ABSTRACT

DENNIS, PAUL A. Do Beliefs About Emotions and Racial Biases Predict Attention for Angry and Angry African-American Faces? (Under the direction of Professor Amy G. Halberstadt).

Broadly speaking, attitudes and beliefs shape how we perceive the world around us (Balcetis & Dunning, 2007; Fazio, Chen, McDonel, & Sherman, 1982; Riskind, Moore, & Bowley, 1995; Schnall, Harber, Stefanucci, & Proffitt, 2008). For instance, people generally devote more attention to objects and events about which they feel strongly than to objects and events about which they do not (Roskos-Ewoldsen & Fazio, 1992). This observation was tested as it relates to people's beliefs about negative emotions and their racial bias against African Americans. Specifically, people who believe that negative emotions are dangerous were hypothesized to pay greater attention to negative emotional expressions (as opposed to positive emotional expressions) than people who did not have strong beliefs about the danger of negative emotions. People who are biased against African Americans were hypothesized to pay greater attention to angry African Americans (as opposed to angry European Americans) than people who are not strongly biased against African Americans. To test these hypotheses, 138 college students participated in a dot-probe task, which measured the degree to which participants fixed their attention on angry vs. happy faces and angry African-American vs. angry European-American faces. Contrary to my prediction, participants with strong beliefs about the danger of negative emotions focused greater attention on happy vs. angry faces than did participants with weak beliefs about the danger of negative emotions, suggesting that participants with strong beliefs focused their attention away from angry faces in avoidance of those faces. There were no significant disparities in attention to angry African-American vs. angry European-American faces as a function of racial bias.

Do Beliefs About Emotions and Racial Biases Predict Attention for Angry and Angry African-American Faces?

by
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BIOGRAPHY

Paul Anthony Dennis was born in High Point, North Carolina on January 24, 1979 to Evelyn Morales and Robert Dennis. He graduated from the North Carolina School of Science and Mathematics in 1997 and continued his undergraduate studies at the University of North Carolina at Chapel Hill the fall of that year. He graduated from UNC in 2001, after which he traveled to Mexico to work at an orphanage in the state of Puebla. He returned to the U.S. in the summer of 2002. Following his return to the U.S., Paul worked as an employment coordinator for people with traumatic brain injuries, as a wilderness therapy instructor for adolescents with behavioral and psychological disorders, and as a research assistant at the Orelena Hawks Puckett Institute and at Duke University's Center for Child and Family Policy.

Since starting his graduate work in the developmental psychology program at North Carolina State University in 2006, he has worked in the Family, Affect, Beliefs, and Behaviors Lab, first as a research assistant and then as lab manager, under the direction of Dr. Amy Halberstadt. He is currently in the process of preparing to spend a year in Mali to study the characteristics of emotional meaning-making amongst the Bamana of Bamako.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Literature Review

People tend to form beliefs and attitudes for just about everything they encounter, from criminal justice (Applegate, Cullen, Fisher, & Vander Ven, 2000) to health (Kressin et al., 2002) to homelessness (Link et al., 1995). It is well known that attitudes and beliefs inform people's thoughts about objects in their environment. They also shape the nature of how people actually perceive these objects (Aarts, Dijksterhuis, & De Vries, 2001; Balcetis & Dunning, 2007). For instance, people are more likely to pay attention to those objects for which they hold a strong attitude, whether that attitude is positive or negative (Riskind, Moore, & Bowley, 1995).

The significance of such disparities in attention for particular objects and events lies in the contribution of attention to meaning-making processes. After all, media sources capitalize on the careful selection of images that they project in order to influence their audiences (Chaffee & Schleuder, 1986). As a result, the attention that individuals pay to certain objects and events creates the selective landscape from which those individuals draw a descriptive narrative of the world around them. In this sense, the relationship between beliefs and attitudes and attention for specific objects and events may be cyclical, with beliefs and attitudes influencing attention and attention in turn informing beliefs and attitudes.

In the following study, I addressed the first piece of this phenomenon, that beliefs and attitudes predict attentional biases. I tested an association between beliefs about the value of emotions and heightened attention for emotion expressed amongst other people. I also tested

the degree to which bias against African Americans manifests itself as a heightened attention for angry African Americans as compared to angry European Americans.

Beliefs, Attitudes, and Attention

This study was developed to determine whether or not individuals' attitudes and beliefs influence how they uniquely view the world around them. The central question in fact addresses whether or not that which people deem as salient, and, more specifically, what holds their attention is a function of their attitudes and beliefs. For instance, if people have a strong attitude about the danger of negative emotions, are they more sensitive to and therefore pay more attention to negative emotions in others? If an individual has a strong attitude that African Americans are "bad" and European Americans are "good", is she more sensitive to anger in African Americans than are people without that strong attitude. As a result does she pay more attention to angry African Americans than to angry European Americans?

By definition, an attitude is "a predisposition to act in a positive or negative way toward some object" (Littlejohn, 2002, as cited in Romano, Donovan, Chen, & Nunamaker, 2003, p. 226). In other words, attitudes are fundamentally evaluative, and, as such, they drive behavior (Fishbein & Ajzen, 1975). Attitudes are generally informed by a handful of domain-specific beliefs, in particular beliefs in entities and beliefs about entities. For instance, a person may believe that the Earth is flat and thus will hold a negative attitude about traveling to the nether regions of the world for fear of falling into the abyss of outer space. Despite these distinctions, beliefs and attitudes are remarkably consistent and often reflect broad worldviews (Ajzen & Fishbein, 1975; Fishbein & Ajzen, 1972).

Attitudes can further be parsed into implicit and explicit entities. Explicit attitudes are those that can be captured in self-report measures and function at a conscious level. Implicit attitudes reflect preferences and biases that reside outside of conscious awareness and typically manifest themselves outside of voluntary control. The Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998), which is an oft-cited and oft-used measure of implicit attitudes, capitalizes on the speed of participants' automatic, or involuntary, word-image pairing toward identifying preconscious associations that are made before conscious cognition can obscure the implicit attitudes underlying them. Implicit and explicit attitudes are variably related to one another.

Attitudes and beliefs function by altering people's perception of the world around them (Fazio, Chen, McDonel, & Sherman, 1982). For instance, arachnaphobes perceive moving spiders as approaching them rather than approaching nearby others, even when this is not the case (Riskind, Moore, & Bowley, 1995). People without social support perceive inclines to be steeper than do people who view the same inclines in the company of close others (Schnall, Harber, Stefanucci, & Proffitt, 2008). People also perceive tasks to be more challenging when those tasks are imposed upon them rather than when they are freely chosen (Balcetis & Dunning, 2007).

In particular, such thought processes may influence the attention that people direct toward one or more objects in their environment. For instance, participants with experimentally induced thirst responded faster to drinking-related items in a lexical-decision task than did participants in a non-thirst condition (Aarts, Dijksterhuis, & De Vries, 2001). One explanation is that a motivated mindset enhances the adaptive perception of particular

cues, such as thirst-quenching stimuli in the above study. The same should arguably be true for attitudes, which represent evaluations of certain objects and scenarios. After all, it would be adaptive to devote selective attention to those objects that may carry some positive or negative consequence (Kahneman & Treisman, 1984). Indeed, there is evidence that this is the case (Roskos-Ewoldsen & Fazio, 1992). Roskos-Ewoldsen and Fazio found that participants were more likely to remember rapidly displayed items if they regarded those items as having positive or negative value. In a second study, the researchers concluded that this effect was involuntary, because participants paid more attention to attitude-centered objects to the detriment of a primary task than they did to non-attitude-centered objects.

With this study, I extended Roskos-Ewoldsen and Fazio's (1992) work by testing whether or not participants' attitudes and beliefs about emotion and race are also predictive of attentional biases for particular classes of faces. The next two sections highlight the known associations between beliefs and attitudes about emotion and race and resulting attentional biases.

Beliefs about Emotion and Attention for Emotion-Eliciting Stimuli

According to appraisal and functional theories of emotion, emotions are produced from the evaluation of events and situations (Campos, Mumme, Kermoian, & Campos, 1994; Frijda, 1986; Lazarus & Smith, 1988; Roseman & Smith, 2001). In a sense, emotions are very much like attitudes, and indeed are reflective of underlying attitudes, because of this evaluative feature. Like attitudes, emotions can function at an implicit level as well as at an explicit level. For instance, people quickly and even subliminally evaluate stimuli as being either neutral or emotion-eliciting (Alpers & Pauli, 2006; Alpers, Ruhleder, Walz,

Mühlberger, & Pauli, 2005; Bunce, Bernat, Wong, & Shevrin, 1999; Dimberg, Elmehed, & Thunberg, 2000; Globisch, Hamm, Esteves, & Öhman, 1999; LeDoux, 1994; Öhman, Esteves, & Soares, 1995). Presumably, this is because emotion-eliciting stimuli have a greater bearing on one's physical state than do neutral stimuli, much as attitude-centered objects pose the potential for greater positive or negative consequences than do non-attitude-centered objects. A function of this evaluative process is the tendency for people to voluntarily focus greater attention on emotion-eliciting stimuli than on neutral stimuli (Fox, Russo, Bowles, & Dutton, 2001; Mather & Carstensen, 2003; Williams, Mathews, & MacLeod, 1996).

Not all emotional stimuli receive equal allotments of attention, however. Negative emotional stimuli hold sustained attention for greater periods of time than do neutral and positive stimuli (Fox et al., 2001; Koster, Crombez, Verschuere, & De Houwer, 2004; Pratto & John, 1991; White, 1996). That is, people tend to find difficulty in disengaging their attention from negative stimuli. For instance, in emotion Stroop tasks, participants take more time to identify the color of negative words than they do with either positive or neutral words, presumably because the meaning of the negative words demands more attention than does that of the positive and neutral words (Pratto & John, 1991; White, 1996). Because emotional stimuli are initially processed automatically and quite rapidly, difficulty in disengaging attention from negative stimuli is evident rather immediately. Koster and colleagues (2004), for one, found evidence of this disengagement effect at under 500 ms post-presentation of distressing stimuli. Derryberry and Reed (1994; 1997) identified this effect at as little as 100 ms post-presentation.

Beyond these broad trends, inter-individual variation with regard to the amount of attention that people allot to emotion-eliciting and neutral stimuli may be related to individuals' sensitivity to emotion-eliciting stimuli. For instance, individuals with high state anxiety have greater difficulty disengaging from negative stimuli than individuals with low state anxiety (Fox et al., 2001; Fox, Russo, & Dutton, 2002; Yiend & Mathews, 2001). Similarly, people with high state anxiety pay greater attention to fearful vs. neutral faces than do people with low state anxiety levels (Matthews, Fox, Yiend, & Calder, 2003; Maxwell, Shackman, & Davidson, 2005). This is because people who are experiencing a lot of state anxiety focus on fear-inducing and/or threatening stimuli.

Here I contended that the belief that negative emotions are dangerous would similarly predict attention for negative faces. Indeed, I suggested that a strong belief that negative emotions are dangerous would make one's experiences with negative emotions particularly salient. Thus, I predicted that a strong belief that negative emotions are dangerous would relate to greater attention for angry faces than would a weak belief that negative emotions are dangerous. An alternative hypothesis was that the belief that negative emotions are dangerous would be negatively associated with attention for angry faces. Such a relationship could possibly arise on account of greater avoidance efforts among people with strong beliefs in comparison to people with weak beliefs. Although I considered this a possibility, it was not my prevailing view.

Racial Bias and Attention for Emotion-Eliciting Stimuli

Racial biases may similarly influence individuals' perceptions of members of another race by directing attention to or away from emotion-salient cues, thus influencing one's

appraisal of a situation or stimulus (Chiu, Ambady, & Deldin, 2004). Indeed, drawing upon the pervasive stereotype that African Americans are more hostile than European Americans, Hugenberg and Bodenhausen (2004) found that participants who were implicitly biased against African Americans more readily categorized hostile (but not happy) faces of ambiguous race as African American rather than European American. The authors attributed this effect to the likelihood that racial bias is related to increased sensitivity to the emotional expressions, particularly those of threat, of members of another race. Much like individuals with high state anxiety, who pay more attention to threatening stimuli than individuals with low state anxiety, individuals who are biased against a particular ethnic group are more sensitive to perceived threat from members of that group than are non-biased individuals (Hugenberg & Bodenhausen, 2003).

Drawing on the above findings, I hypothesized that individuals who are biased against African Americans would be more likely to direct their attention to angry African Americans than to angry European Americans. This is because a) biased individuals more readily perceive anger in African Americans than in European Americans and b) people generally direct their attention to the most negative stimuli in their environment (Fox et al., 2001; Koster, Crombez, Verschuere, & De Houwer, 2004; Pratto & John, 1991; White, 1996). Thus, when biased individuals are exposed simultaneously to an angry African-American face and an angry European-American face, I expected that they would focus more attention on the angry African-American face.

Summary and Implications for the Present Study

Attitudes and beliefs appear to influence perception via the differential attention that people focus on various aspects of their environments (Roskos-Ewoldsen & Fazio, 1992). For instance, people with high state anxiety fixate their attention on angry faces more so than do people with normal levels of state anxiety (Fox et al., 2001; Fox, Russo, & Dutton, 2002; Matthews, Fox, Yiend, & Calder, 2003; Maxwell, Shackman, & Davidson, 2005; Yiend & Mathews, 2001). However, it is not known whether or not people's beliefs about emotions, in particular how dangerous they view negative emotions to be, may also be indicative of their attention to emotions in others. Furthermore, although racial bias against African Americans is associated with a low threshold for the perception of anger in African Americans, such that biased individuals more readily identify African Americans as being angry than European Americans (Chiu, Ambady, & Deldin, 2004; Hugenberg & Bodenhausen, 2003), it is not known whether or not racial bias is associated with a greater attention to angry African-American faces than to angry European-American faces.

For this study, I selected two predictors of attention for varying classes of faces: belief about negative emotions and racial bias against African Americans. Embedded in the belief that negative emotions are dangerous is the concept that the stronger the belief, the greater the salience of negative emotional imagery and therefore the greater the importance of focusing attention on those negative images. Consequently, I predicted a positive relationship between the belief that negative emotions are dangerous and attention for negative faces. Similarly, there is empirical evidence that racial bias against African Americans entails a sense that African Americans are angrier/more threatening than

European Americans (Hugenberg & Bodenhausen, 2004). In other words, racial bias may amplify the perception of anger amongst African Americans, thus increasing the importance of focusing attention on angry African Americans. Following from this, I predicted a positive relationship between the racial bias and attention for angry African-American faces. A conceptual model of the predicted relationships that I investigated in this study is depicted in Figure 1.

Dot-Probe Task

By introducing a series of angry and happy African-American and European-American faces in a dot-probe task, I was able to assess the degree to which participants attended to these faces as a function of both their beliefs about negative emotions and their racial bias against African Americans. The dot-probe task was ideal for this study because it allowed for measurement of differential attentional biases for angry African-American vs. angry European-American faces and angry vs. happy faces by simultaneously comparing two classes of faces. Of course, the limitation of the dot-probe task also lies in that feature. Attention for any one class of faces (angry, happy, angry African-American, and angry European-American) could not be isolated outside of the context of the display contrast. For instance, although the variables of interest for this study were attention for angry and angry African-American faces, it must be understood that the dot-probe task could only measure attention for angry faces at the expense of attention for happy faces, and attention for angry African-American faces at the expense of attention for angry European-American faces.

Methods

Participants

One-hundred thirty-eight participants were recruited from Introductory Psychology classes to participate in this study. All were compensated with course credits for their participation. Data from seven participants were dropped from the study due to equipment problems that disrupted the administration of the experiment. Of the remaining 131 participants, 66 were male, 65 female. Ninety participants were European-American, 15 participants were African-American, 7 Latino, 6 Asian-American, and 13 belonged to other ethnic groups. Participants ranged in age from 18 to 63, with an average age of 20.06 years.

Instruments

Implicit Association Test. The Implicit Association Test (IAT) is a well-known and validated measure used to identify implicit attitudes by assessing the speed with which categories of images are paired with valenced categories of words (Brendl, Markman, & Messner, 2001; Dasgupta, Greenwald, & Banaji, 2003; Dasgupta, McGhee, Greenwald, & Banaji, 2000; Rudman, Greenwald, Mellott, & Schwartz, 1999). The racial-bias IAT has been used to demonstrate that most Americans tend to pair African-American faces with negative words and European-American faces with positive words. It is a difficult test to fake (Kim, 2003; Steffens, 2004), and it is flexible to a wide range of stimuli, as long as those stimuli do not confound distinction between categories of interest with another set of categories (Bluemke & Friese, 2005; Govan & Williams, 2004; Mitchell, Nosek, & Banaji, 2003; Steffens & Plewe, 2001). Nosek and colleagues (2007) reported that the IAT has a satisfactory test-retest reliability (median $r = .56$) that varies very little with retest interval,

with 12 studies represented and retest intervals ranging from less than one day to more than one year.

The IAT used with this experiment was developed as a sample module packaged with the 2004 version of DirectRT (Jarvis, 2004). Images were comprised of color photographs of six African-American males and six European-American males, all with neutral facial expressions. The word list was composed of eight positive words (joy, love, peace, wonderful, pleasure, friend, laughter, and happy) and eight negative words (agony, terrible, horrible, nasty, evil, awful, failure, and war). The test consisted of seven blocks of trials, two of which were practice blocks. In the first block, respondents viewed a random ordering of 20 words from both valence sets and recorded via 'E' or 'I' keystroke the valence of each word. In the second block of trials, responses to a series of 20 randomly ordered photographs of both African Americans and European Americans were recorded with instructions to identify via 'E' or 'I' keystroke the race of the model in each photo. In a practice block of 20 trials, the two sets of categories were matched—one race with positive words, the other race with negative words—based on key response. This block was repeated for data collection. After the fourth block, the race–key pairings were switched. Another practice block with the reversed category pairings was run before data was collected in the seventh block (see Greenwald, McGhee, & Schwartz, 1998, for a full description). Initial pairing of race and word valence was counterbalanced and randomly assigned to participants in order to thwart the systematic finding that initial race–word valence pairing is typically stronger than the second pairing (Greenwald, McGhee, & Schwartz, 1998; Nosek, Greenwald, & Banaji, 2007).

Dot-probe task. The dot-probe task was originally designed to investigate attentional biases to threat-inducing stimuli as a function of anxiety (MacLeod, Mathews, & Tata, 1986). Since then it has been adapted to measure attention to varying classes of visual stimuli, including words and images. The stimuli used in these tasks are often dichotomized along one or more dimensions and are presented in opposing pairs, one on the left side of a computer screen and the other on the right side. Each trial is composed of a paired-stimuli presentation followed by the appearance of a dot, which is located at random on the right or left side of the screen. Participants respond to the dot by entering one of two keys on a keypad that correspond to the right or left position occupied by the dot. Latency of response to the dot location is a direct function of participants' predominant attention for one of the two previously presented stimuli. For instance, participants in one study were found to take longer to respond to the dot location when the dot appeared in a place previously occupied by a neutral face as opposed to a happy face (Mather & Carstensen, 2003). Consequently, the researchers concluded that those participants paid greater attention to happy faces than they did to neutral faces.

The facial images used in the dot-probe task were comprised of African-American and European-American models, displaying either an angry facial expression or a happy facial expression. The faces were selected from the CAL/PAL Face Database (Minear & Park, 2004), the AR Face Database (Martinez & Benavente, 1998), the Matton Images online database (http://www.mattonimages.co.uk/), and the Equinox Corporation (nd) Human Identification at a Distance Database under the criteria that a) they display moderate expressions of either anger or happiness and b) they have uniform backgrounds that could be

altered easily to white. The CAL/PAL Face Database was collected from over 200 adults aged 18 to 94. Multiple photos were available for each subject in black and white or color, varying by emotional expression. The AR Face Database was developed from color photographs taken of 126 adults with various facial expressions, illumination conditions, and occlusions (e.g., sunglasses). No restrictions on clothing, hair, make-up, or eyeglasses were imposed. Matton Images is a multimedia commercial distributor of stock photos created by several different database companies. The Equinox Corporation HID Database was collected with multiple black-and-white photos taken of each of the 96 adults for research on infrared technology facial recognition. Facial expression and illumination condition were varied for each of the within-subjects photos.

A total of 32 unique faces were selected, balanced evenly by race, sex, and emotional expression. Photos were manipulated in Adobe® Photoshop in order to maximize uniformity. All photos were cropped to encompass just the models' heads, formatted to 175 X 219 pixels, and converted to black and white. Background colors and patterns were also removed, leaving them all-white. After the 32 photos were selected, seven lab assistants (three African-American, three European-American, and one Indian-American students; six females and one male) rated each of the faces for attractiveness, age, and intensity of emotional expression. Attractiveness was rated on a five-point scale (1 for 'very unattractive', 2 for 'below average', 3 for 'of average attractiveness', 4 for 'above average', and 5 for 'very attractive'). Age was also rated on a five-point scale (1 for '15 to 25 years old', 2 for '25 to 35 years old', 3 for '35 to 45 years old', 4 for '45 to 55 years old' and 5 for '55 to 65 years old'). Intensity of emotional expression was rated on a four-point scale (0 for 'neutral face', 1 for 'slightly

intense positive or negative face', 2 for moderately intense positive or negative face' and 3 for 'very intense positive or negative face').

Because homogeneity of emotional intensity by race was of particular interest for this study, I conducted analyses to determine if there were significant differences in ratings of emotional intensity for African-American and European-American faces. The mean intensity rating for happy African-American faces was 1.87 (SD = 0.38), which roughly corresponded to a "moderate" rating of intensity. The mean intensity rating for happy European-American faces was 2.06 (SD = 0.69). There was not a significant race difference in ratings of the happy faces ($t = 0.67$, $p = .51$). For angry faces, the mean intensity rating for African-American faces was 2.35 (SD = 0.37), whereas the mean intensity rating for European-American faces was 1.80 (SD = 0.45). Both scores corresponded to a "moderate" rating because they fell within the 1.50 – 2.49 range, however the difference between them was significant ($t = 2.84$, $p < .05$). I considered this difference acceptable for two reasons. For one, the small standard deviations, which indicated that there was desirably little variance with regard to the intensity of the facial expressions, decreased the probability that the two samples of intensity scores would overlap. Secondly, I was counting on the fact that angry African-American faces would generate stronger perceptions of anger than would angry European-American faces for some participants. Therefore I could not discount the possibility that this effect would be evident amongst some of the seven independent raters, thereby driving the significant difference.

Beliefs about Emotions

The 49-item Beliefs About Emotion questionnaire (BAE, modified from the value subscales of the Parents' Belief About Children's Emotions Questionnaire [PBACE; Halberstadt et al., 2008]), consists of four subscales, which were identified via factor analysis: belief that positive emotions are good, belief that negative emotions are good, belief that emotions are dangerous, and belief that emotions just are. The subscale of interest for this study—emotions are dangerous (13 items)—has good internal reliability in the original PBACE ($\alpha = .85$). Confirmatory factor analyses indicated that these subscales were invariant across three ethnic groups (African-American, European-American, and Lumbee) (Halberstadt et al., 2008). Discriminant validity for this subscale was demonstrated in that neither anxiety (STPI, Spielberger et al., 1983), depression, nor social desirability (Crowne & Marlowe, 1960) was associated with parents' belief that emotions are dangerous. Convergent validity was demonstrated in that parents' belief that children's emotions are dangerous was associated with parents' reports of being distressed when their children expressed negative and positive emotions, and with their greater endorsement of minimizing/punishing, controlling, and reprimanding strategies and less endorsement of encouragement when children expressed negative emotions (Halberstadt et al., 2008).

Because the goal of the BAE is to identify respondents' beliefs about the value of emotion in general, items on this questionnaire were rewritten for a general audience rather than for parents of children and adolescents, and the questionnaire was administered to 219 college students. The items for the emotions-are-dangerous scale that related to positive emotions were dropped, leaving nine items relating to the belief that negative emotions are

problematic. The resulting belief-that-negative-emotions-are-dangerous scale had a Cronbach's alpha of .86 (please see Appendix A).

In addition to the BAE questionnaire, participants also completed a short questionnaire that solicited demographic information pertaining to participants' race, gender, age, and handedness.

Procedures

Upon their arrival at the laboratory, participants were told that they would complete a series of activities on a computer, including questionnaires and cognitive tasks. These computer tasks included the BAE, the demographics questionnaire, and a racial-bias IAT. In addition to these, participants completed a dot-probe task.

During the dot-probe task, the following sequence of events occurred for each trial as prescribed by Mather and Carstensen (2003): a) a fixation cross was displayed in the center of the screen for 1000 ms; b) afterwards, a pair of probes was displayed simultaneously on the right and left sides of the screen for 1000 ms; c) after the two probes disappeared from the screen, a small blue dot appeared either on the left or right side of the screen, in the middle of the position previously occupied by one of the probes. This dot remained in place until the participant responded to it via keystroke.

At the outset of the dot-probe task, all participants were informed that they would engage in an exercise aimed at measuring their perceptual processes. They were told to indicate as quickly as possible on which side of the screen the dot appeared but not to respond to the probes. By tapping the 'Z' key, participants indicated that the dot appeared on

the left side of the screen, whereas typing the '/' key indicated that the dot appeared on the right side of the screen.

Participants were given one block of 16 practice trials, in which the two probes were an 'X' and a 'Y'. Afterwards, participants were introduced to four blocks of 16 trials in which the probes were pairings of facial images. Over these cumulative 64 trials, 32 different faces were presented four times each. These 32 faces were split evenly by race (African American and European American), gender, and emotional expression (angry and happy). The dot-probe pairings are listed in Table 1. These pairings were made to correspond to four types of contrasts—race, emotion, race X emotion, and gender—with the key focus of comparison being angry African Americans. Moreover, the pairings were made such that only one angry African-American face would be contrasted with all of the faces of the contrasting type. For instance, the race X emotion contrast pitted one angry African-American female (number 3) against all four photos of happy European-American males. All of the pairings were presented in random order across all four of the blocks during the dot-probe task.

Participants completed the tasks in one of two orders: a) BAE, dot-probe task, IAT, and demographics questionnaire; or b) dot-probe task, BAE, IAT, and demographics questionnaire. The IAT was selected to follow the dot-probe task so as not to give participants an indication that race was a key variable of interest. The demographics questionnaire was chosen as the final task so as to avoid drawing the participants' attention to their own race before the completion of the racial-bias IAT.

All tasks and questionnaires were administered on a laptop computer via Microsoft® Access and DirectRT (Jarvis, 2004). Sessions were individually run and took about 40 minutes to complete. At the end of each session, before the debriefing, a random subset of participants (n = 56) were asked to describe what they thought the experiment was investigating. Specifically, the questions asked were:

1. When you were performing the task in which you saw two faces and then responded to the dot location, what did you think that we were measuring at that time (not after the task was completed)?
2. Were you aware that we were interested in the effect that the race of the faces might have on your performance?
3. If so, at what point did you become aware of that?
4. If you were aware that we were interested in the effect that the race of the faces had on your performance, did you as a result alter the way that you approached this task? How?

The purpose of posing these questions was a) to determine the extent to which participants believed that the study was about racial bias and b) to get a sense for whether or not people altered their behaviors and/or responses in an effort to override any racial bias that may have been measured with the task.

Analyses

Preliminary Analyses

Racial bias. Racial-bias IAT results were scored according to an algorithm created by Greenwald, Nosek, and Banaji (2003) and is as follows: For each participant, reaction times

from the two sets of trials in which the participant categorized faces and words by race and valence respectively were recorded in two blocks. The mean reaction times for correct responses for each block were calculated. Reaction times for incorrect responses were substituted with the sum of the mean correct reaction time and 600 ms in order to control for chance correct responses that arose on account of rapid, reckless keying. In order to reduce the positive skew inherent in reaction time data, each response time was log transformed (Greenwald, McGhee, & Schwartz, 1998). Finally the log-transformed response times for each of the two blocks' trials were compared via paired-samples *t*-tests.

Because the IAT was administered in one of two possible orders—with initial African American-negative word pairings followed by European American-negative word pairings, or *vice versa*—further steps were taken to control for order effects. The IAT data from 127 participants in this study were combined with data collected from 81 participants in another study using the exact same procedure and software. First, a *t*-test was performed to determine if the order of race-word valence pairings influenced IAT scores. The *t*-test was significant ($t[206] = -11.42$, $p < .01$), with an initial pairing of African-American faces and negative words resulting in a score of greater bias against African Americans (indicated by a negative score, $M = -3.05$, SD = 3.16) than an initial pairing of European-American faces and negative words ($M = 1.83$, SD = 2.96). In light of this significant difference, IAT scores (i.e., the *t* statistic calculated in the above steps) were grouped by initial pairing of face and word categories and standardized, such that the means and standard deviations of the two groups were both 0.00 and 1.00, respectively. This allowed me to combine both sets of scores yet maintain a uniform mean and standard deviation for the entire set.

Attention. As stated in the hypotheses, attention was operationalized by performance on the dot-probe task. An initial criterion was set for inclusion of dot-probe data: participants' data were to be included if they responded correctly on no less than 95% of the trials in order to ensure that only those data from participants who demonstrated a high degree of investment in the study were included in the analyses. Three participants' data were removed from the analyses on account of failure to meet this criterion.

The resulting data were stacked such that each participant ID (corresponding to a single participant) was represented 64 times, one for each trial on the dot-probe task. Because the trials were randomly ordered for each participant, one column of data indicated the numerical order of the trials (1-64). Another column of binary data indicated which face was followed by the dot (for emotion-contrast trials, if the angry face was followed by the dot the value was 0, and if the happy face was followed by the dot the value was 1; for race-contrast trials, angry AA faces followed by the dot were indicated by 0, and angry EA faces followed by the dot were indicated by 1). Another column indicated response times only for emotion-contrast trials, and still another column indicated response times only for race-contrast trials. The remaining columns were populated by individual measures, such as scores on the belief-that-negative-emotions-are-dangerous scale and IAT.

The dependent variables consisted of the response times to the emotion-contrast trials and the race-contrast trials. For instance, response times to the 16 "Block 2" trials listed in Table 1 were used to test the relationship between beliefs about negative emotions and attention for angry vs. happy faces. Response times to the first eight "Block 1" trials listed in Table 2 were used to test the relationship between racial bias against African Americans and

attention for angry African-American faces vs. angry European-American faces. The remaining eight trials in the first block were not used because they contrasted happy African-American and happy European-American faces.

In order to determine whether or not participants' response times to the face probes decreased over time due to repeated exposure to the faces (and in order to remove error variance that resulted as a consequence of trial number), the mean response times by trial number for emotion-contrast trials and for race-contrast trials across all participants were plotted as a function of trial number. (Mean response times by trial number across all participants were used rather than plotting every participant's response times because the statistical software could not process such a huge number—7680 cases—of data points.) The resulting plots are depicted in Figures 2 and 3. It is evident in these two plots that participants' response times to the dot were initially high. However, with increased exposure to the faces, response times ebbed toward a floor level of about 350 ms. Furthermore, it appeared that this exposure effect occurred via an inverse function.

In order to determine the exact nature of these curves, the trial-by-response time data were modeled on a power function ($y = a*x^b + c$) in Mathcad®. These estimates are depicted in Table 2, and the power regression lines are plotted in Figures 2 and 3. Because I aimed to test linear relationships between beliefs and biases and attention for faces, I transformed the power models of the data to linear models by raising the trial number values (the x-axis values in Figures 1 and 2) to the power specified by the power regression models (Table 2, Column "b"). Consequently, response times for emotion-contrast trials plotted against trial number raised to the -0.42 power yielded a linear graph, with a slope of 201.95. Response

time for race-contrast trials plotted against trial number raised to the -0.34 power also yielded a linear graph, with a slope of 217.53.

Before I conducted analyses to test the study hypotheses, I performed a second set of analyses in order to determine whether or not the date of testing, the ordering of the study tasks, or the ordering of the IAT pairings were related to the following variables: response time for emotion-contrast trials, response time for race-contrast trials, the belief that negative emotions are dangerous, racial bias, gender, and race (only African-American and European-American participants). Because undergraduate students enrolled in an Introduction to Psychology class participated in this study in partial fulfillment of a class requirement, a basic assumption that I held was that students who waited until the end of the semester to fulfill the requirement ($n = 40$) were less serious about the participation requirement and similarly less invested in serious participation in the study than were students who completed the study before the last two weeks of class ($n = 91$). Of all of the variables tested, only gender ($X^2[1] = 8.87$, $p < .01$) yielded significant differences in date of testing. The significant difference indicated that a disproportionately high number of males participated in the study during the last two weeks of class (70% of all students in the late-administration group) as compared to during the rest of the semester (males represented 42% of all students in the early-administration group). Additionally, using Levene's test of homogeneity of variance, no differences in variance relating to date of administration emerged.

I conducted a second series of tests to determine whether or not the ordering of tasks was associated with differences in the study variables. The same variables used in testing

date-of-administration differences were analyzed via independent samples *t*-tests. No differences emerged as a result of test ordering.

I conducted a third series of *t*-tests in order to determine whether or not the initial pairing of race and word valence in the IAT was associated with differences in the study variables. Again, the same variables used in the above two sets of analyses were analyzed. The only significant difference for initial IAT pairing was for gender ((X^2 [1] = 6.43, $p <$ .05). Of participants who were tested on initial pairings of African Americans with negative words and simultaneously European Americans with positive words, females were more numerous (58%), whereas females were in the minority (36%) amongst participants who were tested on initial pairings of African Americans with positive words.

Multi-level modeling. Multi-level modeling was used for the remainder of the analyses, including hypothesis testing, in order to account for intraindividual variance due to the trial-sequenced exposure effect and to analyze interindividual differences (with regard to beliefs about negative emotion and racial bias) in intraindividual contrasts with regard to attention for angry vs. happy faces and angry African-American vs. angry European-American faces. Although others (Mather & Carstensen, 2003) have calculated mean difference scores to quantify these contrasts on the dot-probe task, the practice of using difference scores is generally discouraged in the field of developmental psychology, because they only capture differences in levels, thus losing information about differences in slopes (Overall & Woodward, 1975). Moreover, the use of mean difference scores fails to account for the exposure effect identified in the preceding analyses. For these analyses, three levels of data were modeled: 1) individual trials (which were demonstrated in the above plots to

follow an inverse curve on account of an apparent exposure effect), 2) type of face presented (i.e., angry vs. happy faces and angry AA faces vs. angry EA faces), and 3) individual characteristics related to beliefs about emotion and racial bias.

Participant awareness of hypotheses. Twelve of the 56 participants who took the post-test survey indicated that during the dot-probe task they were at least somewhat aware that the race of the faces displayed was a variable of interest in the study. However, every one of these 12 participants indicated that they did not alter their performance based on their supposition. Analyses of participants' data also suggested little to no influence of participants' awareness of race as a variable of interest on dot-probe task performance. In one model I tested the influence of race awareness on response times for emotion-contrast trials, and in the second model I tested the influence of race awareness on response times to race-contrast trials.

The first model, with non-varying slopes, was run with face type (happy vs. angry), whether or not participants were aware of race as a key variable (race awareness), and the interaction of the two (face type x race awareness) predicting response time to the 16 emotion-contrast trials. In order to control for the curvilinear effect that trial number had on response time, trial number raised to the -0.42 power (as specified by the power regression model for response times to emotion-contrast trials [see Table 2]) was also entered as an independent variable. After controlling for power-transformed trial number, neither race awareness nor the interaction term were significant ($p > .10$), indicating that participants' race awareness had no significant influence on dot-probe response times for emotion-contrast trials.

A second model, with non-varying slopes, was run with face type (angry African-American vs. angry European-American), race awareness, and the interaction term (face type x race awareness) predicting response times for the eight race-contrast trials in which only angry faces were displayed. Again, a power-transformed trial number variable (trial number raised to the -0.34 power [see Table 2]) was entered in the model in order to control for the curvilinear exposure effect. After controlling for the exposure effect, neither race awareness nor the interaction term were significant ($p > .10$), indicating that participants' race awareness had no significant influence on dot-probe response times for race-contrast trials.

Hypothesis Testing

Attention for Angry vs. Happy Faces. An initial fully unconditional model was run with response time to the 16 emotion-contrast trials (Table 1, "Block 2") set as the dependent variable in order to identify the proportion of variance in response times due to within-individual changes over the sequence of trials and between-individual differences. Both within- and between-individual variances in response time were significant ($ps < .01$), with within-individual variability accounting for 60% of the variance in response times and between-individual differences accounting for 40% of the variance. Although I did not have any specific expectations about the proportioning of variance, I did expect that interindividual differences would account for a significant portion of the total variance in response time. After all, the premise of my two central hypotheses was that individual characteristics—racial bias and belief about emotion—would account for substantial individual differences in response times.

To test the first hypothesis, that participants' beliefs that negative emotions are dangerous would influence their attention to angry faces, a model was created with face type, the belief that negative emotions are dangerous (Danger), and the interaction of the two (Face Type x Danger) predicting response time to emotion-contrast trials. The power-transformed order variable, $Order^{-0.42}$, was also entered into the model in order to control for the exposure effect. The results of this model are displayed in Table 3. After controlling for the $Order^{-0.42}$ variable, there was no main effect for participants' belief about the danger of negative emotions. However, there was a significant main effect for facial emotion, indicating that participants were 28.74 ms slower to respond to the dot when it appeared on the same side of the screen as the happy faces than when it appeared on the same side of the screen as the angry faces. This effect was qualified by a significant interaction (see Figure 4), which indicates that the belief that negative emotions are dangerous was positively related to response times for angry faces but negatively related to response times for happy faces. Subsequent decomposition of the interaction determined that of all of the possible contrasts only the difference by belief strength in response times to trials in which the dot appeared in the place of the happy face was significant ($p < .05$). Thus participants with strong beliefs about the danger of negative emotions were faster to respond to the dot when it appeared after happy faces than participants with weak beliefs. This ran counter to my prediction that the belief that negative emotions are dangerous would be positively related to attention for angry faces. Overall, this model explained just 1% of the interindividual variance in response time and 10% of the intraindividual variance in response time.

Attention for Angry African-American vs. Angry European-American Faces. A fully unconditional model was run to see if significant within- and between-individual variance in response times for the eight race-contrast trials (Table 1, "Block 1", angry faces only) warranted further analyses via MLM. Both within- and between-individual variances were significant (*p*s < .01), with within-individual variance accounting for 58% of the variance in response times and between-individual variance accounting for 42% of the variance in response times. As reported above, I did not have any specific expectations about the proportioning of variance. Generally I did expect that interindividual differences would account for a significant portion of the total variance in response time, which is the case here.

To test the second hypothesis, that participants' bias against African Americans would influence their attention to angry African-American vs. angry European-American faces, a model with non-varying slopes was created with face type, racial bias, and the interaction of the two (Face Type x Racial Bias) predicting response time to the eight race-contrast trials. The power-transformed order variable, $Order^{-0.34}$, was entered into the model in order to control for the exposure effect. The results of this model are displayed in Table 4. After controlling for the $Order^{-0.34}$ variable, there were no main effects for either the race of the face or participants' racial bias. Additionally, the interaction term for these two variables was not significant. Thus, my prediction that racial bias would be positively associated with attention for angry African-American faces as compared to angry European-American faces was not supported. Overall, this model explained 0% of the interindividual variance and 9% of the intraindividual variance in response time to race-contrast trials.

Discussion

In this study I explored the extent to which beliefs and attitudes underlie individuals' perceptions of threat and consequently their attention to threatening images. To do so, I examined two kinds of perceptions, namely beliefs about the danger of negative emotions and implicit attitudes about African Americans, and I tested the influence of these perceptions on college students' attention for faces in a dot-probe task. I initially hypothesized that individuals who strongly believe that negative emotions are dangerous would attend to angry faces to a greater degree than do individuals who only weakly believe that negative emotions are dangerous. Instead, results indicated exactly the opposite. That is, the belief that negative emotions are dangerous was actually negatively related to attention for angry faces. Nevertheless, this result advances the notion that beliefs about the danger of negative emotions influence attention to expressions of negative emotion. Failure to support the second hypothesis, which was that individuals who are biased against African Americans would focus more attention on angry African-American faces to a greater degree than would individuals who are not biased against African Americans, may have been on account of a number of limitations to the present study. Below I discuss further the meaning of these results within the wider literature, the limitations of the current study, and future directions.

First, with regard to the significant effect for beliefs about negative emotions, I specifically found that, during the dot-probe task, participants with strong beliefs about the danger of negative emotions were slower to identify the location of the dot following the presentation of a happy face than were participants with weak beliefs about the danger of negative emotions. This can be interpreted to mean that participants with strong beliefs about

the danger of negative emotions paid more attention to happy faces than did participants with weak beliefs. Furthermore, given the nature of the task, that happy faces were always paired with angry faces, the flipside of this finding is that participants with strong beliefs about the danger of negative emotions paid less attention to angry faces than did participants with weak beliefs about the danger of negative emotions. In other words, individuals who do not strongly believe that negative emotions are dangerous appear to focus more attention on angry faces than on happy faces, whereas individuals who do strongly believe that negative emotions are dangerous focus more attention on happy faces than on angry faces.

This finding suggests that individuals who believe that negative emotions are dangerous shift their attention away from the presence of negative emotions on others' faces. This stands counter to the hypothesis that I forwarded, that individuals who strongly believe that negative emotions are dangerous would focus more attention on angry faces than individuals who weakly believe that negative emotions are dangerous. This finding also stands in contrast to the results linking high state anxiety with increased attention to angry faces rather than avoidance of them. Although this finding was not what I hypothesized, it does support my theory that beliefs, in this case beliefs about negative emotions, may influence attention. However, the valence and timing of that influence was where I appeared to have been in error. Indeed, it appears that individuals with strong beliefs about the danger of negative emotions reacted to the angry faces by avoiding them, which was not the case in those studies that tested attention to angry faces amongst participants with high state anxiety (Fox et al., 2001; Fox, Russo, & Dutton, 2002; Yiend & Mathews, 2001).

This explanation entails a two-step process: first, an initial evaluation of the faces, and second, an avoidance response to the angry faces. Of course, all people undergo the first step by evaluating the emotional content of faces that they encounter. However, whereas people with high state anxiety continue to attend to angry faces on account of what appears to be a transient focus on negative and/or threatening stimuli, this is not the case for people with strong beliefs about the danger of negative emotions. In fact, people with strong beliefs about the danger of negative emotions either never focus their attention on angry faces, or, more likely, they disengage attention from the angry faces and focus it elsewhere. This two-step explanation fits well within the literature on avoidance coping. For instance, although people who predominantly rely on avoidance coping attend more quickly to threatening images than do people who rely on task- or emotion-focused coping, they subsequently block elaboration and memory of those threatening images (Avero, Corace, Endler, & Calvo, 2002; Calvo & Eysenck, 2000).

The two-step explanation is also quite plausible given the amount of time that participants were exposed to the faces prior to the presentation of the dot, 1000 ms. After all, as stated earlier, stimuli are evaluated for their potential to elicit an emotional response quite rapidly, with evidence for this process occurring as early as 100-150 ms post-presentation (Derryberry & Reed, 1994; 1997; Junghöfer, Bradley, Elbert, & Lang, 2001). This means that the participants may have had up to 900 ms to determine the direction of their gaze.

In light of the likelihood of the above explanation, a broad question emerges: given the observation that participants with strong beliefs about the danger of negative emotions ultimately focused their attention away from the angry faces to a greater degree than did

participants with weak beliefs, at what point did they do so? For example, it may be that people who believe negative emotions, such as anger, to be dangerous initially attend more quickly to displays of negative emotion and then quickly shift their attention away if the situation permits that avoidance response. This pattern would thus follow that seen in studies of avoidant coping (Avero, Corace, Endler, & Calvo, 2002; Calvo & Eysenck, 2000). Alternatively, it may be that people who believe negative emotions to be dangerous attend more to happy faces, relative to others with weaker beliefs, throughout their exposure to both angry and happy faces.

This question may be addressed by a methodology that utilizes the same dot-probe task with reduced face-exposure times, such as 200, 400, 600, or 800 ms. This methodology would help to pinpoint when people with strong beliefs about the danger of negative emotions diverge from people with weak beliefs with regard to their attention for angry faces. In addition to a dot-probe task with reduced face-exposure times, an eye-tracking device could provide an even more accurate depiction of people's attention as a function of their beliefs about negative emotions.

Another question regarding the significant effect for the belief that negative emotions are dangerous concerns which aspect of the facial images triggered the discrepancies in attention for angry and happy faces as a function of strength of belief. In developing the hypothesis pertaining to beliefs about emotion and attention to angry and happy faces, I reasoned that participants with strong beliefs about negative emotions would view the expression of negative emotions as being socially taboo, thus driving a particularly strong response to angry faces. However, it is also possible that participants with strong beliefs

about the danger of negative emotions responded to the angry faces by not paying attention to them because those angry faces provoked in them a negative emotion. Thus, an important question is whether participants with strong beliefs about the danger of negative emotions did not pay attention to the angry faces because of their aversion to the social expression of anger or if they did not pay attention to the angry faces because of their broad aversion to negative emotion-inducing stimuli. A very simple way to address this question would be to develop another study that does not rely on human faces as conveyors of emotion. Instead, images that evoke positive and negative emotions, such as a dog licking her puppy or a striking snake, could be applied to the exact same dot-probe paradigm. Thus, if the belief that negative emotions are dangerous is negatively related to attention for non-social negative stimuli, we may conclude that it is related to a broad aversion to negative emotion-inducing stimuli. If it is not related to attention to negative stimuli, we may conclude that it is probably only related to the social expression of negative emotions.

Turning to the hypothesized relationship between racial bias and attention to angry African-American faces, the null finding may reflect a number of possible processes and methodological limitations. The most specific conclusion that may be drawn from the null result is that people do not, as a function of their bias against African Americans, pay more or less attention to angry African-American faces as opposed to angry European-American faces one second after being exposed to said faces. However, this does not necessarily mean that racial bias is unrelated to attention for angry African-American faces before the one-second interval or after it. As mentioned in the above discussion about testing the hypothetical time point of avoidance of angry faces amongst participants with strong beliefs

about the danger of negative emotions, this first possibility could be tested with a dot-probe task that employs reduced exposure times. This would determine whether or not people with high racial bias attend to angry African-American faces more or less so than do people with low racial bias immediately (i.e., less than one second) following exposure to angry African-American and angry European-American faces. Theoretically, the second possibility, that racial bias is related to attention to angry African-American faces after the one-second interval, could be tested by increasing the image exposure times on the dot-probe task. However, the longer the interval is extended, the less likely it is that a systematic attentional bias would be detected. A more accurate approach to determine if and when an attentional bias manifests itself as a function of racial bias would involve monitoring participants' attention to angry African-American faces with eye-tracking equipment.

Another possible explanation for the null finding is that there was a relationship between racial bias and attention for angry African-American faces but that this relationship was moderated by a variable that I did not measure. For instance, perhaps participants who are biased against African Americans paid more attention to angry African-American faces than did low-bias participants because they did not exercise control over their attention and therefore did not avert their attention away from those faces. Conversely, high-bias participants who did exercise attentional control may have paid less attention to angry African-American faces than did low-bias participants. Such as scenario would result in an interaction effect for racial bias and attentional control but would not yield a main effect for racial bias.

Although a number of possible moderators may exist, the basic premise that something may have influenced the relationship between racial bias and attention for angry African-American faces can be tested. After all, in the context of a process—such as attention—that unfolds over time, a simple relationship may take place before a particular time point in which a moderation effect is evident. In the example that I used above, people with a large bias against African-Americans may initially pay greater attention to angry African-American faces than people without a large bias against African Americans. However, that simple relationship may become moderated at a time point during which some people are able to exercise control over their attention and direct it away from angry African-American faces. That said, given the possibility that a moderated relationship between racial bias and attention for angry African-American faces exists, a likely way to identify the simple relationship would be to use a dot-probe task that employs reduced exposure. This solution is particularly appealing because it has also been referenced to address a number of questions raised in the above discussion.

Beyond the above explanations, there are also at least six possible issues relating to methodology that might account for the null finding. As already mentioned, the hypothesized attentional bias may have occurred but was no longer evident by the time that the dot appeared (1000 ms after the initial presentation of the faces). As noted earlier, participants may have had more than enough time to initially evaluate and then respond to the displayed faces. In fact, recent brain-imaging work has identified differences in brain-wave activity in response to angry African-American and angry European-American faces as early as 150 ms post-presentation (Kubota & Ito, 2007). At that time interval, participants paid more attention

to negative and neutral African-American faces than they did to negative and neutral European-American faces. (No difference was found in attention between positive African-American and positive European-American faces.) By 500 to 600 ms post-presentation, these discrepancies in wave patterns for negative African-American and negative European-American were all but non-existent. Therefore, it is possible that a dot-probe task that provides participants with shorter exposures to the faces (150-500 ms) may uncover the racial bias-attention link that was not evident here.

Second, I attempted to choose only moderately expressive faces in order to generate widely generalizable results. In fact, I was largely successful at doing this. Only two faces that I used in the study were not independently rated as either slightly or moderately intense. One was an angry European-American faces that was rated as neutral, and the other was a happy African-American face that was rated as very intense. Of the remaining faces, 9 were rated as slightly intense, whereas 21 were rated as moderately intense. Even though I did select a homogenous sample of moderately expressive faces as intended, I might have obtained more robust results with a more intensely expressive set of faces for the dot-probe task. After all, a more expressive sample of facial images may have yielded stronger effects by generating greater discrepancies in attention to the varying classes of faces.

Third, my failure to select angry faces that were uniformly intense across race may have biased my results. For instance, it is possible that the uneven sample of faces resulted in a uniform attentional bias. For instance, if the African-American faces were angrier than the European-American faces, all participants, not just those biased against African Americans, theoretically would have attended to the angry African-American faces to a greater extent

than they attended to the angry European-American faces. However, there is no evidence that this was the case, as there was not a significant main effect for race as a predictor of response time ($t = 0.40$, $p = .69$). In any case, the uncertainty introduced by using angry faces that were not uniformly intense across race may be addressed by using faces that are better matched across race in subsequent experimentation.

Fourth, dot-probe tasks traditionally employ contrasts between an emotional and a neutral face (Cooper & Langton, 2006; Mather & Carstensen, 2003), rather than pitting two emotional faces against each other, as I have done in the present task. I contrasted angry faces against happy faces and angry African-American faces against angry European-American faces for two reasons: a) to avoid doubling the number of trials with the inclusion of neutral faces and b) to control for the additional variance that would have accrued after doubling the number of contrasts examined. Nevertheless, there are valid questions that arise from my deviance from the standard dot-probe methodology. For instance, would participants with strong beliefs about the danger of negative emotions have paid less attention to angry faces than participants with weak beliefs if those angry faces had been paired with neutral faces rather than happy faces? Conversely, would participants with strong beliefs about the danger of negative emotions have paid more attention to happy faces than participants with weak beliefs if those happy faces had been paired with neutral faces? Theoretically, I would predict the answer to the former question to be yes and the answer to the latter to be no, assuming that the effect for the belief that *negative* emotions are dangerous generated in this study was driven by the angry faces rather than the happy faces in the emotion-contrast trials. Future research can address these questions by employing the

traditional methodology, which contrasts angry and happy faces with neutral faces. An alternative methodology could also be explored that does not rely on competing images in order to quantify attentional biases. With such a methodology, the use of multiple faces as points of contrast could be abandoned altogether.

Fifth, only eight out of the 64 dot-probe trials measured the effect of race by pitting an angry African-American face against an angry European-American face. Although more race-contrast trials would have produced a better estimate of the effect of race on response times, they would have made the aim of the study more transparent to the participants, which could have compromised the validity of the results. Beyond the small number of race-contrast trials, a bigger limitation to the study design concerns the contrasts chosen to measure the race effect: Although the eight trials featured eight different angry European-American faces (four female, four male), they featured only two different angry African-American faces (one female, one male). Thus, the null effect of race on response times is confounded by what may be a face-specific effect. In other words, had a more diverse selection of angry African-American faces been chosen, a relationship between racial bias and attention for angry African-American faces may have been found.

Sixth, the IAT selected for this study may have not had a suitable level of internal validity. As noted in the Analyses section, there was a substantial effect on the score related to the initial pairing of facial images and words. Those participants who were first tested on pairings of African Americans with negative words and European Americans with positive words were much more likely to generate a score indicative of racial bias than were participants who were first tested on pairings of African Americans with positive words and

European Americans with negative words. Even though I statistically controlled for this disparity by standardizing both sets of data before combining them, the initially vast difference in scores between the two groups indicated that this particular IAT lacked satisfactory internal validity. This fact alone may have precluded finding support for the hypothesis about racial bias.

Overall, this study was successful in providing evidence for the link between beliefs about negative emotions and attention for angry and happy faces. The negative relationship between the belief that negative emotions are dangerous and attention for angry faces, which stood contrary to my prediction, does suggest an avoidant response to angry faces on behalf of participants with strong beliefs about the danger of negative emotions. This in turns paves the way for future research that can determine at what point individuals with strong beliefs shift their attention away from angry faces (if at all) and toward happy faces. Future studies could also clarify which aspect of the stimuli provokes the beliefs-related response. For instance, is it the social expression of anger or is it the broad negativity of the stimuli that drives avoidance of angry faces amongst people with strong beliefs about the danger of negative emotions? Additionally, do people with strong beliefs about the danger of negative emotions pay more attention to expressions of positive emotion and less attention to expressions of negative emotions, or do they pay more attention to those images that elicit a positive emotional experience and less attention to those images that elicit a negative emotional experience within themselves? Although such questions remain, the above finding lends support to the important notion that individuals' beliefs may influence which aspects of the environment they focus their attention. In turn, it is evident that beliefs do play a role in

filtering the information from which people draw conclusions about and meaning from the world.

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Table 1. Dot-Probe Trial Blocks (Before Randomization)

Block 1: Race Contrast		Block 2: Emotion Contrast	
Probe 1	Probe 2	Probe 1	Probe 2
Angry AA Male 1	Angry EA Male 1	Angry AA Male 2	Happy AA Male 1
Angry AA Male 1	Angry EA Male 2	Angry AA Male 2	Happy AA Male 2
Angry AA Male 1	Angry EA Male 3	Angry AA Male 2	Happy AA Male 3
Angry AA Male 1	Angry EA Male 4	Angry AA Male 2	Happy AA Male 4
Angry AA Female 1	Angry EA Female 1	Angry AA Female 2	Happy AA Female 1
Angry AA Female 1	Angry EA Female 2	Angry AA Female 2	Happy AA Female 2
Angry AA Female 1	Angry EA Female 3	Angry AA Female 2	Happy AA Female 3
Angry AA Female 1	Angry EA Female 4	Angry AA Female 2	Happy AA Female 4
Happy AA Male 1	Happy EA Male 1	Angry EA Male 1	Happy EA Male 1
Happy AA Male 2	Happy EA Male 2	Angry EA Male 2	Happy EA Male 2
Happy AA Male 3	Happy EA Male 3	Angry EA Male 3	Happy EA Male 3
Happy AA Male 4	Happy EA Male 4	Angry EA Male 4	Happy EA Male 4
Happy AA Female 1	Happy EA Female 1	Angry EA Female 1	Happy EA Female 1
Happy AA Female 2	Happy EA Female 2	Angry EA Female 2	Happy EA Female 2
Happy AA Female 3	Happy EA Female 3	Angry EA Female 3	Happy EA Female 3
Happy AA Female 4	Happy EA Female 4	Angry EA Female 4	Happy EA Female 4

Block 3: Race and Emotion Contrast		Block 4: Gender Contrast	
Probe 1	Probe 2	Probe 1	Probe 2
Angry AA Male 3	Happy EA Male 1	Angry AA Male 4	Angry AA Female 4
Angry AA Male 3	Happy EA Male 2	Angry AA Male 4	Angry AA Female 4
Angry AA Male 3	Happy EA Male 3	Angry AA Male 4	Angry AA Female 4
Angry AA Male 3	Happy EA Male 4	Angry AA Male 4	Angry AA Female 4
Angry AA Female 3	Happy EA Female 1	Happy EA Female 1	Happy EA Male 1
Angry AA Female 3	Happy EA Female 2	Happy EA Female 2	Happy EA Male 2
Angry AA Female 3	Happy EA Female 3	Happy EA Female 3	Happy EA Male 3
Angry AA Female 3	Happy EA Female 4	Happy EA Female 4	Happy EA Male 4
Angry EA Male 1	Happy AA Male 1	Angry EA Male 1	Angry EA Female 1
Angry EA Male 2	Happy AA Male 2	Angry EA Male 2	Angry EA Female 2
Angry EA Male 3	Happy AA Male 3	Angry EA Male 3	Angry EA Female 3
Angry EA Male 4	Happy AA Male 4	Angry EA Male 4	Angry EA Female 4
Angry EA Female 1	Happy AA Female 1	Happy AA Female 1	Happy AA Male 1
Angry EA Female 2	Happy AA Female 2	Happy AA Female 2	Happy AA Male 2
Angry EA Female 3	Happy AA Female 3	Happy AA Female 3	Happy AA Male 3
Angry EA Female 4	Happy AA Female 4	Happy AA Female 4	Happy AA Male 4

Table 2. Power Regression Estimates for Response Times to Two Sets of Trials

Trials	a	b	c
Emotion Contrast (Angry vs. Happy Faces)	201.95	-0.42	350.17
Race Contrast (Angry African-American Vs. Angry European-American Faces)	217.53	-0.34	327.52

Note. The coefficients, a, b, and c, correspond to the power function, $y = a*x^b + c$, where x refers to dot-probe trial and y is response time.

Table 3. Response Time to Faces as a Function of Facial Emotion and Belief That Negative Emotions Are Dangerous

Fixed Effects	Model
Response Time, β0	
Intercept, γ00	345.21** (36.95)
Order$^{-0.42}$ slope, β1	
Intercept, γ11	184.25** (13.29)
Face Type slope, β2	
Intercept, γ21	28.74* (14.47)
Danger slope, β3	
Intercept, γ31	3.29 (11.22)
Face Type x Danger slope, β4	
Intercept, γ41	-9.42* (4.42)
Random Effects	
Response Time level (τ00)	10188** (1382.21)
Within-person fluctuation (σ2)	6841.09** (228.23)

Note. Estimates and standard errors (in parentheses)
$^{\dagger}p < .10$ *$p < .05$, **$p < .01$

Table 4. Response Time to Faces as a Function of Facial Race and Racial Bias

Fixed Effects	Model
Response Time, β0	
Intercept, γ00	336.13** (10.89)
Order$^{-0.34}$ slope, β1	
Intercept, γ11	193.91** (13.95)
Face Type slope, β2	
Intercept, γ21	1.53 (3.92)
Racial Bias slope, β3	
Intercept, γ31	3.06 (10.06)
Face Type x Racial Bias slope, β4	
Intercept, γ41	-0.88 (4.07)
Random Effects	
Response Time level (τ00)	10152** (1386.48)
Within-person fluctuation (σ2)	7223.64** (242.00)

Note. Estimates and standard errors (in parentheses)
$^{\dagger}p < .10$ $*p < .05$, $**p < .01$

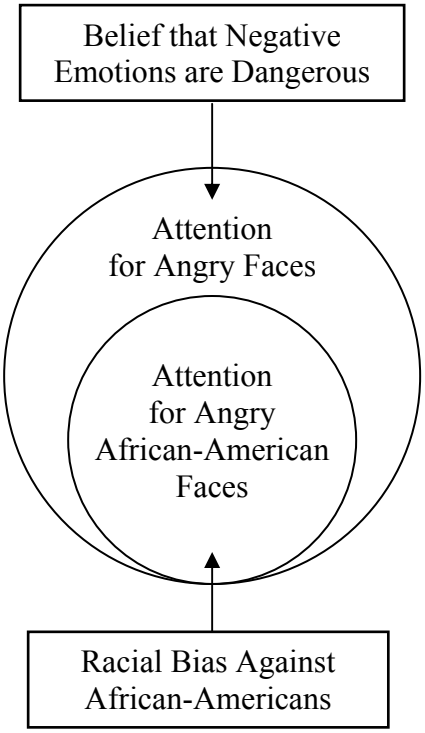

Figure 1. Model Depicting Hypothesized Processes in Which Belief About Negative Emotions and Racial Bias Predict Attention Toward Target Faces

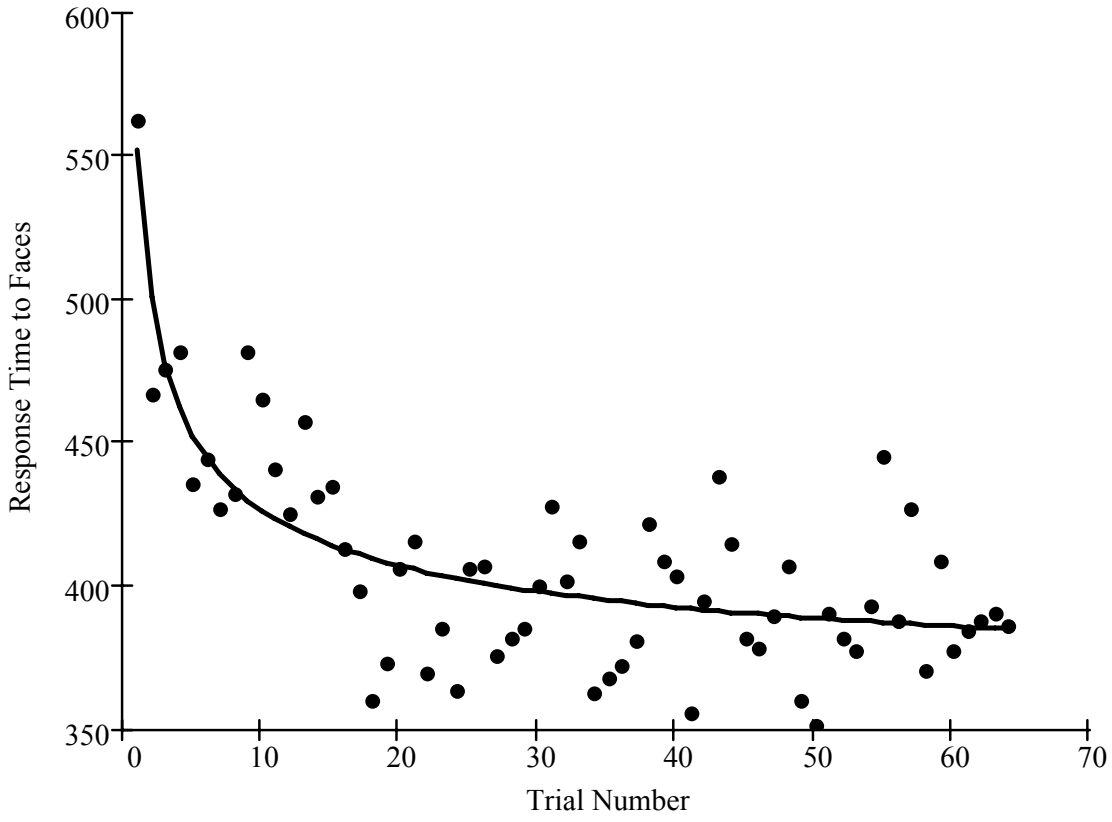

Figure 2. Mean Response Times for Emotion-Contrast Trials

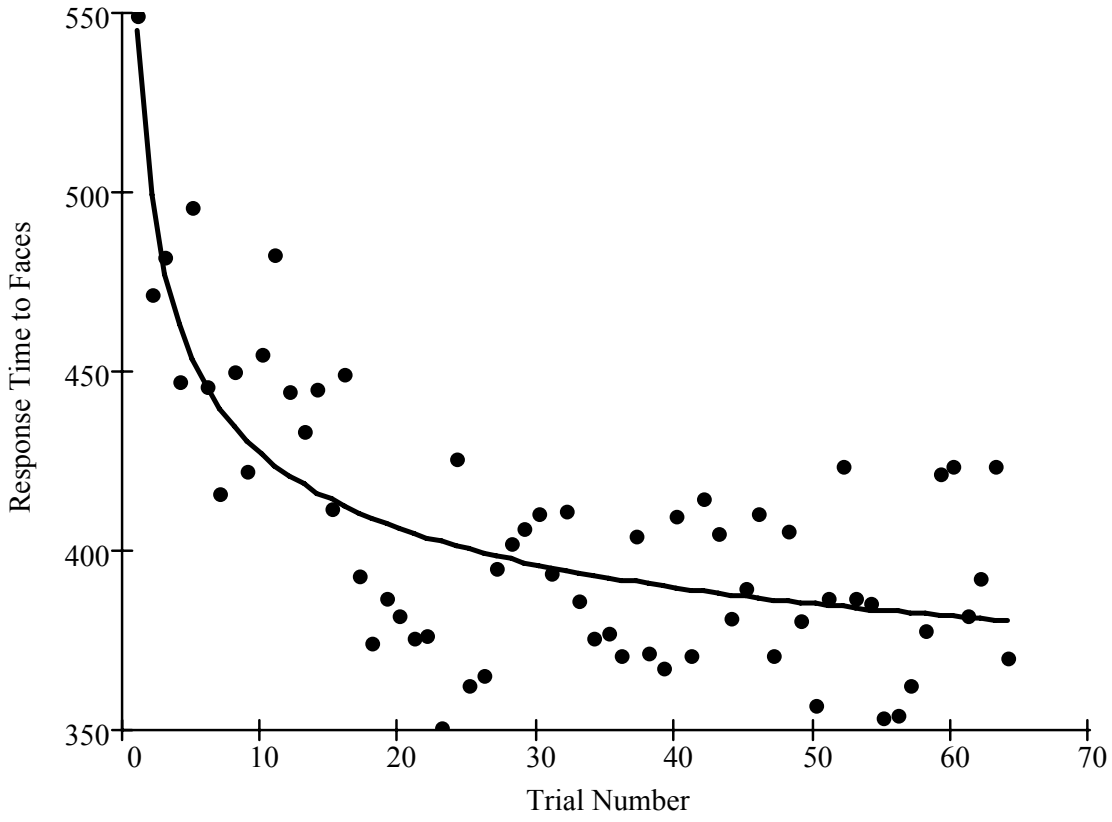

Figure 3. Mean Response Times for Race Contrast Trials

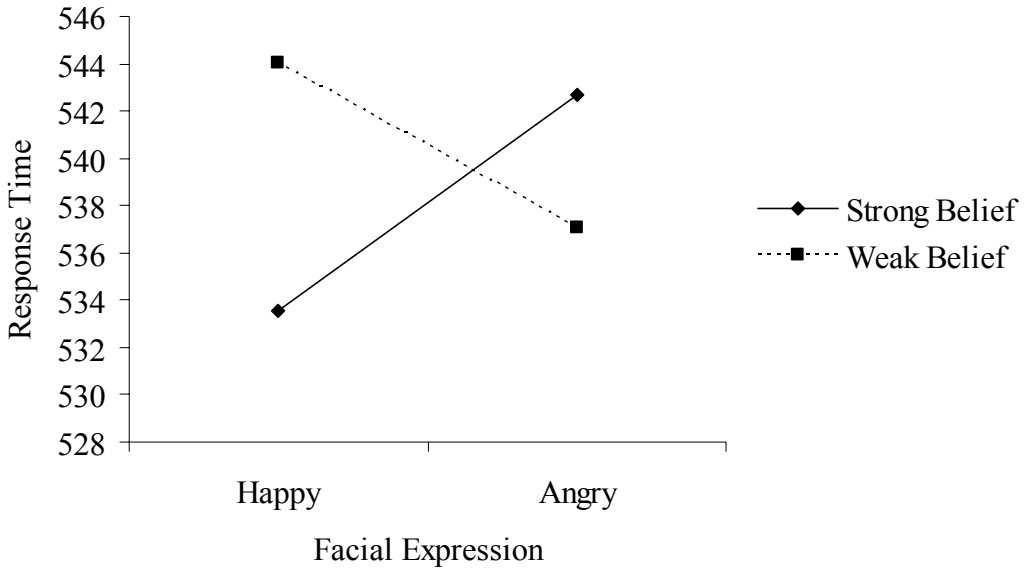

Figure 4. Belief About Danger of Negative Emotions and Facial Expression Predicting Response Time to Emotion-Contrast Trials

Appendix

Appendix A: Beliefs About Emotions (BAE) Scale

1. Getting mad can help people do things they need to, like sticking with a task that's hard, or standing up for themselves.
2. It is okay when people feel angry, and it is okay when they don't.
3. Showing emotions isn't a good thing or a bad thing, it's just part of being human.
4. It's good when individuals in a group share their positive emotions.
5. It is important for people to be able to show when they are happy.
6. It is important for people to express their happiness when they feel it.
7. Feeling sad sometimes is just a part of life.
8. It is good for people to feel sad at times.
9. Feeling negative emotions is sort of a dead end street, and people should do whatever they can to avoid going down it.
10. Showing anger is not a good idea in general.
11. Feeling all emotions is a part of life, like breathing.
12. When people get angry they create more problems for themselves.
13. It is important for people to develop lots of ways to be happy.
14. Feeling angry sometimes is just a part of life.
15. Feeling sad is just not good for people.
16. It is important for people to show others when they feel upset.
17. It is okay when people feel sad, and it is okay when they don't.
18. When a person is too loving others take advantage of them.
19. A person who is too loving can get walked all over.

20. People’s anger can be a relief to them, like a storm that clears the air.
21. It is useful for people to feel angry sometimes.
22. Joy is an important emotion to feel.
23. Feeling angry is just not good for people.
24. Sometimes it is good for a person to sit down and have a good cry.
25. When people get angry, it can only lead to problems.
26. In general, having lots of joy is very important.
27. Showing sadness is neither bad nor good, it is just part of being human.
28. When people are too happy, they can get out of control.
29. When people show pride in what they have done, it is a good thing.
30. It is good for people to let their anger out.
31. When a person shows anger, they are letting you know that something is important to them.
32. It is important for people to avoid feeling sad whenever possible.
33. It is important for people to share their positive emotions with others.
34. Being sad isn't good or bad – it is just a part of life.
35. It is important for people to feel pride in their accomplishments.
36. Being angry isn't good or bad – it is just a part of life.
37. It is important for people to be proud of a job well done.
38. Feeling sad helps people to know what is important to them.
39. When a person expresses anger, someone else ends up having to deal with the consequences.

40. Anger in general can be emotionally dangerous.
41. People who feel emotions strongly are likely to face a lot of trouble in life.
42. The experience of anger can be a useful motivation for action.
43. It is okay when people feel happy, and it is okay when they don't.
44. People can think more clearly when emotions don't get in the way.
45. People’s feelings can get hurt if they love too much.
46. Being angry can motivate people to change or fix something in their lives.
47. It is okay if people show they are happy, and it's okay if they don't.
48. Expressing anger is a useful way for people to let their desires and opinions be known.
49. When people start to show strong emotions, one never knows where it will end up.