

Running head: POSITIVE EMOTION ELIMINATES OWN-RACE BIAS

"We all look the same to me": Positive emotions eliminate the own-race bias in face recognition

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Abstract

Extrapolating from B. L. Fredrickson's (1998, 2001) broaden-and-build theory, the authors hypothesized that positive emotion may reduce the own-race bias (ORB) in facial recognition. In Experiments 1 and 2, Caucasian participants ($N = 89$) viewed Black and White faces for a recognition task. They viewed videos eliciting joy, fear, or neutrality before learning (Experiment 1) or testing (Experiment 2). Results reliably supported the hypothesis. Joy experienced before either learning or testing improved recognition of Black faces and significantly reduced the ORB relative to fear or neutral states. Discussion centers on possible mechanisms for ORB reduction, including improvements in holistic processing and promotion of a common-ingroup identity due to positive emotions.

When describing people of a different race, it is not uncommon to hear someone exclaim “they all look the same to me.” This colloquial phrase describes one of the more reliable empirical findings, the own-race bias (ORB) in face recognition. Generally people are less able to recognize and distinguish between people of a different race than people of their own race (Slone, Brigham, & Meissner, 2000; Meissner & Brigham, 2001). This recognition bias is prevalent among all racial groups (Ng & Lindsay, 1994; Teitelbaum & Geiselman, 1997), but some evidence suggests the effect is most pronounced for Caucasians viewing racial minorities (Meissner & Brigham, 2001). The prevalence of the bias has significant practical and societal costs. For instance, the ORB makes cross-racial eyewitness identifications highly unreliable and has dire consequences for the criminal justice system (Kassin, Ellsworth, & Smith, 1989; Doyle, 2001).

The cognitive and social factors responsible for the ORB remain unclear (Slone, Meissner, & Brigham, 2000). Theories focusing on people’s experience with cross-race faces from interracial contact have been only weakly supported (Chiroro & Valentine, 1996). A meta-analysis of thirty years of research has shown that interracial contact only accounts for about 2% of the variance in ORB across samples (Meissner & Brigham, 2001). Although negative racial attitudes are correlated with limited interracial contact, no relationship has been found between the ORB and racial attitudes, whether explicit or implicit (Ferguson, Rhodes, & Lee, 2001).

Recently researchers have suggested that the ORB results from differences in the perception of own-race and cross-race faces (Tanaka, Kiefer, & Bukach, 2004; Rhodes, Tan, Brake, & Taylor, 1989). Generally faces are recognized holistically, that is, a face is seen as a collective whole instead of a collection of parts (Tanaka & Farah, 1993; Maurer, LeGrand, & Mondloch, 2002). A classic demonstration of holistic face processing is the “inversion effect” where the change in

spatial configuration from turning a face upside-down dramatically impairs facial recognition, but has little impact on object recognition (Farah, Wilson, Drain, & Tanaka, 1998).

Some evidence suggests that one reason for the ORB may be that cross-race faces are perceived less holistically than own-race faces (Tanaka et al. 2004; Rhodes et al., 1989). In essence, cross-race faces may be perceived more like objects. Tanaka and colleagues (2004) recently found that people rely on more holistic information for recognizing own-race faces than cross-race faces. In addition, the inversion effect is more disruptive to recognizing own-race faces than cross-race faces (Rhodes et al., 1989). Facial recognition has also been localized to an area of the brain dubbed the “fusiform face area” (Tong, Nakayama, & Moscovitch, 2000).¹ However, the FFA is less active in response to cross-race faces than own-race faces (Golby, Gabrieli, Chiao, & Eberhardt, 2001), again suggesting that cross-race faces are perceived less holistically than own-race faces.

An additional explanation for the ORB is that when viewing cross-race faces people focus more on cues of racial category than individual identity (Levin, 2000; Maclin & Malpass, 2003). Race is perhaps the most salient social category. Montepare and Opeyo (2002) demonstrated that racial differences are detected faster than other social differences such as gender, age, or emotional expression. Evoked-response potentials are about 50% faster responding to racial differences than gender differences (Ito & Urland, 2003). People are also significantly faster at racially categorizing cross-race faces than own-race faces (Levin, 1996). Levin (2000) showed that an enhanced ability to categorize cross-race faces by race is correlated with an impaired ability to recognize cross-race faces, suggesting that the ORB occurs because encoding information about racial category interferes with encoding individuating information.

The role of racial categorization is also highlighted by Maclin and Malpass (2003) who argue that the mere act of categorizing a face by race alters how individual facial features are

represented in memory. For example, after categorizing a face as “African-American”, the skin tone may be remembered as darker than it actually was and facial features may be remembered as being more like a prototypic racial exemplar. Maclin and Malpass (2003) conclude that the altered perception of cross-race faces due to the categorization process may underlie the ORB.

Even though the underlying mechanisms remain unclear, the ORB has proven to be a very robust psychological phenomenon, both prevalent and persistent (Meissner & Brigham, 2001). One study did show that hours of intensive training could reduce the magnitude of ORB, but the effect was short-lived and one-week later there was no difference between trained and untrained participants (Lavrakas, Buri, & Mayzner, 1976). A new perspective on emotions, however, leads us to test whether experienced positive emotions can reduce the ORB.

The benefits of positive emotions extend beyond the good feelings associated with them. Fredrickson's (1998, 2001) broaden-and-build theory states that positive emotions are evolved adaptations that in the moment broaden a person's “thought-action” repertoire and over time build that person's enduring personal resources. Positive emotions may have long-term survival benefits by making people more open-minded and flexible, and ultimately better able to see and take advantage of more opportunities in the environment.

One aspect of the broaden-and-build theory, the *broaden hypothesis*, predicts that positive emotions widen the scope of attention and literally enhance an individual's ability to see the “big picture” (Fredrickson & Branigan, in press). Several studies have demonstrated that positive emotions facilitate holistic attentional processes (Gasper & Clore, 2002; Basso, Schefft, Ris, & Dember 1996; Derryberry & Tucker, 1994). Studies investigating global versus local attentional processes have found that individuals high in negative emotional traits, like anxiety, focus more on local elements, whereas those with positive emotional traits, like optimism, focus more on global elements (Basso et al., 1996).

When positive or negative feedback is used to induce mood during global-local tasks, failure feedback produces a local bias whereas success feedback produces a global bias (Derryberry, & Tucker, 1994). We have additional evidence linking positive emotions to more holistic perceptions. In one experiment, we showed that induced positive emotions produced global biases on a global-local choice task (Fredrickson & Branigan, in press). Recently, we found that Duchenne smiles measured through facial EMG predicted faster reaction times to global relative to local targets (Johnson, Waugh, Wager, & Fredrickson, 2004). Because one explanation for the ORB is weaker holistic encoding of cross-race faces (Rhodes et al., 1989), we propose that positive emotion may reduce the ORB by facilitating holistic perceptions.

An additional prediction of the broaden-and-build theory is that positive emotions help to build social resources, perhaps by diminishing the salience of group differences. Positive affect is known to produce more inclusive categorization strategies which increase perceived similarities between social groups (Isen, Neidenthal, & Cantor, 1992). Dovidio, Isen, and colleagues have found that induced positive affect promotes the use of more inclusive social categories and more superordinate group representations, making participants more likely to view each of their groups as part of one larger, all-encompassing group (Dovidio, Gaertner, Isen, & Lowrance, 1995). Positive affect fosters a common in-group identity in which individuals are more willing to see "them" as "us" (Dovidio, Isen, Guerra, & Rust, 1998). However, we do not know whether these more inclusive social categorizations also extend to racial perceptions. An intriguing possibility is that by promoting a common in-group identity, positive emotions could reduce the ORB by reducing the salience of racial differences.

Possible mechanisms aside, the present experiments were designed to test the initial hypothesis that positive emotions reduce the ORB in facial recognition relative to negative emotions or neutral states. Because recognition tasks require at least two stages, an encoding (learning) stage

and a later recognition (testing) stage, we conducted a pair of experiments to examine the influence of emotions on encoding (Experiment 1) and recognizing (Experiment 2) pictures of Black and White people of both genders. Brief video segments were used to induce joy, fear, or a neutral state. Procedures for Experiments 1 and 2 were identical except for the timing of emotion induction. In Experiment 1 we induced joy, fear, or neutrality prior to encoding faces, whereas in Experiment 2 we induced these same states prior to recognition. Because we were interested in reducing the *own-race* bias, we restricted our analyses to participants identifying themselves as Caucasian.

Experiments 1 and 2

Method

Participants

Eight-nine Caucasian students at the University of Michigan (40 males, 49 females) participated in the experiment in exchange for course credit.

Facial Stimuli

Fifty-six yearbook-style grayscale images of Black and White college-aged individuals were used as visual stimuli.² Images were evenly divided by race and gender. All stimuli were frontal images of faces with a neutral emotional expression to avoid false recognition of smiling faces (Baudouin, Gilibert, Sansone, & Tiberghien, 2000).

Emotion Induction Videos

A set of four five-minute videos were used to induce emotions of joy, fear, or neutrality. “Comedy” (4 min 54 secs), a clip of a stand-up comedian was used to induce joy. “Horror” (4 min 50 secs), a clip from a horror movie was used to induce fear. Two videos were used to induce neutral states. The first, “Neutral-1” (3 min 45 secs), presented a series of pictures of common everyday objects, and the second, “Neutral-2” (5 min 3 secs), featured footage from an instructional video of a box being made in a woodshop.³ For Experiment 1, participants were randomly assigned

to view the Comedy, Horror, or Neutral-1 video as their first induction and all participants viewed the Neutral-2 video as their second induction. For Experiment 2, all participants viewed the Neutral-1 video as their first induction, but were randomly assigned to the Comedy, Horror, or Neutral-2 video as the second induction. Note that participants viewing the two neutral videos served as the neutral condition for both Experiments 1 and 2.

Emotion Induction Manipulation Checks

Two self-report measures were used to assess the effectiveness of the emotion inductions. Immediately after the learning and testing phases of the recognition task, participants indicated their emotion at the moment by marking an affect grid. The affect grid (Russel, Wiess, & Mendelshon, 1989) represents subjective experience as a nine-by-nine matrix varying along two-dimensions, valence and arousal. For example, positive valence and high arousal would indicate a feeling of joy. Next, participants completed a retrospective emotion report (adapted from Ekman, Friesen, & Ancoli, 1980). Participants were asked to indicate the degree to which they had felt (on a 0 to 8 scale) each of seven different emotions (amusement, anger, anxiety, fear, happiness, joy, sadness) during the videos.

Procedure

Each experimental session consisted of four stages: 1) first emotion induction video, 2) learning phase of recognition task, 3) second emotion induction video, 4) testing phase of recognition task. Video inductions were presented on a television monitor. At the end of each video, participants were instructed to complete part of the facial recognition task.

During the learning phase of the face recognition task, participants viewed 28 faces presented in a random order. Each was presented for 500 milliseconds, with a 2000 millisecond delay between images. During the testing phase, participants were presented with 56 faces in a random order. Half of these faces were the same 28 shown during the learning phase, and the rest

were foils -- images not previously viewed. Each image remained on screen until a response had been made. Participants indicated whether they had seen each face previously with the first two fingers of their dominant hand by pressing keys on a stimulus response box labeled YES or NO.

Results

Manipulation Checks

As shown in Table 1, each emotion induction video was very effective at producing the desired emotional response.⁴ Participants viewing the comedian reported significantly higher levels of positive emotions like joy and amusement relative to the other videos. Likewise, the horror clip resulted in significantly higher reports of negative emotions like fear and anxiety relative to the other videos. A few significant gender differences in reported emotion emerged with males reporting higher levels of joy in response to the male comedian ($M = 5.7$ vs. $M = 4.5$, $t(31) = 2.3$, $p < .05$), and females reporting higher levels of fear, anxiety, and anger in response to the horror clip (Fear: $M = 6.0$ vs. $M = 3.3$, $t(32) = 4.8$, $p < .001$; Anxiety: $M = 5.5$ vs. $M = 3.7$, $t(32) = 2.9$, $p < .03$; Anger: $M = 1.4$ vs. $M = 0.0$, $t(32) = 2.6$, $p < .02$).

Both neutral videos were effectively neutral. The means across all seven emotion report items were less than two (on a 0 to 8 scale) and the modal response for each item was zero with one exception. There were no significant gender differences for either neutral induction video.

The effectiveness of the emotion inductions were also supported by reported valence and arousal on the affect grids completed immediately after the learning and testing phases. The joy video resulted in higher reports of positive valence in comparison to the fear or neutral videos, and the fear video resulted in higher reports of negative valence and arousal than the joy or neutral videos. Across all conditions males reported significantly more positive valence after the learning and testing phases of the recognition task than females (learning: $M = 1.1$ vs. $M = .25$, $F(1,86) = 12.0$, $p < .001$; testing: $M = .85$ vs. $M = -.04$, $F(1,86) = 5.6$, $p < .02$).

Measures of Facial Recognition Performance

We used a signal detection measure of discriminability (d') to determine performance on the facial recognition task. The d' (d-prime) statistic, often described as discriminability or sensitivity, is a composite measure incorporating hit rate and false alarm information. One advantage of the d' statistic is that the value is independent of an observer's threshold for making a response (Wickens, 2002). For each participant, we calculated d' values for both Black and White faces.

Experiment 1: Effect of Emotion Induction Prior to Encoding

A 3 (Emotion Induction: joy, neutral, or fear) X 2 (Race of Face: White or Black) mixed factors ANOVA revealed a significant main effect for the race of the facial stimuli ($F(2, 60) = 5.31, p < .03, \eta^2 = .09$). The main effect for race of face replicates the ORB with recognition performance higher for White faces ($M = 1.31$) than Black faces ($M = 1.07$). In order to measure the ORB directly, we subtracted discriminability (d') of Black faces from discriminability of White faces for each participant, with higher scores indicating higher levels of ORB. A priori pairwise comparisons of these difference scores by emotion condition revealed that the joy-eliciting video viewed before the encoding stage resulted in significantly lower levels of ORB relative to the neutral video ($t(39) = 2.05, p < .05, \eta^2 = .10$) and the fear-eliciting video ($t(37) = 1.76, p < .09, \eta^2 = .08$)

To determine the magnitude of ORB within each emotion condition, we applied paired sample t-tests separately by emotion condition. Results revealed that although a significant ORB emerged for the neutral ($t(21) = 2.38, p < .05$) and fear ($t(19) = 1.97, p < .08$) conditions, there was no recognition difference between Black and White faces in the joy condition ($t(18) = .47, ns.$).

Figure 1 portrays these findings.

Considering White and Black faces independently, a pair of oneway ANOVAs demonstrated that the elimination of the ORB was due to improved recognition of Black faces in the joy condition. Although emotion inductions did not alter recognition performance for White faces ($F(2,$

60) < 1, *ns.*), there was a significant effect of the inductions on recognition of Black faces ($F(2,60) = 4.00, p < .03, \eta^2 = .12$). Planned comparisons revealed that the joy induction resulted in higher discriminability of Black faces compared to the neutral ($t(39) = 2.53, p < .03, \eta^2 = .12$) and fear ($t(37) = 2.53, p < .02, \eta^2 = .15$) inductions.

Experiment 2: Effect of Emotion Induction Prior to Recognition

A 3 (Emotion Induction: joy, neutral, or fear) X 2 (Race of Face: White or Black) mixed factors ANOVA revealed a significant main effect for the race of the facial stimuli ($F(2, 47) = 8.55, p < .005, \eta^2 = .18$). The main effect for race of face again replicates the ORB with higher recognition for White faces ($M = 1.41$) than Black faces ($M = 1.07$). As in Experiment 1, ORB was calculated as discriminability of White faces minus discriminability of Black faces. A priori pairwise comparisons of difference scores by emotion revealed that the joy induction before the recognition stage resulted in significantly lower levels of ORB relative to the neutral induction ($t(33) = 1.79, p < .09, \eta^2 = .09$) and the fear induction ($t(26) = 2.11, p < .05, \eta^2 = .15$).

As in Experiment 1, we use paired sample t-tests separately by emotion condition to determine the magnitude of ORB. Again, the results revealed a significant ORB for the neutral ($t(21) = 2.38, p < .03$) and fear ($t(14) = 2.98, p < .01$) conditions, but no recognition difference for Black and White faces in the joy condition ($t(12) = .30, ns.$). Figure 2 portrays these findings.

As in Experiment 1, the reduction of ORB was due to improved recognition of Black faces. Again, emotion inductions did not significantly alter recognition performance for White faces ($F(2, 49) < 1, ns.$), but a significant effect of the inductions emerged for Black faces ($F(2,49) = 3.54, p < .05, \eta^2 = .13$). The joy induction resulted in higher face recognition for Black faces compared to the neutral ($t(33) = 2.23, p < .05, \eta^2 = .13$) and fear inductions ($t(26) = 2.52, p < .02, \eta^2 = .20$).

Discussion

The results of Experiments 1 and 2 provide clear support for the hypothesis that positive emotions can reduce the ORB. In Experiment 1 we found that inducing a positive emotion before faces were learned improved our Caucasian participants' recognition of Black faces, and effectively eliminated differences in recognizing Black and White faces. Experiment 2 showed this same effect when emotions were induced prior to testing, induced positive emotion improved recognition of Black faces and eliminated the ORB in facial recognition relative to negative emotion or neutral state.

Taken together, Experiments 1 and 2 establish that positive emotions can reduce and even *eliminate* the ORB. Even so, the present experiments do not directly address the mechanism(s) through which this elimination occurs. Drawing from the broaden-and-build theory (Fredrickson, 1998, 2000) we have proposed two separate but not mutually exclusive possibilities. The broaden effect of positive emotions may boost recognition of cross-race faces by promoting more holistic perceptual processes (Fredrickson & Branigan, in press; Basso et al., 1996). It is also possible that positive emotions, by promoting more inclusive social categorizations (Dovidio et al, 1998; Isen et al., 1992), decrease the salience of racial categories. That is, positive emotions may facilitate more accurate memories of cross-race faces because people are less likely to suffer memory distortions due to categorizing the faces by race (Maclin & Malpass, 2003).

Induced positive emotion significantly improved recognition of other-race faces, but had no appreciable effect on recognition for own-race faces. We suspect that this is due to a "ceiling effect" for own-race faces. If own-race faces are already processed holistically, the relative boost in holistic processing from a positive emotion may not alter performance for own-race faces. Additionally, if White faces are already seen as ingroup members, no improvement in own-race recognition would be expected from using more inclusive social categorizations.

Whereas previous research has shown that training could reduce the ORB temporarily (Lavarkas et al, 1976), we have shown that induced positive emotion can do the same. We cannot yet generalize our findings to all positive emotions because our positive emotion induction focused on joy and humor. It remains an empirical question whether a positive emotion like contentment would produce a similar reduction in the ORB, or whether laughter is responsible for eliminating the ORB.

Originally we expected that emotions would most likely influence the ORB by changing how cross-race faces are encoded. If participants could encode cross-race faces more holistically and/or without categorizing the faces by race, they would have a more accurate visual memory of the faces (Tanaka et al., 2004; Maclin & Malpass, 2003). However, Experiment 2 showed improved recognition of cross-race faces even when the positive emotion was induced after faces were encoded. It is not clear how positive emotions could improve recognition after faces have already been learned. We suspect that improved holistic processing and decreased racial categorization of the test faces allow for more accurate comparisons with faces in memory.

We have proposed two possible mechanisms for how positive emotions may eliminate the ORB; however, other possibilities exist. For instance, a recent neuroimaging study has shown that subliminal presentation of Black faces generated higher levels of amygdala activation relative to White faces in Caucasian participants. The activation of the amygdala to Black faces predicted lower activation in the FFA relative to White faces and more pro-White/anti-Black bias on the IAT (Cunningham, Johnson, Raye, Gatenby, & Gore, 2004). Positive emotions could reduce the ORB by buffering against automatic amygdala activation, possibly increasing activation of the FFA in response to cross-race faces. Indeed, this type of modulated neural activation could underlie changes in holistic processing and/or racial categorization.

The finding that positive emotion can eliminate the ORB suggests one way that positive emotion may help build social resources. Positive emotions, by eliminating the ORB, may alter the way we interact with others. Functionally, positive emotions might build resources by producing a state of "social broadening" during which the distinctions and typical boundaries between social groups become less salient within social interactions. This contention is supported by experiments showing that inducing positive affect fosters a common ingroup identity and reduces intergroup bias (Dovidio et al., 1995). Recent work by Waugh and Fredrickson (2004) found that induced positive emotion increased self-expansion, the incorporation of another person into one's self-concept (Aron, 1991). Subsequently, they found that positive emotions in the weeks before starting freshmen year predicted the degree of self-expansion between new college roommates, which in turn predicted a closer relationship between the roommates a month later.

For now, our research reliably demonstrates a new finding: Positive emotion eliminates the highly robust own-race bias in face recognition. The practical applications of this finding could include developing methods to improve eyewitness testimony, or designing interventions to reduce racial biases in the workplace. While future studies will address underlying mechanisms, we hope the current studies represent the beginning of a line of research which may ultimately facilitate more harmonious social relations by showing that positive emotions can erase some effects of race.

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Footnotes

1. Activation of the FFA is not restricted to faces and has been found for other complex stimuli when the perceiver has developed a form of perceptual expertise (Gauthier & Logothetis, 2000). For example, dog experts perceive different dog breeds holistically, whereas novices do not.
2. We use the terms "White" and "Black" to refer to the race of facial stimuli, and the terms "Caucasian" and "African-American" to refer to the race of participants.
3. All of the people portrayed in the emotion induction videos, including the comedian and the audience members were also Caucasian.
4. Emotion reports to videos did not differ as function of being the first or second induction so analyses are for each video collapsed across experiments.

Table 1

Self-Reported Emotion by Video Induction (Experiments 1a & 1b)

	Joy (N = 33)		Fear (N = 34)		Neutral1 (N =51)		Neutral2 (N =60)	
	<u>Mean</u>	<u>Mode</u>	<u>Mean</u>	<u>Mode</u>	<u>Mean</u>	<u>Mode</u>	<u>Mean</u>	<u>Mode</u>
<u>Emotion Reports</u>								
Amusement	5.8 (1.6) _a	6	2.7 (2.3) _b	0	1.6 (1.6) _c	1	1.6 (1.6) _c	0
Anger	0.2 (0.5) _a	0	1.0 (1.5) _b	0	0.4 (1.0) _a	0	0.3 (0.9) _a	0
Anxiety	0.9 (1.5) _a	0	4.9 (2.2) _b	6	1.5 (2.0) _c	0	0.7 (1.4) _a	0
Fear	0.1 (0.4) _a	0	5.2 (2.3) _b	6	0.3 (0.8) _a	0	0.3 (1.0) _a	0
Happiness	5.3 (1.8) _a	6	0.9 (1.3) _b	0	1.5 (1.7) _c	0	1.1 (1.2) _b	0
Joy	5.0 (1.8) _a	6	0.7 (1.2) _b	0	1.1 (1.3) _b	0	0.7 (1.2) _b	0
Sad	0.3 (0.9) _a	0	1.0 (1.7) _b	0	0.3 (0.7) _a	0	0.3 (1.0) _a	0
<u>Affect Grids</u>								
Valence	1.5 (1.7) _a	2	-1.1 (1.9) _b	-2	0.3 (1.7) _c	1	0.6 (1.5) _c	0
Arousal	0.4 (1.7) _a	2	1.3 (1.7) _b	2	-0.7 (1.6) _c	-2	-0.9 (1.7) _c	-2

Note: Emotions reported on a 0 (*no emotion*) to 8 (*a great deal of*) scale. Standard deviations are reported in parentheses. Values in same row with different subscripts differ at $p < .05$ (Fisher's LSD).

Figure Captions

Figure 1. Own-race versus other-race facial recognition discriminability with emotion induced before encoding(Experiment 1). Note that error bars represent standard errors.

Figure 2. Own-race versus other-race facial recognition discriminability with emotion induced before recognition (Experiment 2). Note that error bars represent standard errors.

Figure 1

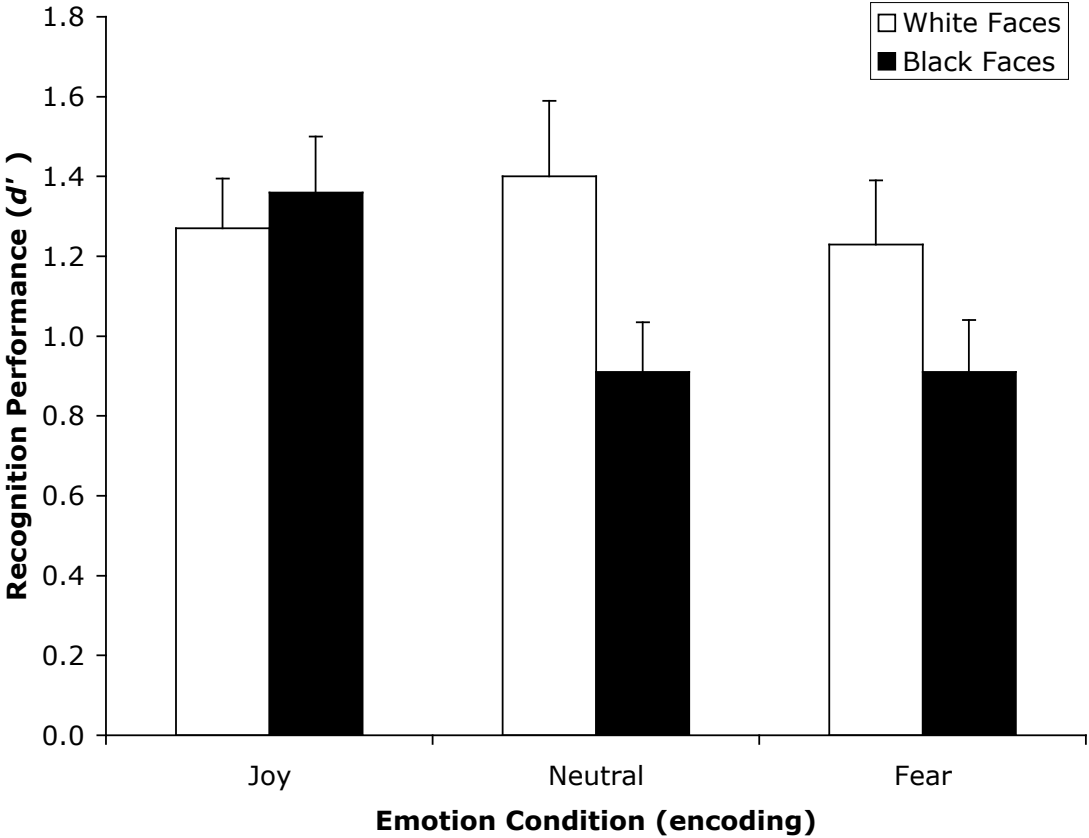


Figure 2

