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Individual Differences Correspond with Attention to the Eyes of White Versus Black Faces

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Abstract

Black, relative to White, individuals have experienced discrimination for centuries in the United States. Recent work suggests that subtle differences in how novel Black faces are initially perceived relate to prejudicial behavior. One such difference is that non-Black people attend more to the eyes of White versus Black novel faces. The present study sought to better characterize this difference by assessing how distinct individual differences widely shown to relate to prejudicial behavior—internal motivation to respond without prejudice (IMS), external motivation to respond without prejudice (EMS), and implicit race bias—relate to disparities in attending to the eyes of novel Black and White faces. Participants viewed novel Black and White faces one at a time on the right or left side of the display. Replicating a race-based disparity in visual attention to the eyes, non-Black perceivers fixated more on the eyes of White in comparison to Black faces. Individual differences among perceivers corresponded with the extent of this race-based disparity. IMS had a negative relationship with a race-based disparity in attention to the eyes, such that higher levels of IMS among perceivers corresponded with lower disparities in attention. Implicit race bias had a positive relationship with this disparity, such that higher levels of implicit race bias among perceivers corresponded with higher disparities in attention. Together, these findings illustrate that two individual differences known to affect prejudicial behavior are associated with preferential gaze patterns in visual attention toward faces on the basis of race.

Keywords Face perception · Visual attention · Race · Internal motivation to respond without prejudice · Implicit race bias

Introduction

Black individuals have long been subjected to discriminatory treatment in the United States (e.g., Cuddy et al. 2007; Goff et al. 2008, 2014). Because Black Americans' experiences with prejudice are linked to myriad negative consequences (for a review, see

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Mays et al. 2007), understanding the mechanisms that predicate their prejudicial treatment can provide important insight into developing interventions to reduce prejudice. The extent to which non-Black perceivers attend to the eyes of Black faces when initially encountering them reflects one such mechanism and is the focus of the current investigation.

The eyes convey information about people's mental states (Baron-Cohen et al. 1997), contributing to impressions and social communication (Adams and Kleck 2003, 2005; Mason et al. 2004; Mason et al. 2005). In fact, looking at another person's eyes humanizes that person (Khalid et al. 2016). The extent to which perceivers attend to the eyes of cultural outgroup members predicts how well they humanize those individuals (e.g., understand their mental states) (Adams et al. 2009; Baron-Cohen et al. 1997). Directly relevant to the current investigation, perceivers who attend less to the eyes of Black relative to White faces exhibit more prejudicial behavior toward Black individuals (e.g., are less willing to interact with them; Kawakami et al. 2014). The goal of the present work was to replicate and expand this finding by determining if individual differences that relate to prejudicial behavior also relate to race disparities in visual attention to the eyes.

Negative cultural associations engender racial stereotypes. However, knowledge of such stereotypes does not result in the same level of prejudicial behavior across perceivers (Devine 1989). Instead, the extent to which such negative associations are automatically activated (e.g., the extent of people's implicit race bias) and/or actively controlled (e.g., due to differences in motivation to control prejudice) relates to people's prejudicial behaviors (e.g., Greenwald et al. 1998; McConnell and Leibold 2001; Plant and Devine 1998). Implicit race bias is associated with numerous prejudicial outcomes for Black Americans (e.g., Green et al. 2007), including subtle differences in nonverbal behaviors (McConnell and Leibold 2001). Because implicit race bias reflects more automatic prejudicial associations (Greenwald et al. 1998), perceivers are often unaware that they have such bias even though it affects the quality of their interactions with outgroup members. For example, more implicit racial bias predicts less friendly nonverbal behaviors to racial outgroup members (Dovidio et al. 2002; Dovidio et al. 1997). Such biases are often assessed using implicit measures and are commonly assessed using the Implicit Association Test (IAT; Greenwald et al. 1998). Implicit race bias may thus also relate to an increase in race disparity in attention to the eyes.

Although perceivers are often unaware of their implicit biases, bias is also modulated by top-down controlled processes. One of the most widely studied examples of these is people's motivation to respond without prejudice. Motivation is separated into internal and external components, both of which can be reliably measured through self-report (IMS and EMS, respectively; Plant and Devine 1998). IMS, defined as a goal not to appear prejudiced to oneself (Plant and Devine 1998), captures individual differences in *intrinsic* motivation to behave in a non-prejudicial way. Neuroimaging research has demonstrated that IMS engages control when people are motivated to behave in an egalitarian manner (e.g., Amodio et al. 2008). EMS, by contrast, reflects sensitivity to *external pressure* to appear non-prejudiced rather than intrinsic goals. Because IMS relies on intrinsic motivation, it is perhaps unsurprising that IMS, but not EMS, is a stronger predictor of behaving in a non-prejudicial manner (e.g., Plant and Devine 1998; Plant et al. 2010). For example, IMS positively relates to focusing on strategies to reach positive outcomes when interacting with Black targets (Plant et al. 2010). By contrast, people with high EMS are less likely to control race-related stereotypes (Amodio et al. 2008), and are unlikely to behave non-prejudicially without a threat of social disapproval (Devine et al. 2002). To the extent that less race disparity in attention to the eyes corresponds with less prejudicial behavior

(Kawakami et al. 2014), IMS, and not EMS, may thus more strongly relate to decreases in this disparity.

In the current investigation, we examined whether implicit race bias and motivation to control prejudice related to differences in the extent to which non-Black perceivers attended to the eyes of Black (versus White) individuals. This investigation may shed light on studies that have yielded mixed findings as to whether or not racial majority perceivers attend more or less to the eyes of racial majority members than they do to racial minority members (e.g., Blais et al. 2008; Goldinger et al. 2009; Kawakami et al. 2014). One possibility is that methodological differences elicited these mixed findings. Trying to remember a face versus not, for instance, could change how people attend to faces. Another possibility is that differences *within perceivers* that relate to prejudicial behavior could affect race disparities in attention to the eyes. That is, variation in individual differences could relate to increases or decreases in this disparity, contributing to mixed findings. Indeed, internalized schemas (i.e., generalized knowledge about objects or people) that differ among perceivers guide looking behavior (Pannasch et al. 2011) and face perception (Dotsch et al. 2008).

Directly related to the possibility that individual differences among perceivers may affect a race disparity in attention to the eyes, recent work suggests that manipulating motivation attenuates non-Black perceivers' race disparity in attention to the eyes (Kawakami et al. 2014). This finding emerged when perceivers were explicitly instructed to individuate Black faces (Kawakami et al. 2014). Individuation instructions might have thus motivated perceivers to attend to Black faces differently and extract more information from them (e.g., unique mental states; Baron-Cohen et al. 1997). That manipulating motivation affects attention to the eyes by race raises the possibility that some perceivers may attend to the eyes of Black and White faces to the same extent even in the absence of individuating instructions because they are naturally motivated to do so. The present study extended the literature by directly addressing this second possibility.

Distinct individual differences could affect attention to the eyes by race in different ways. A race disparity, for example, could emerge because perceivers are not motivated to behave equitably toward Black individuals *or* because they have more bias against them. To this end, we tested how perceiver levels of motivation *and* implicit bias affect this disparity. We predicted higher implicit race bias would relate to an increase in race disparity in attention to the eyes. We also predicted that higher IMS, and not EMS, would relate to a decrease in race disparity in attention to the eyes. These potential effects are important to disentangle because they may require unique interventions to reduce a race disparity in attending to the eyes. Implicit race bias may relate to attention regardless of motivation, for example. Alternatively, motivation might also override bias (e.g., Moskowitz et al. 1999) when their effects are considered together.

In the present study, our first goal was to replicate prior work that has found a broad race disparity in perceivers' visual attention to the eyes (Hypothesis 1). Having replicated this disparity, our second goal was to test if IMS and implicit race bias, respectively, related to decreases and increases in it (Hypothesis 2). Finally, we tested, in an exploratory analysis, if broad race disparities in attention to the eyes would emerge in two trait-evaluative contexts: trustworthiness and dominance. These traits reflect separable aspects of face perception (Oosterhof and Todorov 2008). Evaluations of these traits also have social ramifications related to prejudice. Evaluations of higher dominance elicit more use of force against Black suspects, for example (Wilson et al. 2017). However, evaluations of lower trustworthiness elicit more extreme criminal sentences (Wilson and Rule 2015). This analysis had two key benefits. First, testing if a disparity holds across contexts provides insight into the generalizability of a race disparity in attending to the eyes. Second, it would connect this disparity to contexts that have negative consequences for Black individuals.

Method

Participants

Power analyses (PANGEA: for details see www.jakewestfall.org/pangea) using $d = .60$ (selected on the basis of the interaction between area of interest and target race from Study 1 of Kawakami et al. 2014) and alpha = .05 targeted 72 participants for 80% power to detect a Target Race × Area of Interest interaction. Seventy-three non-Black Indiana University students ($M_{age} = 19.05$ years, $SD = 1.18$, 41 female, 64 non-Hispanic White and nine Asian students) provided written informed consent. All had normal or corrected-to-normal vision and were compensated with course credit. The Indiana University IRB approved this study.

Stimuli and Procedure

Forty grayscale images of Black and forty White neutrally expressive male faces were selected from the Eberhardt Lab Face Database (http://web.stanford.edu/group/mcslab/cgi-bin/wordpress/). To focus attention on facial features, all faces were cropped to create oval images that excluded hair and were standardized for size (550 × 688 pixels). Norms from the database indicated that the Black ($M = 3.37$, $SD = .75$) and White ($M = 3.37$, $SD = .90$) faces were similarly attractive, $t(78) = .03$, $p = .98$.

After providing written informed consent, participants were seated at a desk in front of a 23'' computer monitor with 1920 × 1080 pixel resolution and a Tobii TX300 eye tracker with a sampling rate of 300 Hz, accuracy of .4° of visual angle and precision to .14° of visual angle. Participants sat 24 in. away from the monitor. Eye-tracking calibration was established and validated before beginning the tasks using Tobii software. Calibration was established by having participants fixate on a series of dots presented on the screen. Tobii calibration establishes the mapping between a known gaze position and the eye tracker's estimate of the same position. Participants were recalibrated when the criterion for calibration was not met. Participants were instructed to keep their heads still throughout calibration and the experiment to minimize drift.

Participants were told that they would be completing two tasks in which they would evaluate faces on trustworthiness and dominance. Stimuli were presented using E-Prime 2.0. The two tasks were completed in a counterbalanced order. Thirty-seven participants completed the trustworthiness task first and 36 participants completed the dominance task first. Due to ongoing concerns regarding data quality, the validity of the second task, and because our hypotheses concerned visual attention when *first* perceiving faces, we restricted analyses to the first task. Indeed, preliminary analyses suggested evidence of the first two possibilities.[1] Thus, trait (trustworthiness or dominance) was examined as a between-subjects factor in the below analyses.

Each task contained 80 trials in which participants evaluated either the trustworthiness (or dominance) of the 40 Black and 40 White faces. Each task began with a 5000 ms period in which participants were instructed to fixate on a cross at the center of the display. After the initial 5000 ms fixation, participants completed the 80 trials in random order. Each trial (Fig. 1a) began with participants attending to a fixation cross at the center of the display for 1000 ms. Then, a face appeared on the right or left side of the display for 5000 ms. Black and White faces had an equal probability of appearing on the right or left side. Face presentation order and the left- or right-side presentation were randomized. After viewing a face for 5000 ms, the face disappeared, and a scale appeared at the center of the display for 3000 ms. Participants rated each face using a 7-point scale ("How trustworthy is this this face?" or "How dominant is this face?"; 1 = *not at all* [trait] to 7 = *very* [trait]). Participants made each rating via keypress on a keyboard. We collected ratings via the keyboard versus verbally to reduce the possibility that participants would feel outward pressure to respond in a non-prejudicial way that might affect how they attended to faces. After the 3000 ms scale display, participants viewed a blank display for 1000 ms, after which the next trial began.

After the eye-tracking tasks, participants completed several questionnaires and computer tasks, several of which were for unrelated studies. Relevant here, participants completed the Internal and External Motivation to Respond Without Prejudice questionnaire (Plant and Devine 1998). In this 10-item questionnaire, five items address internal motivation to avoid prejudicial behavior (e.g., "I am personally motivated by my beliefs to be non-prejudiced

[1] Initial concerns about the trustworthiness and dominance tasks were 1) that participants would be less attentive in the second task, thereby reducing the quality of their data, and 2) that making one type of evaluation first could influence the second evaluation, which would reduce the validity of the second task among susceptible perceivers. Moreover, the literature on race disparities on attention to the eyes has primarily used novel faces, meaning only data from the first task would capture such *initial* attention to faces as they could only be novel in their first appearance. To inform our analytic plan, we addressed these concerns one month into data collection.

To address if participants attended more to faces in the first versus the second task, we compared the number of fixations on faces and the total time fixating in the first versus the second task. Suggesting less attention, participants had fewer fixations in the second ($M = 773.89$, $SD = 266.99$) versus the first ($M = 857.96$, $SD = 199.45$) task, $t(27) = 2.52$, $p = .02$. Also suggesting less attention, participants spent less time (ms) fixating on faces in the second ($M = 242{,}395.83$, $SD = 74{,}595.48$) versus the first ($M = 268{,}039.29$, $SD = 51{,}485.34$) task, $t(27) = 2.56$, $p = .02$.

To address if evaluations of one trait might influence evaluations of the second, we subjected trait ratings to a 2 (Order: trustworthiness first and dominance second, dominance first and trustworthiness second) × 2 (Trait: trustworthiness, dominance) × 2 (Target Race: Black, White) mixed ANOVA. Emerging were main effects of trait, $F(1, 26) = 22.77$, $p < .001$, $\eta_p^2 = .17$ and of race, $F(1, 26) = 15.23$, $p = .001$, $\eta_p^2 = .37$, and a Trait × Race interaction, $F(1, 26) = 17.42$, $p < .001$, $\eta_p^2 = .40$. Qualifying these effects was the critical Order × Trait × Race interaction, $F(1, 26) = 4.19$, $p = .05$, $\eta_p^2 = .14$. People rated White faces as more dominant when dominance was rated first ($M = 3.83$, $SD = .65$) versus second ($M = 3.34$, $SD = .56$), $t(26) = 2.04$, $p = .05$. People did not rate Black faces on dominance differently when dominance was rated first ($M = 4.44$, $SD = .62$) versus second ($M = 4.65$ $SD = .79$), $t(26) = .87$, $p = .40$. People rated Black faces as marginally less trustworthy when trustworthiness was rated first ($M = 3.36$, $SD = .65$) versus second ($M = 3.75$, $SD = .46$), $t(26) = 1.85$, $p = .07$. People did not rate White faces on trustworthiness differently when trustworthiness was rated first ($M = 3.78$, $SD = .74$) versus second ($M = 3.73$, $SD = .77$), $t(26) = .17$, $p = .87$. This initial evidence in at least some participants raised the possibility that order influenced the second evaluation of faces, reducing the validity of the trait manipulation. Coupled with evidence of less attention to faces in the second task and with the fact that initial attention to faces could only be captured when faces were novel, we restricted analyses of the full sample of 73 participants to the first task.

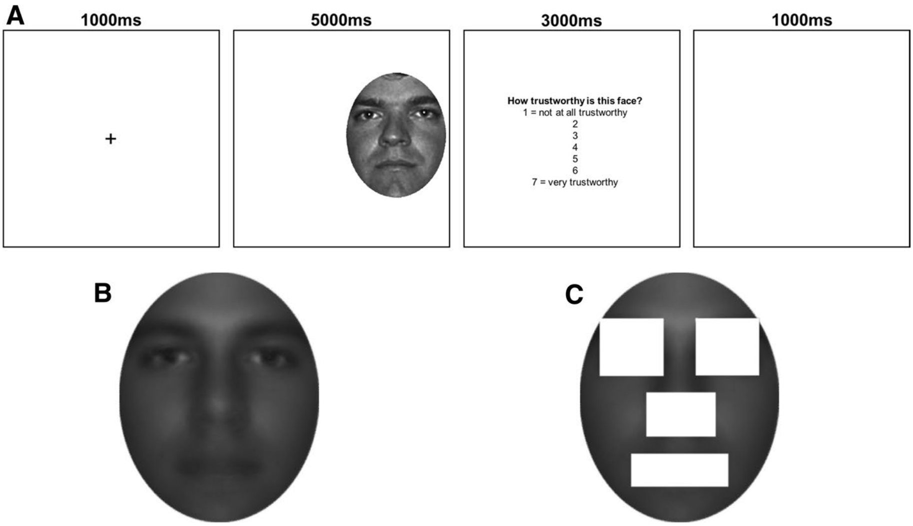

Fig. 1 Example eye-tracking trial (**a**), the face obtained from averaging the 40 Black faces and the 40 White faces used in the task (**b**) and eyes, nose, and mouth areas of interest overlaid on the average face (**c**). Although fine distinctions are less apparent on this average face, such distinctions were apparent on the individual faces used in each trial (as in **a**)

toward Black people") and five items address external motivation to avoid prejudicial behavior (e.g., "I try to hide any negative thoughts about Black people in order to avoid negative reactions from others"). Responses are made using a 9-point scale, with possible scores on each ranging five to 45. Higher scores reflect more motivation to respond without prejudice. Responses to the five IMS items (Cronbach's $\alpha = .87$) and the five EMS items (Cronbach's $\alpha = .82$) were reliable.

To quantify implicit race bias, participants completed an implicit association test for race (IAT; Greenwald et al. 1998, 2003). For the IAT, participants viewed 20 male faces (10 Black and 10 White not used in the eye-tracking task) and 20 words (10 pleasant and 10 unpleasant) and categorized them in a stereotypically congruent (e.g., a pleasant word paired with a White face) or incongruent (e.g., a pleasant word paired with a Black face) way. The IAT followed the seven-block protocol described in Greenwald et al. (2003). Half of the participants completed the congruent before the incongruent block, and half completed the incongruent before the congruent, making the presentation of the blocks pseudorandom. Implicit race bias (IAT-D) was quantified using procedures recommended by past work (Greenwald et al. 2003). IAT-D scores range from −2 to +2, with higher scores reflecting implicit pro-White bias (Nosek et al. 2002).

Although not relevant here, participants also completed a Big 5 personality inventory, BIS/BAS (Carver and White 1994), the Interpersonal Reactivity Index (Davis 1980), an SES ladder, and a Stroop task. These data were collected after the measures described above and were used for undergraduate statistics instruction.

Data Preparation

Eye-tracking data were processed using MATLAB (MathWorks, Natick, MA) using the signal processing toolbox. The data were first pre-processed to remove invalid samples (e.g., the eye-tracker could not locate the eyes or gaze was off-screen). Estimates of eye positions during periods of missing data (lasting no longer than 80 ms or 24 samples) were then inferred by creating a linear trajectory to connect the gaze-positions measured just before and after the gap. Using a Savitzky-Golay filter (*sgolayfilt* function), the interpolated data were filtered to remove high-frequency noise from the measured gaze position. Information processing occurs while the eyes remain stable at a single location, a behavior known as a "fixation", but does not occur during "saccades", or ballistic eye movements, to a new location. We combined the measured velocity at each time point with a priori oculomotor constraints (see below) that limit the frequency with which the eyes alternate between fixation and saccade within the framework of a Hidden Markov Model (HMM) (Salvucci and Anderson 2001). The Viterbi algorithm (*hmmviterbi* function) was used to infer the most likely sequence of classifications (fixation or saccade) within each trial according to these constraints. The model was specified such that adjacent samples were biased towards the same classification as one another with 95% probability, and by defining the range of velocities expected from each state, according to an initial fixation classification based on velocities under 40°/s. Sequences of consecutive "fixation" classifications lasting longer than 50 ms were then stored for further analysis.

Areas of Interest

Before analyzing the data, we defined the eyes, nose, and mouth using non-overlapping areas of interest (AOIs) on an average face created by averaging the 80 faces used in the eye-tracking tasks (see Fig. 1b for the average face and Fig. 1c for AOIs positioned on the average face; note that AOI positions were chosen on the basis of past work). As in related work (Goldinger et al. 2009; Henderson et al. 2005; Kawakami et al. 2014; Wu et al. 2012), we used standard procedures and parameters for defining these AOIs such that the whole area providing meaningful information was included. The left and right eye AOIs were 160×175 pixels each. The nose AOI was 120×200 pixels and the mouth AOI was 90×270 pixels. The duration (in milliseconds) that participants fixated on the AOIs was recorded for each face. Mean gaze latencies were separately calculated for Black and White faces.

Results

Behavior

Implicit Race Bias and Motivation to Respond Without Prejudice

See Table 2a for descriptive statistics and correlations. Participants had overall implicit pro-White bias (range −.33–1.11) when comparing their IAT-D scores to zero, $t(72) = 9.70$, $p < .001$, a finding widely shown in the literature regardless of a participant's race (e.g., Nosek et al. 2002). There was also a wide range in IMS (range 7–45) and EMS (range 5–45).

Trait Ratings

The mean ratings for the Black and White faces from the first eye-tracking task were entered into a 2 (Trait: trustworthiness, dominance) × 2 (Target Race: Black, White) mixed ANOVA. An interaction between trait and race emerged, $F(1, 71) = 8.38$, $p = .01$, $\eta_p^2 = .11$. Participants evaluated Black faces ($M = 4.33$, $SD = .51$) to be more dominant than White faces ($M = 3.90$, $SD = .56$), $t(35) = 3.80$, $p = .001$, consistent with work showing that Black males are perceived to be bigger and more physically threatening than White males (Wilson et al. 2017). Black ($M = 3.72$, $SD = .75$) and White ($M = 3.81$, $SD = .65$) faces were evaluated to be similarly trustworthy, $t(36) = .61$, $p = .55$, consistent with work showing that when making valence-laden decisions like trustworthiness, participants may not always explicitly rate Black faces more negatively (e.g., Stanley et al. 2011). There was a marginal main effect of race, $F(1, 71) = 3.87$, $p = .05$, $\eta_p^2 = .05$. Black faces ($M = 4.03$, $SD = .71$) were rated higher on the scale than White faces ($M = 3.85$, $SD = .60$). There was a main effect of trait, $F(1, 71) = 9.59$, $p = .003$, $\eta_p^2 = .12$. Faces were evaluated as more dominant ($M = 4.12$, $SD = .49$) than trustworthy ($M = 3.76$, $SD = .49$).

Eye-Tracking

Because it takes 180–200 ms to register a visual stimulus and execute a saccade in response (Rayner 1998), all analyses discarded fixations beginning between 0 and 200 ms post-face onset to follow analysis conventions (Pflugshaupt et al. 2005). Fixations were measured in 99.04% ($SD = 3.67\%$) of trials where Black faces were presented and 98.94% ($SD = 3.95\%$) of trials where White faces were presented. Overall, participants had more fixations on White ($M = 443.49$, $SD = 109.53$) versus Black ($M = 431.16$, $SD = 100.19$) faces, $t(72) = 3.56$, $p = .001$. Participants were also quicker to fixate on (i.e., had an earlier first fixation onset on) Black faces ($M = 324.88$, $SD = 175.49$) than on White faces ($M = 350.44$, $SD = 238.60$), $t(72) = 2.46$, $p = .02$. This finding replicates work showing enhanced early attention to Black as compared to White faces that reflects the threat communicated by race (Trawalter et al. 2008). The total time fixating (ms) on White and Black faces during the entire task ($M_{White} = 133{,}902.56$, $SD_{White} = 27{,}447.4088$, $M_{Black} = 134{,}425.75$, $SD_{Black} = 26{,}960.52$, $t(72) = .56$, $p = .57$) and average time fixating on White and Black faces in each trial ($M_{White} = 3369.27$, $SD_{White} = 639.89$, $M_{Black} = 3381.18$, $SD_{Black} = 630.99$, $t(72) = .52$, $p = .60$), did not differ.

Hypothesis 1: People will Attend more to the Eyes of White Versus Black Faces

Because Hypothesis 1 regarded replicating prior findings that have shown that non-Black perceivers attend more to the eyes of White versus Black faces (Kawakami et al. 2014), we structured and analyzed our data to replicate this prior analysis. Gaze proportion to each AOI was calculated by dividing mean gaze latencies (in ms) for each AOI (eyes, nose, and mouth) that were calculated separately for Black and White faces by 4800 ms (i.e., the 5000 ms total presentation time with the initial 200 ms removed). The gaze proportion for the eyes was collapsed across the right and left eyes, replicating past work (Kawakami

Table 1 Means (standard deviations) for gaze proportion on each AOI for White and Black faces that were evaluated on their trustworthiness or dominance

	Eyes	Nose	Mouth
Trustworthiness			
White	.28 (.15)	.12 (.07)	.05 (.05)
Black	.26 (.14)	.14 (.07)	.05 (.05)
Dominance			
White	.32 (.17)	.11 (.08)	.04 (.05)
Black	.30 (.16)	.13 (.08)	.05 (.05
Overall			
White	.30 (.16)	.11 (.08)	.05 (.05)
Black	.28 (.15)	.13 (.08)	.05 (.05)

et al. 2014). A larger gaze proportion indicates a longer amount of time fixating on (i.e., attending to) an AOI.

Gaze proportion values were entered into a 2 (Trait: Trustworthiness, Dominance) × 2 (Target Race: Black, White) × 3 (AOI: eyes, nose, mouth) mixed ANOVA. Trait was included in the model as an exploratory variable addressing if gaze patterns by race would generalize across the trait evaluated by the perceiver.[2] See Table 1 for descriptive statistics. A main effect of AOI emerged, $F(2, 142) = 84.42$, $p < .001$, $\eta_p^2 = .54$. Qualifying the AOI effect was the predicted Target Race × AOI interaction, $F(2, 142) = 50.35$, $p < .001$, $\eta_p^2 = .42$. Supporting Hypothesis 1 by replicating past work (Kawakami et al. 2014), contrasts showed more attention to the eyes of White versus Black faces, $F(1, 71) = 33.06$, $p < .001$, $\eta_p^2 = .32$. People attended more to the noses of Black versus White faces, $F(1, 71) = 64.53$, $p < .001$, $\eta_p^2 = .48$, showing that they do not always attend more to features of White versus Black faces. There was no race difference in attending to the mouth, $F(1, 71) = 1.78$, $p = .19$, $\eta_p^2 = .03$. There was no main effect of target race, $F(1, 71) = .80$, $p = .37$, $\eta_p^2 = .01$.

Addressing the Generalizability of a Race Disparity in Attention to the Eyes

There was no main effect of trait, $F(1, 71) = .52$, $p = .48$, $\eta_p^2 = .01$, no interactions of trait with area of interest, $F(2, 142) = 1.00$, $p = .37$, $\eta_p^2 = .01$, or target race, $F(1, 71) = .02$, $p = .90$, $\eta_p^2 < .001$, and no three-way interaction, $F(2, 142) = .11$, $p = .89$, $\eta_p^2 = .002$. The patterns shown in visual attention to different facial features as a function of race suggest generalization across the dimension of trait being evaluated.

Hypothesis 2: IMS and IAT-D Scores will Relate to a Race Disparity in Attending to the Eyes

Hypothesis 2 built on Hypothesis 1 by determining whether IMS and IAT-D negatively and positively, respectively, related to race disparity in attention to the eyes (i.e., gaze proportion on the eyes of White faces—gaze proportion on the eyes of Black faces). Larger

[2] Analyses were restricted to the first task due to evidence suggesting poorer data quality in the second task. Exploratory analyses collapsing across both tasks did in part support hypotheses despite poorer data quality (e.g., the AOI × Race interaction on proportion of gaze).

Table 2 Means (*M*), standard deviations (*SD*), and intercorrelations for gaze proportion to the eyes of White versus Black faces and perceiver characteristic predictor variables (A). Hierarchical regression analysis predicting gaze proportion to the eyes of White versus Black faces with perceiver characteristics (B)

A. Variable	*M*	*SD*	1	2	3
Eyes: White–Black	.02	.04	.22^{+}	−.33**	−.05
Predictor variable					
1. IAT-D	.43	.38	–	−.001	.08
2. IMS	36.47	9.06		–	.29*
3. EMS	29.03	9.92			–

B. Step and predictor variable	R^2	ΔR^2	*sr*	*β*	*t*	*p*
Step 1	.16**	.16**				
IAT-D			.21	.21	1.93	.058
IMS			−.33	−.34	2.94	.004
EMS			.03	.03	.27	.79
Step 2	.18*	.02				
IAT-D × IMS			−.05	−.06	.48	.63
IAT-D × EMS			−.01	−.01	.11	.91
IMS × EMS			.13	.14	1.14	.26

sr = semipartial correlation coefficient; $^{+}p < .07$, $*p < .05$, $**p < .01$

values of gaze proportion to the eyes of White versus Black faces reflect larger race disparities in visual attention to the eyes. We regressed gaze proportion to the eyes of White versus Black faces on IAT-D scores, IMS, and EMS in a hierarchical regression. IAT-D scores, IMS, and EMS were mean centered before being entered into the regression. See Table 2 for regression-related statistics. In the first step, we simultaneously added IAT-D scores, IMS, and EMS to the model. The model was significant, $F(3, 69) = 4.30$, $p = .008$, and accounted for 15.70% of the variance in race disparity in attention to the eyes.[3] Supporting Hypothesis 2, higher IMS related to less race disparity in attention to the eyes. Also supporting Hypothesis 2, higher implicit race bias related to (albeit marginally) more race disparity. EMS did not relate to race disparity. Because IMS and IAT-D scores were not correlated in this sample, these patterns suggest distinct contributions of these individual difference to a race disparity in visual attention to the eyes. To further address if IMS and IAT-D scores had distinct effects on attending to the eyes of White versus Black faces, or if they acted in tandem to contribute to a race disparity in visual attention, we entered two-way interaction terms between the variables into the model in the second step (interaction terms were created from mean centered variables; see Table 2b for regression statistics). The R^2 *change* in the second model from the first was not significant, R^2 *change* = .02, *F*(3,

[3] Potential IMS, EMS, and IAT-D effects were of theoretical interest to examine on attention to the eyes of White versus Black faces. Although not of theoretical interest, we also regressed the difference in gaze proportion to the noses of White versus Black faces on IAT-D scores, IMS, and EMS. This model was non-significant, $F(3, 69) = .58$, $p = .63$, $R = .16$ $R^2 = .02$. A model regressing the difference in gaze proportion to the mouths of White versus Black faces on IAT-D scores, IMS, and EMS was also non-significant, $F(3, 69) = .67$, $p = .57$, $R = .17$, $R^2 = .03$.

Table 3 Correlations between IMS, EMS, and IAT-D with gaze proportion to the eyes of White faces and Black faces

	White	Black
IMS	− .17	− .10
EMS	− .29*	− .29*
IAT-D	− .11	− .17

*$p < .05$

66) = .54, $p = .66$. These data thus suggest that IMS and IAT-D scores thus had distinct effects on attending to the eyes of White versus Back faces.

Finally, we wanted to rule out the possibility that the shown IMS and IAT-D effects could be attributed to their effects on a race *disparity* in visual attention rather than potential unique effects driven by attention to either the eyes of White faces *or* the eyes of Black faces alone. We did not find support for this possibility: IMS and IAT-D did not correlate with attention to the eyes of Black or of White faces by themselves (see Table 3).

Discussion

The present study replicated work showing that non-Black perceivers attend more to the eyes of White versus Black faces (e.g., Kawakami et al. 2014), and made several additional contributions. First, this effect generalized over two trait-evaluative contexts: trustworthiness and dominance. This finding suggests that a tendency to look more at the eyes of White versus Black faces emerges in two key dimensions of impression formation during face perception (Oosterhof and Todorov 2008) that have serious consequences for prejudicial behavior (e.g., Wilson et al. 2017). Second, this study identified two individual differences that relate to the extent of this disparity: internal motivation to respond without prejudice (IMS) and implicit race bias. IMS negatively related to this disparity, whereas implicit race bias positively related to it.

IMS related to a decrease in a race disparity in visual attention to the eyes. This finding extends work showing the causal role of instructions motivating the individuation of Black faces on reducing this race disparity (Kawakami et al. 2014). Showing that IMS relates to decreases in this disparity is important because it suggests that natural differences in motivation affect attention to the eyes by race. One possible explanation of this finding is that high-IMS perceivers may attend more to the eyes of Black individuals because they want to better understand them. Consistent with this interpretation, high versus low IMS perceivers focus on more positive and egalitarian outcomes when interacting with Black individuals (Plant et al. 2010), and may be less surprised at positive behaviors from Black individuals (Li et al. 2016). Speculatively, IMS may engender more positive interracial interactions by increasing attention to the eyes, thus affecting approach orientations related to eye gaze (Mason et al. 2005; Richeson et al. 2008). EMS, by contrast, did not relate to race disparity in attending to the eyes, likely because the task did not yield the possibility of social disapproval for perceivers (see Devine et al. 2002). Future work may investigate these possibilities. IMS and EMS, however, were positively correlated, as they both map onto the concept of motivation. That they did not have a one-to-one mapping speaks to the idea that although they each reflect motivation, they address different aspects of it that relate to prejudicial behavior in different ways (e.g., Devine et al. 2002; Plant and Devine 1998).

Beyond IMS effects, the present study suggested that implicit race bias positively relates to race disparity in attention to the eyes. These data extend work suggesting higher levels of implicit race bias relate to less friendly nonverbal behavior toward Blacks (e.g., Dovidio et al. 2002), and that White and Black faces are processed differently as a function of implicit race bias (Brosch et al. 2012). By showing that implicit race bias also relates to race-biased attention to the eyes, the current study suggests that implicit race bias affects attention to facial features signaling what other people might be thinking or feeling (e.g., Adams and Kleck 2003, 2005). Less attention to a person's eyes signals the lesser relational value of that person (Wirth et al. 2010). Speculatively, less attention to the eyes of Black versus White faces may contribute to prejudicial behaviors associated with bias (McConnell and Leibold 2001) that signal the lesser relational value of Black people.

Only one prior study (Hansen et al. 2015) examined if implicit race bias related to attention to facial features. That study found higher bias related to looking more *between* the eyes of Black and White faces. Although it did not find bias associated with looking at the eyes of White *versus* Black faces, this discrepancy with the present work could be due to methodological differences. For instance, past work might not have had enough trials (e.g., 24 versus 80) to detect a bias effect on attention to the eyes by race. Past work also included male and female faces. People may attend more to the eyes of female versus male Black faces given that Black men are more primary objects of discrimination (Sidanius and Pratto 1999). Regardless, patterns from past work suggest that higher bias may relate to a lesser likelihood to engage with other-race faces (Frischen et al. 2007).

By suggesting that motivation and bias relate to decreases and increases, respectively, in race disparity in attention to the eyes, the current work may help reconcile mixed findings in the literature (e.g., Blais et al. 2008; Goldinger et al. 2009; Kawakami et al. 2014). For example, work not finding such race disparities could have mostly included participants with high IMS or low implicit race bias. Alternatively, it is possible that task contexts may elicit differential gaze patterns to the eyes by race. A distinct feature of the present task is that it used an explicitly trait-evaluative context. Using an evaluative versus an encoding context may affect how people attend to faces. Trying to encode faces for a future test (e.g., Blais et al. 2008), for example, might elicit attention to features helping to individuate faces (e.g., the eyes) to enhance performance and thus reduce the potential for the emergence of a broad race disparity in attention to the eyes. Unlike such an encoding task, however, the present study had perceivers view faces in a context that may be likened to trait evaluation occurring in everyday life (Todorov et al. 2009). Broad race disparities emerged when evaluating dominance and trustworthiness, two aspects of face evaluation naturally occurring during everyday impression formation (Oosterhof and Todorov 2008). Because some work has found race disparities in attention to the eyes even with an encoding context (e.g., Goldinger et al. 2009), however, it will be important for future work to compare attention to the eyes by race in different task contexts to disentangle these possibilities.

Because these data were correlational, we cannot determine if motivation or bias *causes* race disparities in attention. However, such disparities mediate a relationship between being motivated (versus not) to attend to Black faces and prejudicial behavior (Kawakami et al. 2014). Future motivation and bias manipulations can address causality. Further, both White and Asian perceivers completed this study. Prejudice toward Blacks is in part due to strong negative cultural stereotypes (e.g., Stephan et al. 2002) reflected in work showing bias among non-Black (e.g., White and Asian) perceivers (e.g., Nosek et al. 2002). Because Black perceivers can harbor the same biases, it would be worthwhile to test if they elicit similar attentional biases.

The present work suggests IMS and implicit race bias each relate to race disparity in attention to the eyes. Because IMS and bias relate to prejudicial behavior, this work provides a basis for efforts to reduce such behavior. For example, future work may address if IMS and bias relate to disparities in visual attention that also relate to race-based disparities in hiring. If they do, interventions increasing IMS or decreasing bias may be beneficial to promote equitable hiring. Identifying factors related to race disparities in attention is thus critical to detail mechanisms for prejudicial behavior.

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Compliance with Ethical Standards

Conflict of interest The authors declare no conflicts of interest.

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