Value 1 | 1.07 (0.11) | 0.28 (0.06) |
| Value 12 | 1.36 (0.14) | 0.13 (0.07) |
| *Experiment 2* | | |
| Black | | |
| Value 1 | 0.84 (0.07) | 0.13 (0.05) |
| Value 12 | 1.07 (0.06) | 0.02 (0.05) |
| White | | |
| Value 1 | 1.32 (0.09) | 0.22 (0.05) |
| Value 12 | 1.42 (0.08) | 0.17 (0.05) |

block. All analyses are examined collapsed across block; analyses were additionally examined for any interactions with block, and any significant results are reported as footnotes for completeness, as they do not affect our main question of interest.

## 2.2. Results

### 2.2.1. Recognition

Given that the manipulation of value would affect only hits (i.e., studied faces correctly identified as "old") and not false alarms (i.e., new faces incorrectly identified as "old"), our focal analyses in Experiments 1 and 2 were conducted only on hits. The mean proportion of hits by value and race of the face (see Fig. A.1) was analyzed in a 2 (Race of face: Black, White) × 2 (Point value: 1, 12) repeated-measures analysis of variance (ANOVA).[3] Overall, participants were more likely to correctly recognize White faces ($M$ = .64, $SE$ = .02) than Black faces ($M$ = .56, $SE$ = .03), $F(1, 39) = 7.58$, $p = .009$, $\eta^2_p = .16$. Hits did not vary by point value, $F(1, 39) = 2.44$, $p = .126$, $\eta^2_p = .06$, but this finding was qualified by a reliable race of face by point value interaction, $F(1, 39) = 4.94$, $p = .032$, $\eta^2_p = .11$. Follow-up tests showed that, for faces paired with values of 1, hits did not differ between Black and White faces, $t < 1$. However, for faces paired with a value of 12, hits were greater for White faces than for Black faces, $t(39) = 4.62$, $p < .001$, $d = .71$. That is, the own-race bias was evident for high-value but not low-value faces. We note that false alarm rates were higher for Black faces ($M$ = .31, $SE$ = .03) than White faces ($M$ = .24, $SE$ = .02), $t(39) = 2.72$, $p = .010$, $d = .61$.

### 2.2.2. Signal detection analyses

In the interest of completeness we also report analyses of sensitivity and response criterion (see Table A.1) as d′ and C. The measure d′ reflects the standardized difference between old and new distributions. The measure C calculates criterion based on its distance from the intersection of the old and new distributions (i.e., d′ / 2), and is measured in standardized units: C = zFA − d′ / 2. Neutral responding is indicated by a value of 0, with values above 0 indicative of conservative responding and values below 0 indicative of liberal responding. Each measure was analyzed in a 2 (Face value: 1, 12) × 2 (Race of face, white, black) repeated-measures ANOVA. Given that values are not associated with lures, a common false alarm rate was used for all calculations. For example, when calculating indices for recognition of Black faces, a participant's false alarm rate for Black faces was used.

*2.2.2.1. Sensitivity.* Overall, sensitivity was reliably better for White faces ($M$ = 1.22, $SE$ = .11) than Black faces ($M$ = .75, $SE$ = .10), $F(1, 39) = 17.51$, $p < .001$, $\eta^2_p = .31$. Sensitivity did not differ by value, $F(1, 39) = 2.50$, $p = .122$, $\eta^2_p = .06$, but this was qualified by a reliable race of face by point value interaction, $F(1, 39) = 7.08$, $p = .011$, $\eta^2_p = .15$. Follow-up tests indicated that sensitivity was superior for White compared with Black faces for low-value, $t(39) = 2.33$, $p = .025$, $d = 0.41$, and high-value, $t(39) = 4.79$, $p < .001$, $d = 0.79$, faces. This finding that discriminability was superior for White faces across values was expected given the higher level of false alarms to Black faces.

*2.2.2.2. Response criterion.* Overall, the response criterion was somewhat conservative (exceeding a neutral value of 0) and did not reliably differ between Black and White faces, $F(1, 39) = .01$, $p = .920$, $\eta^2_p = .00$. Further, responding was similarly conservative for both high-value and low-value faces, $F(1, 39) = 2.18$, $p = .148$, $\eta^2_p = .05$. The interaction was reliable, $F(1, 39) = 6.22$, $p = .017$, $\eta^2_p = .14$. Follow-up tests indicated that responding was more conservative for White low-value ($M$ = .27, $SE$ = .06) than White high-value ($M$ = .13, $SE$ = .07) faces, $t(39) = 3.01$, $p = .005$, $\eta^2_p = .35$. Responding did not differ reliably between high- and low-value Black faces, $t(39) = .55$, $p = .589$.

## 2.3. Discussion

Participants were more likely to recognize high-value than low-value own-race faces, extending previous research (Castel et al., 2007) beyond verbal stimuli to demonstrate that item importance can enhance face recognition. In contrast to a social-cognitive account, pairing high values with other-race faces did not enhance recognition. That is, by a social-cognitive account, participants should have had greater motivation to remember high-value faces (regardless of race) with the consequence of diminishing or eliminating the own-race bias for those high-value faces. Rather, these data are consistent with an expertise account, suggesting that recognition of other-race faces is limited by whether participants are capable of engaging in effective encoding operations, regardless of the importance of that information.

We note that we have replicated these findings in a conceptually similar experiment that is not reported here. Specifically, participants studied Black and White faces paired with a range of values from 0 to 12 (0, 4, 8, 12). Recognition was enhanced for 12-point (compared to all other point values) faces of both races, but the own-race bias remained.[4]

[3] In Experiment 1, a significant Race × Value × Block interaction was found, $F(1, 38) = 6.69$, $p = .014$, $\eta^2_p = .150$. A priori follow-up tests revealed that when White faces were presented in the second block, more 12-point than 1-point White faces were recognized, $t(38) = 3.34$, $p = .003$, Cohen's $d = .769$. Most important, block did not affect memory for high-value faces of either race, $ts < 1$.

[4] These data may be obtained by contacting the corresponding author.

In Experiment 2, we attempted a stronger comparison of the perceptual-expertise and social-cognitive accounts.

## 3. Experiment 2

Experiment 1 demonstrated that participants were unable to eliminate the own-race bias for the highest-value faces. One possible reason for this failure to eliminate the own-race bias is that participants attempted to augment their encoding of high-value, other-race faces but were unable to do so in the time allotted. The impact of value on memory has generally been assumed to reflect a form of strategic encoding, such that participants allocate more encoding resources to high-value items (Ariel et al., 2009; Bui, Friedman, McDonough, & Castel, 2013; Castel et al., 2002; Castel et al., 2013; but see DeLozier & Dunlosky, 2014). Castel et al. (2013) report evidence consistent with this perspective. They presented learners with an array of point values (1–30) which they would receive if they correctly recalled a word paired with that point value at test. Learners selected words for study by clicking on a point value and were permitted to study the word-value pair for as long as deemed necessary. Overall, learners spent more time studying (and recalled more) high-value than low-value word pairs. Thus, when given control over learning, individuals selectively attended to the highest-value information and were most likely to remember that high-value information.

Accordingly, it is possible that learners might eliminate the own-race bias if permitted to strategically encode other-race faces by controlling study time. Although several factors influence allocation of study time, one common finding is that learners allocate the most time to items thought to be most poorly learned (Benjamin & Bird, 2006; Dunlosky & Thiede, 1998; Soderstrom & Bjork, 2014; Thiede & Dunlosky, 1999; but see Ariel et al., 2009; Metcalfe & Kornell, 2005). Applied to the own-race bias, this would suggest that, if given control, learners should spend more time studying other-race than own-race faces. However, the few studies to directly examine the issue have generally observed that participants allocate the same amount of time to studying own- and other-race faces (Rhodes et al., 2013; Tullis et al., 2014; Experiment 1). Tullis et al. (2014) report an exception to this finding. They permitted learners to self-pace their study of own- and other-race faces, instructing participants to individuate other-race faces. Under these circumstances learners allocated more study time to other-race faces, but this additional study time did not eliminate the own-race bias.

Taken together, prior work suggests that permitting control over study time does not alter recognition of other-race faces, even when participants allocate additional time to such faces. In Experiment 2 we ask whether recognition of other-race faces can be improved if control over study time is paired with a manipulation of the importance of the to-be-learned faces. When permitted to self-pace their study, learners should spend more time studying high-value than low-value faces (Ariel et al., 2009; Castel et al., 2013; DeLozier & Dunlosky, 2014). If learners are permitted to strategically control their encoding, a social-cognitive account would predict that learners would be motivated to differentiate between high-value and low-value other-race faces, enhancing recognition and reducing the own-race bias. Alternatively, if the own-race bias reflects a core deficit in perceptual expertise, value should have no influence over recognition of other-race faces, even when participants are given control over encoding.

### 3.1. Methods

#### 3.1.1. Participants and design

Fifty-nine participants from Colorado State University participated in this experiment for partial course credit in Introductory Psychology. A 2 (Test item: old or new) × 2 (Race of face: Black or White) × 2 (Point value: 1 or 12) within-subjects design was used.

#### 3.1.2. Materials and procedure

The materials 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.

Study-time allocation for each face was measured by recording the duration from the onset of the study face until pressing the spacebar terminated study.

### 3.2. Results

#### 3.2.1. Recognition

Hits were analyzed in a 2 (Race of face: Black, White) × 2 (Value: 1, 12) repeated-measures analysis of variance (ANOVA); see Fig. A.2. Overall, no reliable difference in hits as a function of the race of the face was evident, $F(1, 58) = 2.63$, $p = .111$, $\eta^2_p = .04$. Participants recognized more 12-point faces ($M = .67$, $SE = .02$) than 1-point faces ($M = .63$, $SE = .02$), $F(1, 58) = 11.11$, $p = .001$, $\eta^2_p = .16$. The interaction of race by point value was not significant, $F(1, 58) = 2.28$, $p = .137$, $\eta^2_p = .04$. Nonetheless, we conducted follow-up tests on the relationship between race and point value, based on our a priori hypotheses. Hits for 1-point faces were lower for Black faces than for White faces, $t(58) = 2.13$, $p = .037$, $d = .31$; however, hits did not differ for 12-point Black and White faces, $t < 1$. Thus, the own-race bias was eliminated for high-value (but not low-value) faces. As in Experiments 1 and 2, false alarm rates were higher for Black faces ($M = .31$, $SE = .02$) than for White faces ($M = .22$, $SE = .02$), $t(58) = 4.94$, $p < .001$, $d = .69$.

#### 3.2.2. Signal detection analyses

*3.2.2.1. Sensitivity.* Overall, sensitivity (see Table A.1) was reliably better for White faces ($M = 1.37$; $SE = .08$) than Black faces ($M = 0.96$; $SE = .06$), $F(1, 58) = 39.18$, $p < .001$, $\eta^2_p = .40$. In addition, sensitivity was superior for high-value ($M = 1.25$; $SE = .06$) relative to low-value ($M = 1.08$; $SE = .07$) faces, $F(1, 58) = 10.76$, $p = .002$, $\eta^2_p = .16$. The interaction was not reliable, $F(1, 58) = 2.20$, $p = .14$, $\eta^2_p = .04$. Follow-up tests indicated that sensitivity was superior for White compared with Black faces for low-value, $t(58) = 5.59$, $p < .001$, $d = 0.63$, and high-value, $t(58) = 4.84$, $p < .001$, $d = 0.76$, faces. This finding that discriminability was superior for White faces across value was expected given the higher level of false alarms to Black faces.

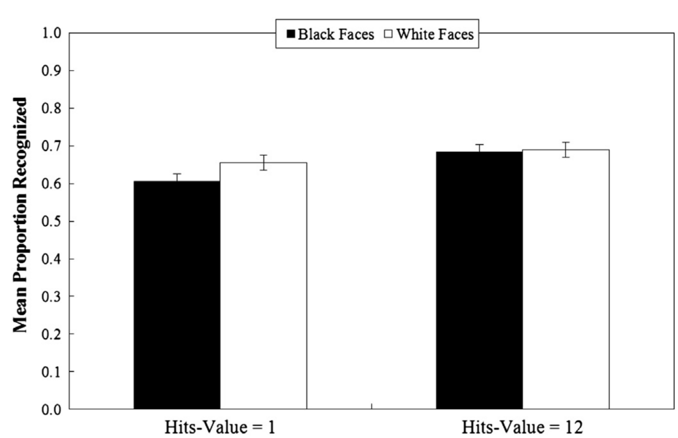


**Fig. A.2.** Mean proportion of items correctly recognized as a function of value and race of the face in Experiment 2. Error bars represent the standard error of the mean.

*3.2.2.2. Response criterion.* Overall, response criterion was relatively conservative and more so for White faces ($M = 0.20$; $SE = .04$) than Black faces ($M = 0.07$; $SE = .05$), $F(1, 58) = 6.39$, $p = .01$, $\eta^2_p = .10$. As well, responding was reliably less conservative for high-value ($M = 0.09$; $SE = .04$) compared with low-value ($M = 0.18$; $SE = .04$) faces, $F(1, 58) = 11.63$, $p = .001$, $\eta^2_p = .17$. The interaction was not reliable, $F(1, 58) = 1.90$, $p = .17$, $\eta^2_p = .03$.

### 3.2.3. Self-paced study

Median study time (in milliseconds; see Fig. A.3) was analyzed in a 2 (Race of face: Black, White) × 2 (Value: 1, 12) repeated-measures analysis of variance (ANOVA). Overall, participants allocated similar amounts of time to studying Black and White faces, $F(1, 58) = 1.75$, $p = .191$, $\eta^2_p = .19$ (cf. Rhodes et al., 2013). Participants spent more time studying 12-point faces ($M = 5245.36$, $SE = 541.88$) than 1-point faces ($M = 3902.43$, $SE = 381.22$), $F(1, 58) = 20.22$, $p < .001$, $\eta^2_p = .26$. The Race × Point interaction was not significant, $F(1, 58) = 1.50$, $p = .225$, $\eta^2_p = .03$, and study time for 1-point and 12-point faces did not differ by race of face, *ts* < 1.4. Gamma correlations demonstrated a minimal relationship between study time and recognition ($G = .04$, $SE = .02$), which did not differ significantly from zero, $t(58) = 1.75$, $p = .086$. The magnitude of this relationship was similar for correlations between race and value. That is, increased study time was not reliably related to subsequent recognition regardless of whether faces were Black or White, or whether they were 1-point or 12-point faces.

### 3.3. Discussion

Participants in Experiment 2 showed elevated recognition of high-value compared to low-value faces, consistent with prior work examining memory based on item importance (Ariel et al., 2009; Castel et al., 2007, 2010). Most importantly, the own-race bias was no longer evident for high-value faces, supporting the social–cognitive account of the own-race bias. Thus, when able to selectively control encoding, learners were able to reduce the own-race bias, in contrast to previous findings (Rhodes et al., 2013; Tullis et al., 2014). Indeed, a comparison of Experiments 1 and 2 showed that the level of hits was reliably greater when study was self-paced ($M = .69$, $SE = .02$) than when it was experimenter-paced ($M = .62$, $SE$ .02), $F(1, 39) = 6.91$, $p = .012$, $\eta^2_p = .15$. However, this effect was qualified by a significant race of face by study time interaction, $F(1, 39) = 7.38$, $p = .010$, $\eta^2_p = .16$. That is, for Black faces, recognition was greater when participants were permitted to self-pace their study ($M = .68$, $SE = .02$) than when their study was experimenter-paced ($M = .56$, $SE = .03$), $t(39) = 3.58$, $p = .001$, $d = .80$, yet this difference was not significant for White faces, $t < 1$. Thus, self-paced study reduced the ORB and appeared to selectively affect encoding of other-race faces. However, as demonstrated by the gamma correlations reported, self-paced study was not a reliable predictor of recognition for individual faces of either race. One possibility is that permitting control over study time yields global benefits to performance that do not track item-by-item relationships between the amount of time devoted to study an item and the recognition outcome for that item. As well, under self-paced study conditions, participants frequently "labor-in-vain" (Nelson & Leonesio, 1988), continuing further study even after the benefits of continued study are no longer substantial. Future experiments should further examine this hypothesis in the context of the own-race bias.

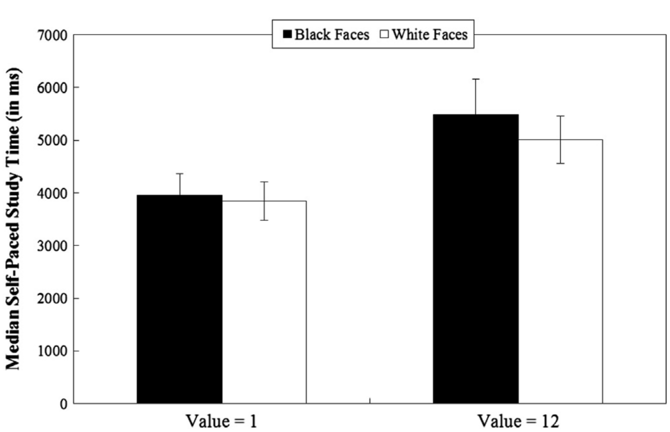


**Fig. A.3.** Median time (in milliseconds) spent studying each item as a function of race and point in Experiment 2. Error bars represent the standard error of the mean.

## 4. General discussion

The current study investigated whether participants' recognition of other-race faces could be influenced through a value-based reward paradigm (e.g., Ariel et al., 2009; Castel et al., 2002), testing a social-categorization account of the own-race bias. Accordingly, participants studied own- and other-race faces paired with values indicating the importance of later recognizing that face at test. A key prediction of a social-categorization account is that the own-race bias should be significantly reduced or eliminated altogether for the most important faces (Hugenberg et al., 2007; Shriver & Hugenberg, 2010). We found inconsistent evidence supporting that prediction. Indeed, results from Experiment 1 suggested that even when motivated, participants could not reduce the own-race bias, consistent with a perceptual-expertise account. Although value enhanced recognition for own-race faces, participants were not able to also enhance recognition for the highest-value other-race faces. According to a perceptual-expertise account, this failure reflects a fundamental inability to effectively encode other-race faces (Young & Hugenberg, 2012), regardless of whether participants have additional motivation to learn such faces.

A different pattern of results emerged in Experiment 2. Specifically, when participants were afforded control over study time, the own-race bias was no longer evident for high-value faces. This was further confirmed by a cross-experiment analysis demonstrating that, under self-paced study conditions, recognition was enhanced for high-value Black faces. Thus, participants were not only motivated to attend to high-value faces (evident through self-paced study), but were able to effectively encode high-value, other-race faces, in accordance with a social-categorization account of the own-race bias.

Although our results demonstrate that value can enhance memory for faces, these data suggest that manipulating value was not always sufficient to eliminate or reduce the own-race bias. Neither perceptual-expertise nor social-cognitive accounts can fully accommodate these results. Perceptual-expertise accounts hold that expertise should consistently hinder recognition of other-race faces, whereas social-cognitive accounts hold that motivation should consistently enhance memory for high-value faces, regardless of race. Hybrid models that combine elements of social-cognitive and perceptual expertise accounts (for a review, see Young, Hugenberg, Bernstein, & Sacco, 2012) may provide one method of reconciling these findings. For example, the *categorization–individuation* account proposes that the own-race bias is due to a combination of interacting factors: social categorization, motivation to individuate, and expertise. Faces are initially processed categorically and expertise is only posited to enhance recognition when the learner is sufficiently motivated to employ existing face expertise (Hugenberg & Sacco, 2008; Hugenberg, Young, Bernstein, & Sacco, 2010; Young et al., 2012). Under this account, one might argue that participants were insufficiently motivated in Experiment 1 to bring expertise to bear in a manner that would eliminate the own-race bias. It was only when study was self-paced (Experiment 2) that the means of fully realizing any latent expertise for other-race faces was realized. Although plausible, it remains unclear how to specify a priori when such expertise will or will not eliminate the own-race bias.

Regardless of the explanation, one striking finding from the experiments reported is that the own-race bias was eliminated when participants were given control over study time. Indeed, when study time is limited, or learners are unable to create a learning agenda, the effects of value-directed remembering are diminished (Ariel & Dunlosky, 2013; DeLozier & Dunlosky, 2014). To illustrate, DeLozier and Dunlosky (2014) permitted learners to study low-value (points 1–10) and high-value (points 90–100) word–value pairs, either for as long as they chose (self-paced condition), or for 1 s each (experimenter-paced condition). Learners who were permitted to self-pace their study spent more time studying (and recalled more) high-value than low-value words. However, learners in the experimenter-paced condition did not demonstrate differential recall for high-value compared to low-value word–value pairs. Similarly, we demonstrated that the own-race bias was eliminated only when participants were permitted to control their study time for high- and low-value faces. These data suggest some boundaries on the effect of value on remembering. Future work should seek to further explore these boundaries and examine other potential instantiations of value.

Several caveats are in order regarding the experiments reported. Most importantly, it should be noted that although high-value, other-race faces were correctly endorsed as frequently as high-value own-race faces in Experiment 2, discriminability was poorer for other-race faces in each experiments (see Table A.1). This reflects either equivalent or reduced levels of hits for other-race faces in conjunction with a consistently higher level of false alarms for other-race faces. An elevation in false alarms for other-race faces is common as is a more liberal response criterion for other-race faces (Meissner & Brigham, 2001). Could our effects of value be accommodated by an account contingent on changes in response criterion for high- versus low-value faces? We think this possibility is highly unlikely. In particular, although participants are capable of frequent shifts in response criterion within a single test (e.g., Rhodes & Jacoby, 2007; but see Stretch & Wixted, 1998), there was no information at test designating the value of a face and thus no external cue to signal a criterion shift. Designating items as high or low value at test does influence response criterion (e.g., Healy & Kubovy, 1978) but, to our knowledge, such a manipulation has not been extended to the own-race bias. For the present, we suggest that any influence of value on subsequent recognition reflects enhanced encoding rather than a shift in response criterion. We also note that the experiments reported tested only White participants due to 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, it will be important to generalize these findings across populations that permit one to examine crossover interactions.

Overall, our findings suggest that the own-race bias may be attenuated by value attached to a face, but only under circumstances that permit the learner to control encoding. These data should serve to inform theoretical accounts of the own-race bias as well as frameworks characterizing the impact of value and motivation on memory.

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