Biased Visual Attention to Out-Group Members' Skin Tone Does Not Lead to Discriminatory Behavior

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Biased Visual Attention to Out-Group Members’ Skin Tone

Does Not Lead to Discriminatory Behavior

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Honors Thesis

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Abstract

According to the racial phenotype theory, the extent to which members resemble or depart from the physical prototype of a particular race will determine how strongly the perceiver associates them with preconceived racial stereotypes. For Blacks, skin color was predicted to be a primary feature attended to and those with dark skin were more negatively stereotyped. The current study aimed to explicitly measure visual attention during judgment of faces through the use of eye-tracking. Past methodologies measuring the attention to skin tone and its relationship to stereotype judgment were not directly measured. The study used a mixed model design: Label (perpetrator/victim) x Trial (24) with skin tone (dark, medium, light) embedded within trials. Twenty-eight White participants were instructed to find a crime target (perpetrator or victim) from a fictitious crime scene by selecting a face from an array of three faces ranging in skin tone. Visual attention and selection of faces were recorded. Results showed an interaction between tone and label. Dark and medium faces were attended to more often than light faces in the perpetrator condition. In the victim condition, they are attended to less than light faces. A tone effect was also seen, dark faces were frequently looked at first. Despite biased visual attention, preference for a particular tone was not found. Racial phenotype bias theory need to be re-evaluated because eye-tracking data showed that dark and medium faces were attended equally in the negative perpetrator condition. Dark faces had not monopolized visual attention as predicted.
Biased Visual Attention to Out-Group Members’ Skin Tone

Does Not Lead to Discriminatory Behavior

Jennifer Thompson-Cannino, a White woman, was convinced that Ronald Cotton was the rapist who assaulted her. Later she found out, through DNA analysis, that Cotton was not the perpetrator. Bobby Poole was discovered to have committed the crime (Celizic, 2009). This incident raises two questions that need to be answered. Had the crime incident primed Mrs. Thompson-Cannino to certain implicit racial beliefs when looking at Cotton? Did these implicit beliefs then direct her attention to certain features of Cotton’s face? When comparing the two Black individuals, there was one defining feature that differed between the two men. Cotton’s skin tone was much darker than Poole’s. Racial phenotypicality bias and associative network theory may account for Mrs. Thompson-Cannino’s choice of Cotton as the perpetrator. Thompson-Cannino’s situation may be applied to any situation in which people are forced to rely on phenotypical cues to determine criminality or culpability of out-group members. Shedding light into the visual attention strategies people use when perceiving out-group members will provide both further understanding of implicit prejudice and help prevent the unjust accusation of innocent individuals.

Racial Phenotypicality Bias

According to the racial phenotype theory, ethnic and racial groups have a presumed set of defining features. Within groups there is variation on those features. The extent to which members resemble or depart from the physical prototype of a particular race will determine how strongly the perceiver associates them with preconceived racial stereotypes (Maddox, 2004). The perceiver’s judgments of a member of that category will then be in accord with those associations. If a White individual believes that Blacks are mostly criminals, then according to
racial phenotype bias, Blacks who possess more Afrocentric features (i.e., darker skin color, kinkier hair, broader nose, and fuller lips, Maddox, 2004) will be more likely to be viewed as more criminal.

There is evidence to suggest that skin tone can be the defining physical feature used by Whites when judging the characteristics of Blacks. In a study by Maddox and Gray (2002, Study 2), White and Black participants were given the task of listing traits for seven social groups which were coded as positive, negative, or neutral (i.e., valence). The groups consisted of dark-skinned Black women, dark-skinned Black men, light-skinned Black women, light-skinned Black men, White men, White women, and Native Americans. The first four groups were the focal groups. Maddox and Gray found that dark-skinned groups were ascribed more negative than positive traits compared to light-skinned groups. In a second portion of the study, the traits were coded into 22 categories that were labeled as stereotypic, counterstereotypical, or neutral (refer to page 257 in Study 2 for the complete list). Results revealed that for both White and Black participants, trait ratings of dark-skinned Blacks were negatively stereotypic in comparison to light-skinned Blacks. In terms of specific traits, White participants tended to list traits of dark-skinned males that fit into the categories: criminal, ostentatious, tough/aggressive, unattractive, uneducated, and least likely to be wealthy compared to their light-skinned counterpart. Dark-skinned women were more likely to be listed into the categories: lazy, poor, tough/aggressive, unattractive, uneducated, and unintelligent for their comparison.

The divide between dark and light Blacks was suggested to be due to light-skinned Blacks having more “Eurocentric features” therefore lower phenotypic prototypicality (Maddox, 2004). In a series of studies by Wilkins, Kaiser, and Rieck (2010), phenotype prototypicality of the minority group members affected judgments by out-group members (White majority) and
was used to determine the targets’ levels of racial identification. White participants were asked to rate unlabeled pictures of out-group members (Study 1 and 2 consisted of Black targets, while Study 3 introduced Latino targets). Only the ratings from participants who correctly judged the race of the targets were collected. Targets that were high in phenotypic prototypicality were rated to have higher identification to their race in comparison to targets lower in prototypicality. This research provides possible clarification for how light-skinned minorities are judged. In the case of light-skinned Blacks, they are more likely to be viewed, by out-group members, as less identified with their racial identity. Therefore they could be perceived as more likely to act in a different and often positive manner (Maddox & Gray, 2002).

To provide further evidence, two other studies document skin tone bias with more negative evaluation of Blacks with more Afrocentric (i.e. prototypical) features (Blair, Judd, Sadler, & Jenkins, 2002; Blair, Judd, & Fallman, 2004). Blair et al. (2002, Study 2) showed that when given a task to try to find four targets with certain provided descriptions, the faces with high rating in Afrocentric features (as rated in Study 1) were the most likely to be attributed descriptions depicting negative stereotypical views compared to less Afrocentric faces. To elaborate on the methodology, White participants were given the task of finding four people with certain characteristics. Two of the descriptions were written to be stereotypic and the other two counterstereotypical. In addition, the nature of the descriptions was also either positive or negative (for full details on these descriptions see Blair et al., 2002). Participants were asked to determine whether any of the Black male faces shown was one of the four targets. Judgments were made using a probability rating ranging from 0-99.

Blair et al. (2004, Study 3) also found that Afrocentric feature-based judgments were automatic in nature and, unlike racial prejudice, were more resistant to conscious inhibition.
This finding was done through the inclusion of between-race judgments. The four targets were either White or Black. Participants were given explicit directions to be objective in two different ways based on either racial features (condition 1) or Afrocentric features (condition 2). When instructed to not use race-based judgments (discriminate facial variations between Whites and Blacks), participants were less likely to attribute the stereotypic descriptions to Black pictures. When instructed to not use Afrocentric features (discriminate facial variations within Blacks) the decline was not as pronounced. This finding raised the question of what made racial phenotype bias automatic (i.e., implicit) and how it was established.

*Associative Network Theory*

Although racial phenotype bias may explain why dark-skinned Blacks are likely to be seen as more criminal, associative network theory can elaborate on how and why those beliefs are established. The theory also attempts to explain and distinguish factors that are needed for these beliefs to get activated in racial judgment of the out-group. According to the theory, there are concepts that are in the brain for everything that a person has been exposed to and these concepts are termed “nodes” (Eberhardt, Goff, Purdie, & Davies, 2004). The nodes are also interconnected to form associations. Establishment of these nodes and associations are the product of learning. The strength of the associations will increase the probability of certain nodes activating together. In the context of stereotyping, the “Black race” node will increase the probability of activation of other concepts associated with it ranging from physical features to behavioral components (e.g. black, tall, poor, uneducated, etc.).

The same theoretical logic can be applied to concepts “Blacks” and “crime.” Dixon and Maddox (2005) examined the relationship between race, skin tone, and news viewing patterns. Participants in the study (mainly White females) were primed with a mock news story involving
an identified perpetrator. The perpetrator was labeled as a White, a light-skinned Black, a medium-skinned Black, or a dark-skinned Black male. The participants were then asked about the frequency of their news-watching pattern. The findings indicated that heavy news watchers were more threatened about the mock news story when the story had a dark-skinned Black male compared to those who had the story with a White male. Since the light news viewers did not have this pattern, we can see that the frequency of news watching can strengthen (i.e., prime) our associations of “Blacks” with “crime.”

The reverse can be true as well. The concepts associated with a race can be the precursor node that activates the race node. Eberhardt et al (2004) demonstrated this bi-directionality through the use of the dot-probe task using both negative and positive primes (negative crime images in Study 2 and positive basketball images in Study 3). After primes were exposed for 30 ms, two Black and White male faces appeared for 450 ms. Once the faces disappeared, a dot appeared for the participant to locate. The logic behind the task was that if a particular race was strongly associated with the two prime types, then the person would automatically pay attention to the appropriate face and thus the latency to find the dot should be faster the closer the dot was to the particular face. Dot detection was quicker when the dot appeared near the black face and slower when it appeared near the white face. Bi-directionality of association was observed. The race node was activated as a consequence to the primes. Thus, this showed an automatic preference for the Black face over the White face due to its stronger association with both negative and positive primes.

In addition, the association between concepts merely has to be strong enough (i.e., primed) for them to be closely linked. For instance, the association of danger and Middle Eastern people has changed due to the 9-11 attacks. Before this event, this connection may not
even cross the minds of the general public. Horry and Wright (2009) have applied the dot-probe task in priming words related to terrorism in order to prime the participants to Middle Eastern faces. The same attentional bias was seen for the Middle Eastern faces by White participants in this study, which was consistent with the results from Eberhardt et al. (2004).

The Value of Implicit Mental Processes in Intergroup Relations

This present research focuses on the role of implicit associations in the context of racial phenotypical features. However, with the introduction of implicit or “unconscious” thoughts, there is generally an attitude of skepticism to the idea that our conscious behavior is controlled by it. When we look at this aspect of thought in the context of evolution it may not be that farfetched. Our brain/mind (i.e., source of mental processes) is a product of nature. Evolutionarily speaking, the more efficient a bodily process an animal has, the more likely that it will survive and reproduce.

Implicit mental processes can be explained to be an evolutionary process through the ideomotor principle (Custers & Aarts, 2010). Custers and Aarts have argued this notion in the context of goal pursuit. The ideomotor principle proposes that there is an unconscious preparation of behaviors that have been associated with goal accomplishment over time. In a study by Aarts, Custers, and Marien (2008), participants were shown to be implicitly influenced (i.e., primed) by words relating to the experimental task.

Participants were given the task of gripping a pressure sensitive handle whenever a “squeeze” word appeared on a computer screen. The participants were not directed in any way regarding the amount of pressure that was to be applied to the sensor. The “goal” of this activity was to help the experimenters test out the equipment. There were two experimental conditions involving primes. In one experimental condition, the prime words were related to physical
exertion, which would be more strongly associated with the action of squeezing. In another condition, the same set of prime words was also paired with either a positive (e.g., good, pleasant, etc.) or neutral word (e.g., furthermore, around, etc.). The addition of positive words served to modify affect to manipulate the participants’ squeeze pressure. The use of positive words was important in showing implicit goal facilitation, since accomplishment of a goal will often be followed by and associated with a sense of accomplishment (i.e., positive emotions). According to the bi-directionality of primes (Eberhardt et al., 2004), priming for positive emotions before the completion of the goal should, and did, have an effect.

The evidence showed an effect of the primes in the significantly stronger squeezes in both prime conditions. In addition, the pairing of the priming words facilitating force with positive words resulted in the strongest squeezes. The participants were implicitly primed to act in a certain way, in this case to exert more energy to what they believed was to help test the equipment (i.e., the goal).

The reason the behaviors from the participants were judged to be implicitly associated with the goal was due to the difference shown in the experimental group and the control group. In the control conditions, the word “squeeze” was paired with word primes consisting of random letters. The pressure exerted in these conditions was significantly lower. If there was no association between the primes, activity, and affect, then there would be no difference between these two experimental conditions and the control condition.

This finding relates to the context of social priming in intergroup relations and how there may be an evolutionary advantage. In terms of intra-species interactions, the in-group is seen as safe in relation to the out-group. In the animal kingdom, animals are likely to be rejected and harassed by the out-group if not outright killed (therefore a source of danger). Over time, the
association of safety with the in-group becomes established. This association is an intricate one where group-specific phenotypes (racial phenotypes for humans) get paired with beliefs of security. Preservation of the in-group will be a goal for the organism. To do so, the organism will also have to discriminate the features that out-group members have that differ from them. The most salient features will often be used as key distinguishers such as the appearance of fur or skin color.

In cases of perceived threat of out-group members, there may be an implicit facilitation of in-group preservation as a goal. Theoretically, this threat will cause the organism to associate members of the out-group with negative beliefs and affect. The prototypical out-group members would be the easiest to distinguish and the most likely to engender such responses. Unfortunately, this mechanism becomes over generalized in the human species. As a result, hostilities for the out-group arise, generally much more easily, than for any individual of the in-group.

*Novel Role of Eye-Tracking in Race Member Perception*

The studies discussed provide strong evidence that implicit racial thoughts shift attention to the most prototypical members. However, despite the strong evidence that visual evidence is involved, the measurements are often only inferences of how the participants are attending to the stimuli. In the case of the dot-probe task, measurements are latencies for faces that were attended to, but the actual movement of the eyes and their fixations never get recorded (Eberhardt et al. 2004; Horry & Wright, 2009). The common “judgment-by-photograph” protocol type has also been a common procedure, which has participants looking at pictures and giving judgments and ratings (Blair et al., 2002, Blair et al., 2004; Wilkins et al., 2010). The same limitations apply. Consequently, a significant methodological and theoretical advance
would be gained by the methods that actually determine to which elements of a stimulus field the perceiver attends. Modern eye-tracking methods can accomplish this goal.

Little work has been done with eye-tracking in the field of social psychology, although the procedures and applications have been developing for decades (Yarbus, 1967). Yarbus was one of the very first people to investigate the scanning patterns of the eyes in the presence of complex images such as a human face (1967, page 171). Only recently has the field gradually started to move in this direction. For example, Malcolm, Lanyon, Fugard, and Barton (2008) looked at the fundamental characteristics and differences of people’s visual attention patterns in facial identification and emotion detection using the Eyelink 1000 eye tracker. This particular apparatus allowed the experimenters to see that when given the task of facial identification (i.e., matching) of a target to a morphed face, the upper portion of the face was attended to with more fixation points (i.e., measurement of the participant’s focus) while in the expressional evaluations fixations were primarily focused at the bottom half.

Similarly, eye-tracking will be able to explicitly measure the nature of visual attention in the context of out-group perception and perceptual bias, as indicated by eye focus. The measurements are now more accurate. Eberhardt et al. (2004, Study 1) demonstrated a change in detection latency in which degraded images of crime-related objects were more quickly identified by participants primed with a Black face for 30 ms. The images of the objects were presented frame by frame with 500 ms for each exposure. However, there was no explicit way to rule out that the participants were merely guessing what the objects were more quickly rather than actually shifting their perceptual threshold in seeing what the object was. If the prime of a Black face had only decreased response latency in the absence of recognition of the object, one may say that the accuracy would have then been closer to pure chance. This was not the case.
The type of guesses may have been more accurate due to the prime because supposedly relevant associations were being accessed. With eye tracking software, movement in the fixations can be measured and mapped; one can determine if eye movement matches the gross outline of the object and in addition to shift of fixation to unique patterns of the particular object.

Importance of Eye-Tracking in the Present Research

In the case of the current research, the visual attention patterns of White individuals, while viewing Black male faces during an apparent identification task, will be studied. Black male faces will vary in skin tone while all other Afrocentric features of faces will vary randomly. A conceptual prime will be used that should activate racial stereotypes that involve, among other things, skin tone associations. That is, the prime should permit assessment of the strength of the relationship of one particular phenotype feature (i.e., skin tone) and a trait judgment (i.e., identify a particular face as a perpetrator or victim of a crime depending on the condition). Unlike past research, in the present experiment, visual attention to stimulus features will be directly measured and related to social judgments of the out-group members.

The Tobii Eye-tracker has the ability to create Areas of Interests (AOIs) which records fixation points from the participant’s eyes. Each face will have an AOI that covers the whole face. Naturally, adults will briefly scan the eyes, nose, and lips because they are the most expressive (Yarbus, 1967, page 191). Since the facial expression of the stimuli for this study is always neutral, the participants cannot rely on expression for judgment of criminality or innocence. Instead the whole face becomes the main focus with skin tone being the most salient. The primary goal of the experiment is to determine how large the role of skin tone plays in activating associations of criminality in racial judgments because the skin covers most of the
face. The choices of perpetrators or victims should reflect fixation patterns that focus primarily on skin tone.

Hypotheses

The participants (consisting of White college student) will be primed by the label “perpetrator of a crime” or “victim of a crime” according to their randomly assigned condition. Primes should influence the visual attention of Whites when viewing an array of three Black male faces with a dark, a medium, and a light skin tone. Based on previous work involving skin tone (Maddox & Gray, 2002; Dixon & Maddox, 2005), the dark faces will be the primary choice for participants when attempting to identify the “perpetrator of a crime”. The perpetrator label should strongly prime the beliefs that Blacks are criminals. When searching for the perpetrator, faces with dark skin tone will be the attended to more often than faces with a lighter skin tone (Hypothesis 1). Participants will be more likely to pick dark faces as the perpetrator (Hypothesis 2).

Under the “victim of crime” prime, White participants should visually attend to and select a face with features more similar to their own. The inaccurate stereotype prevails that Whites are the most likely victims of Black crime. When primed with “victim of a crime” the information should be self-relevant and when presented with an array of faces, a face with skin tone closer to one’s own should be attended to and selected. Most of the fixation points from the participant’s eyes will focus on the lighter faces (Hypothesis 3). Moreover, past research has revealed that people hold a “White is good” stereotype where lighter skin represents more positive traits (Maddox & Gray, 2002). If lighter is better on the skin tone dimension, then the lighter face should be selected as a victim; facial features that are most Eurocentric, and similar to one’s own, will be the basis for this biased choice (Hypothesis 4).
Methods

Participants

Twenty-eight White (male and female) undergraduate students from Rhode Island College participated in the study either through volunteering or through the psychology participant pool of an introductory psychology course.

Materials

Three hundred Black faces were randomly generated using FaceGen Modeller 3.5 (see Figure 1) with the following setting: African, male, age at 30, typical, and symmetrical. Typicality was selected due to the superior realism of the faces. The spectrum of choices ranged from average (no variation) to monster (nonhuman features). The symmetry setting controlled for the likeness of the left hemisphere to the right hemisphere of the face. Skin tone values of each face were also provided by the software with lower values being light and higher values being dark. The data on these features from FaceGen were then transferred into an SPSS file to be analyzed for the distribution of skin tone values. Raw scores were transformed to z-scores. Skin tone values of the faces were determined to be normally distributed with the highest value (dark tone) being 2.59 standard deviations away from the mean and the lowest value (light tone) being 2.41 away from the mean.

A total of 72 faces were selected from the 300 faces based on skin tone values with all other features varying randomly. For the dark skin tone faces, the top 24 nonrepeating (i.e., unique skin tone value) skin tone values were picked. For the lightest, the bottom 24 nonrepeating values were picked. The medium tone faces were selected equally from the values ascending and descending away from the mean skin tone. Out of the 72 faces, 24 arrays of three faces each were made (see Figure 2). Each trial/array was randomly assigned a specific set of
dark, medium, and light tone faces. Positions of the faces were controlled for. There were 3 possible arrangement types an array could be assigned to as determined by a Latin Square (see Figure 3). During the presentation of the 24 trials, participants would see eight of each arrangement type. Labeling was provided under the faces with A beneath the left face, B beneath the middle face, and C beneath the right face.

There were also 24 images of crowded places with a mixture of Black and White people in them (see Figure 4). The images served to introduce the situational context of the experiment (the crime scenes) in which either the perpetrator or victim were present at that time. Care was made to insure that the people in the “crime scenes” were not easily discernable. In addition, the faces in the arrays were not actually in these scenes. Therefore, judgment would be made purely on the perceivers own biases and association they may have with a particular skin tone. The 24 images of crowded places were randomly assigned to each of the 24 arrays. All participants will be shown these 24 images labeled as the crime scenes followed by an array of three faces as described above.

Eye-Tracking Procedures

All images used for the experiment were shown using the Tobii T60 XL Eyetracker (see Figure 5). The images were displayed as if on a regular computer monitor. However, the Tobii Eyetracker was used for more than the visual display of the stimuli. The hardware tracked and recorded the eye-movements of the participants to evaluate visual attention. A computer was also connected to the eye tracking hardware for the experimenter to control.

Procedures

Participants began the study by entering a lit room with relatively little exposure to external natural light sources. The first task the participants was asked to perform was to read
the informed consent document. Upon giving consent, participants were asked to sit approximately 36 inches away from the Tobii Eyetracker screen in preparation for eye calibration. The research assistant instructed the participant to perform the necessary steps to calibrate the eye-tracking software. Once the calibration was complete, the visual stimuli was presented based on the condition to which the participant was randomly assigned.

Embedded in the visual stimuli were instructions for the participant to follow that are presented below:

*Slide 1*

In this study, we are studying eyewitness identification under conditions that make this identification very difficult. That is, we are attempting to determine if people can accurately identify perpetrators/victims of a crime in crowded social environments that actually exist in the real world.

*Slide 2*

You will be presented with pictures of actual scenes where crimes occurred that were recorded by video cameras. These scenes are in busy cities and show the difficulty one has when attempting to identify a perpetrator/victim of a crime in a crowded, complex natural environment filled with people, sounds and images.

*Slide 3*

The perpetrator/victim of the crime is in the scene. We extracted the person’s picture from the videotape and used software to remove all features (body, hair, clothing, etc.) except their face. The software then produced a computer generated image of only their facial features. These images will not look like actual photographs.

*Slide 4*
VISUAL ATTENTION TO SKIN TONE OF OUT-GROUP MEMBERS

(see Figure 7)

Slide 5
You are to play the role of the witness to a crime. Your job is to identify the perpetrator/victim (i.e., the one who committed the crime/the target of the crime) from a lineup of three people.

Slide 6
You will be shown the perpetrator’s/victim’s image for a brief time period. After the image has been shown, there will be a lineup of three individuals. Your job is to pick the face of the perpetrator/victim. The will be twenty-four perpetrators/victims that need to be identified.

Slide 7
Before the study will begin, you will see what the eyewitness identification procedure will look like. For this example we will use seagulls. You will need to find the "perpetrator/victim" seagull. This is only an example.

The research assistant answered all questions the participant had. The visual stimuli began with contextual information slides (i.e., one of the 24 “crime scenes”). The slides were shown similarly to how Microsoft PowerPoint slides would be displayed. Time was unlimited for contextual and instruction slides. For these types of slides, to move to the next slide the research assistant pressed a space bar. In addition, these slides were configured to not record eye-movement. Once the participant had completely read the instructions and understands the task, a prompt slide appeared for 2 seconds preparing the participant for the crime scene slide. The crime scene slide appeared for 100 ms with a pre-mask (slides with a + mark at the center) and a post-mask (slides with a + in one of four possible positions: top left, top right, bottom left, or bottom right corner quadrant). The pre-mask and post-mask was shown for 1000 ms. The
array of faces then appeared after the post-mask. The faces remained on the screen for 5 seconds and eye tracking was recorded during this period. Once the 5 seconds were over, the participants were prompted by an instruction slide to give a decision on which face was the perpetrator/victim (depending on condition) by indicating the letter that under the corresponding face.

To prevent the eyes from averting off the screen, the research assistant recorded the choices. In the situation that participants were unable to provide an answer, the research assistant asked the participant to provide an answer to the best of their abilities. If the participant had not provided an answer, the answer for that particular trial was marked with an asterisk to indicate no answer. The experiment would still continue. When the experiment was completed, the participants were thanked for their participation and dismissed. Those from the psychology participant pool were also given course credit.

**Dependent Measures**

There were two dependent measures. The first dependent measure was the selection of a face by the participants from the array of three faces on each of the 24 trials. The second dependent measure was the eye-gaze pattern recorded by the Tobii Eyetracker. Of the three faces in each array, visual attention to each of the faces was measured. There were five types of eye-tracking data: Total Fixation Duration, Fixation Count, Total Visit Duration, Visit Count and Time to First Fixation.

All of the eye-tracking data types described the nature of participants’ fixations within an AOI or area of interest. A fixation was defined as a pause of eye movement on a specific area of the visual field where both eyes are focused. Total Fixation Duration was the average time of all fixations on a given AOI. Fixation Count was the average number of fixations on an AOI.
Total Visit Duration was the average of all visits to an AOI. A visit was defined as the time interval from the first fixation on an AOI to the next fixation outside of the AOI. Visit Count was the average number of visits to an AOI. Time to First Fixation was the average time interval from when the stimulus appear on screen to the start of the first fixation on an AOI.

**Statistical Analyses**

A repeated measures ANOVA was used to determine the presence of bias in participants’ choice of crime targets. The choices were analyzed using the skin tone values attributed to the chosen faces (taken from FaceGen Modeller).

Eye-tracking data (i.e. time of fixation measurements) was the dependent measure analyzed using mixed model ANOVA. Prime label (perpetrator or victim) was a between subjects factor and trials (24) was a within subjects factor with face tone (dark, medium, light) nested within trials.

**Ethical Concerns**

The Rhode Island College Institutional Review Board reviewed and approved this study. Participants completed an informed consent document when they arrive at the lab before the experiment began. They may terminate their participation at any time with no penalty. An alternative activity had been provided for those who do not wish to participate in this experiment. Only those who consented were run through the experiment. Participants were debriefed of the deceptive nature of the study after the experiment (Appendix B); that is, they eventually learned that the perpetrators or victims that were presented in the study were not real. The experimenter explained that this deception was necessary to get valid eye-tracking data. Moreover, they learned that the faces presented were actually computer generated and not real faces. In addition, the participants were also informed that their eye movements were tracked during the study and
that their data will be aggregated with data from other participants. No one other than the researcher had access to their eye tracking data and their names were never linked to it (only their identification number). In the event that the participant felt distressed, contact with the principal investigator (Dr. Thomas Malloy) was provided as well as information to the campus counseling center. The IRB protocol stated (and was approved) that this research involves minimal risk.

Results

Overview of the Eye-tracking Analyses

A mixed-model ANOVA was used on the five different types of eye-tracking data: Total Fixation Duration (TFD), Fixation Count (FC), Total Visit Duration (TVD), and Visit Count (VC), Time to First Fixation (TtFF)\(^1\). A 2 (prime label) x 24 (trial) experimental design was used where tone (dark, medium, and light) was nested within trials between conditions (perpetrator or victim). There were no main effects for the prime label of perpetrator or victim. Only for the variable TtFF was there a main effect for skin tone. A consistent pattern of results was observed for the eye tracking variables; the effect of the prime label was moderated by skin tone resulting in a statistically or marginally significant (FC) interaction effect on the visual attention measures. An exception was the TtFF in which a different pattern was observed. The alpha level for all of the statistical analyses was .05.

Interaction Effects of Prime and Skin Tone on Visual Attention

Results shown in Table 1 match the predicted eye-search patterns specified in hypotheses 1 and 3. The general pattern (excluding TtFF) that appeared in the eye-tracking data revealed that prime labels (perpetrator/victim) had an effect on visual search patterns. Given the

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\(^1\) For an explanation of the different type Eye-track data please refer to the methods section under dependent measures.
perpetrator label, dark and medium faces were attended to more often than light faces. In the victim condition, the light faces were attended to more often than dark and medium faces.

In Total Fixation Duration, participants in the perpetrator condition fixated longer on dark and medium tone faces ($M = 1.42s, SD = .08$ and $M = 1.43s, SD = .07$ respectively) compared to light faces ($M = 1.26s, SD = .05$). The reverse was found in the victim condition. Light faces were fixated on longer ($M = 1.33s, SD = .05$) than dark and medium faces ($M = 1.27s, SD = .08$, and $M = 1.29s, SD = .07$ respectively), $F(2, 25) = 3.44, p = .02$.

Analysis of Fixation Count revealed a marginally significant label x skin tone interaction. In the perpetrator condition, dark and medium faces had more fixations (i.e., attention) than light faces ($M = 4.07, SD = .20, M = 4.04, SD = .20$, and $M = 3.8, SD = .12$ respectively). In the victim condition, dark and medium faces were fixated on less often than light faces ($M = 3.76, SD = .20, M = 3.94, SD = .20$, and $M = 4.05, SD = .12$ respectively), $F(2, 25) = 2.70, p = .09$.

Total Visit Duration also revealed the label x skin tone interaction. The duration of visit time to a face in the perpetrator condition were longer for dark and medium faces compared to light faces ($M = 1.48s, SD = .07, M = 1.49s, SD = .06$, and $M = 1.33s, SD = .04$ respectively). In the victims condition, dark and medium faces had shorter visit times than light faces ($M = 1.34s, SD = .07, M = 1.34s, SD = .06$, and $M = 1.42s, SD = .04$ respectively), $F(2, 25) = 3.80, p = .04$.

Analysis of Visit Count showed the same preferential attention to certain faces as a function of the label prime. There were more gaze visits to dark and medium faces compared to light faces in the perpetrator condition ($M = 2.50, SD = .12, M = 2.54, SD = .14$, and $M = 2.43, SD = .11$ respectively). In the victim condition, the dark and medium faces had lower visit counts than light faces ($M = 2.41, SD = .12, M = 2.49, SD = 1.4$, and $M = 2.60, SD = .11$ respectively), $F(2, 25) = 4.71, p = .02$. 
In Time to First Fixation, fixation patterns in the perpetrator and victim condition were not statistically different as shown in table 1, \(F(2, 13) = .07, p = .94\). However, there was a tone main effect, \(F(2, 13) = 6.81, p = .01\). Regardless of condition, participants tended to look first at the dark faces (54.17% of the time) than medium or light faces (29.17% and 16.66% respectively). There clearly was a bias to dark-toned faces due to the probability exceeding 33.3%, the level of chance. Twelve participants with missing data in this particular analysis were eliminated.

**Behavioral Choice: Selection of the Perpetrator or Victim**

A repeated measures ANOVA was used to determine presence of bias in participants’ choice of crime targets. The use of an ANOVA was justified because the choice of a crime target was essentially a choice of a specific skin tone value. The numerical value was obtained from FaceGen Modeller. Results were found to be non-significant, \(F(23, 4) = 1.59, p = .35\). Participants selected crime targets in a random manner in both conditions failing to support hypotheses 2 and 4. The participants did not favor the selection of dark faces when given the perpetrator label. The selection of light faces in the victim condition was also unbiased.

**Discussion**

**Predictions and Outcomes**

The results for participants’ visual activity matched the predictions hypothesis 1 and 3 with one discrepancy (later mentioned in the discussion). The prediction was participants would focus most of their attention on dark faces when given the prime label, perpetrator (hypothesis 1), while more attention on light faces when given the label, victim (hypothesis 3). The primary reason for these predictions was that the labels had an associated level of innocence; the word, perpetrator, had a low level of innocence whereas, victim, had a high level. Participants were
predicted to react to these labels in this specific way primarily due to ethnocentricism. The participants, being White, would use their in-group characteristics as a gauging tool for what characteristics they would deem ideal (similar to oneself) for an “innocent” face or a “criminal” face. This thought process would be more implicit in nature. Given only a crime-related prompt for the Black faces, participants were forced to develop a discriminatory visual search process based solely on physical features in tandem with cognitive biases. With tone being the prominent facial feature, it would be a key reference point; the lighter the tone of the face the more associated it was to being innocent. Dark face tone would be seen as most different from the White ideal and therefore seen the least innocence.

Preferential Nature of Visual Attention

The data show that when given the label of perpetrator, participants elicited more gaze activity centered on dark faces and medium faces while light faces had the least attention. The label, victim, had an opposite effect on participants’ gaze activity. Light faces were attended to more often than dark and medium faces. These findings match the predictions made in the hypotheses. The perpetrator and victim label interacted with skin tone to elicit biased visual attention. The focal attention to light faces in the victim condition and diminished attention in the perpetrator condition was not surprising as prior studies have shown that light tone Black faces were associated with more positive characteristics (Blair et al, 2002, 2004; Maddox & Gray, 2002).

Visual attention directed towards dark faces was not as clear. The data also showed a detail not addressed by hypotheses 1 and 3. Dark and medium faces were essentially attended to equally in both conditions, with the most attention received in the perpetrator condition. This suggested that participants were not only using an exemplar-centered (i.e., Afrocentric) search
process in finding the crime target. To elaborate, the participants did not simply rank each face based on the strength of association to crime label and focus on the strongest one. The medium face had its own set of complexities that demanded extra attention given the right criteria.

The participants had to determine the optimal chance of correctly selecting the right crime target. The choice may involve the resolution of two thought processes: evaluation of the ideal exemplar respective to label *against* the most probabilistic face, i.e., the prototype face (medium tone). As repeatedly shown in several studies, the darkest Black targets were often perceived as the strongest candidates for certain stereotypes (Blair et al, 2002, 2004; Maddox & Gray, 2002; Dixon & Maddox, 2005). The exemplar represents the most ideal phenotype therefore would elicit the most underlying associations (e.g., dark face would prime for criminality while light faces would prime innocence). On the other hand, as a prototype, medium faces have both qualities of dark and light faces (exemplars) which produced ambiguity. With this ambiguity, decisions concerning medium faces were more focused on perceived tangible information such as crime scene tone base rate. The participants would try to compare the majority face tone in the crime scene to the three faces they were shown. However, due to the 100 ms exposure rate of the crime scene, very little to no information was obtained. They were left to infer which face was most likely to match the crime scene. The medium tone face would be the preferable choice because it represented the perceived average/prototype, and is statistically most probable.

The similarity in visual attention between dark and medium tone faces was similar in both perpetrator and victim conditions. If the medium tone face was seen as a prototype, the average, it would also mean that the prototype should compete with light faces in the victim condition (making dark faces the least attended). The difference between dark and medium faces
should be seen equivalent to the difference between light and medium faces. This was not the case because there was no similarity in visual activity between medium faces and the exemplar light faces in the victim condition.

The extra attention to medium faces may have not mattered in the victim condition. The relationship between the person and target faces in each condition was also important to take into consideration because it shifted balance between the exemplar versus prototype conflict. In selecting the perpetrator, the person was directly faced with someone who can potentially harm them hence more motivation to carefully evaluate and resolve the exemplar versus prototype conflict. In that condition, medium faces would be visually attended to in a similar manner to dark faces. They, too, could possibly be harmful as the dark face exemplars. According to the Categorization-Individuation Model (Hugenberg, Young, Bernsein, & Shaco, 2010), in situations where motivation to know certain aspects about the out-group was high (such as the presence of threat in the perpetrator condition) people would visually scrutinize Afrocentric features to get the most information about the out-group. It was to their best interest to know the faces of potential attackers. One should note that dark and medium faces do have a greater degree of Afrocentricity (i.e., darker skin tone) than the light faces hence their greater attraction of attention and similarity amongst the two. Not only do these features served as warning marks, they also were factors in conjuring associations of threatening stereotypes.

In the victim condition where motivation to individuate was low, this scrutiny of Afrocentric features disappeared because it had lesser personal significance to the person (little to no level of threat). Afrocentric features may even undermine self-serving biases possibly explaining why medium faces did not have more attention than dark faces. Medium and dark faces were possibly treated as a homogenous pair. The exemplar versus prototype conflict was
not at the same magnitude between medium faces and light faces if any. Closer to their own tone, the participants paid more attention to light faces. Hypothetically, it might be an unconscious desire to pick the light Black face as a desirable or least-disliked exemplar of the out-group because it was most similar to the in-group. There was little motivation to evaluate the prototype face to the same extent in the perpetrator condition. The similarity between dark and medium faces suggested that participants perceived the two, equivalently, as less innocent. This can be seen as unwillingness to differentiate out-group individuals not close to the in-group’s ideal features. The out-group would be viewed homogenously as documented through the literature on the Other-Race Effect (Hugenberg et al, 2010).

The data for Time to First Fixation did not follow the general trend found in other eye-tracking variables. Regardless of condition, participants were immediately drawn to dark faces 54.17% of the time. One possible explanation could be that participants were primed by the general crime context of the study itself. Crime had been shown to have a strong association with Blacks (Eberhardt et al, 2004). Given this strong association, participants were initially drawn to the face with the strongest association which was the dark face. After the initial focus, visual attention would then shift into opposite directions respective to the perpetrator and victim condition. Another possibility, albeit less substantiated, could involve the saliency of the dark faces producing this visual phenomenon. Given a salient image, such as a face, people are quickly drawn to it (Yarbus, 1967). However, literature looking at the saliency of varying facial skin tone was scarce and limits the claim that dark Black faces were the most salient of the Black faces in the current study. Moreover, one could argue that a light toned Black face is more salient for White perceivers than a darker toned Black face.

*Biased Attention Does Not Necessitate Biased Behavior*
The nature of visual discrimination did not translate to discriminatory behavior as predicted by hypotheses 2 and 4. Participants were not inclined to select dark faces in the perpetrator condition. There was also no bias for light faces in the victim condition. The crime target choices were essentially random. For these White participants, there was no incentive to saliently show biased behavior in announcing certain crime targets as hypothesized. The motivation to avoid the subject of racism and not appear discriminatory was also a factor. Studies have found that overt biased behavior can be modified given that the person was aware of their racial biases and motivated to change (Dasgupta, 2004). The participants were well aware that all the people that they were selecting were Black. Visual activity, in of itself, was not affected by behavior modification due to the fact that they were not aware that visual data was collected until after the experiment. In addition, control of eye behavior can be described as automatic in nature therefore quite difficult to control.

*Implications for Racial Phenotype Bias*

The body of research covering the relationship between Whites and Blacks do not satisfactorily address the graded nature of out-group perception (Maddox, 2004). Maddox stressed this idea through his review of racial phenotype bias and the need for further research. In the review, Maddox has stated that amongst the Black community, there has been a prevailing belief that those who are the most Afrocentric (i.e., dark skin color) receive the brunt of the hatred. They trigger the strongest associations to negative stereotypes.

The visual data provided some evidence for differentiated scrutiny amongst Blacks of varying skin tone. However, the results do not necessarily show dark Black faces being visually attended to the most in the negatively associated condition. Medium faces were equally likely to be visually attended too. Although as a caveat, the participants were not measured with any self-
report scales. Looking only at the visual data, one can only definitively say that given a negative prime, dark and medium faces were attended to the most and evaluated similarly. More is needed to further investigate how the medium face is being evaluated in relation to the dark faces. There is still the possibility that the Black faces had the strongest association with the perpetrator prime.

On the other hand, visual data for light Black faces perfectly matched the predictions by racial phenotype bias theory. Light faces were least attended to in the negative perpetrator condition and most attended to in the positive victim condition. This finding paralleled other studies that support the claim that Whites judged light skinned Blacks more favorably than dark and medium skinned Blacks (Blair et al, 2002, 2004; Maddox & Gray, 2002; Dixon & Maddox, 2005).

_The Pervasiveness of Implicit Discriminatory Behavior_

People’s implicit attitudes often manifest itself in subtle negative behaviors such as unwillingness to smile, crossing of the arms, general irritability rather than overt behaviors. Despite the subtle nature, people of the targeted group such as Blacks are often aware of these behaviors, thereby potentially straining relations (Dasgupta, 2004). A dark skinned Black person can be overlooked for a job in favor of a light skinned Black person just because the employer had already started to form negative associations about him/her. The person in the position of power may not even realize that they are discriminating and thus inadvertently undermine the person. In situations like these, the victim’s livelihood would unnecessarily be burdened. In one of the worst situations, the victim could end up in a situation similar to Ronald Cotton who was wrongly accused of and jailed for rape. This misunderstanding was even not out of malice. Mrs.
Thompson-Cannino, the victim, did not realize a misjudgment of skin color from the real rapist would cost an innocent man’s freedom.

The current study has shown that by simply priming the label perpetrator, people will readily scrutinize the dark and medium faces more than the light faces despite any external reasons to do. As previously mention, the ability to control these implicit biases is often extremely difficult more so than overt behaviors. Blair and her research team (2004, study 3) demonstrated the difficulty in inhibiting these behaviors. However, it does not mean that nothing can be done about it. In the review by Dasgupta (2004), she discussed the rigidity of automatic behavior and how it varied. People can, to an extent, control some behaviors. However, they had to be aware of the bias and were motivated to do so.

*Future Goals*

There were a few questions that arose from the results of this study that need further investigation. The role of the medium face should be further looked at to see if it is internally categorized the same way as dark faces. The other reason for the similarity could be the result of perception that the medium face was equally appealing to participants but through a different thought process. This would support racial phenotype bias’s main claim. Racial phenotype bias described the medium face as the prototypical and black faces as the extreme deviation from the average. One would expect to see differential gaze pattern, however, no such difference was found. One possible way to investigate would involve the manipulation of the frequency of certain face tones in the crime scene and lower the exposure time of crime scenes.

The data in Time to First Fixation need further investigation. The current study did not have a crime neutral condition to compare with the perpetrator and victim condition. If the neutral condition fails to show the initial preference for dark faces, the crime context of the
experiment would be proven to have a priming effect. On the other hand, if the same pattern remains, it might be due to the characteristic of the dark faces (perhaps salience).

Eye-tracking’s Contribution to the Research

The present study has provided strong support in stating that implicit attitudes are ever present despite the desire to be egalitarian. People often choose to not physically manifest their racial attitudes and often describe themselves as not being racist, but its presence can linger. Numerous studies have devised methodologies to expose these implicit attitudes such as dot-probe tasks (Eberhardt et al, 2004) or Implicit Association Tests (Greenwald, McGhee, & Schwartz, 1998). These methodologies have also been successful in showing the presence of implicit attitudes. However, a limitation remained in that only inferences could be made. The major dependent measures for these methodologies consisted of reaction times.

With the current eye-tracking data, the visual data gave a very detailed description of how attention was allocated. There was much less inference the researcher had to make. Despite the failure to see any biased judgment choices of crime targets, the visual data showed that people were discriminatorily changing their viewing patterns of the different Black faces in accordance to the prime label.

This shows how powerful this tool can be in observing minute/subtle details. Given the preferential crime target result, without the eye-tracking technology, the researcher may have made a false conclusion that there was no significant data. Even in the event that the researcher had devised a method to physically record eye-movements by video, the chance for error would be higher than using an eye-tracker. In addition, the hours required to code the activity in the video would be strenuous.
The importance of methodology has often been underappreciated (Greenwald, 2012). Many would vehemently say theory is the main factor in driving research and innovation. Theory is indeed vital in the construction of studies. However, methodology is not of lesser importance either. In fact it is crucial in the reinvigoration of old theories and birth of new ones. New methodologies such as eye-tracking bring about a plethora of information that was unimaginable from previous generations. Greenwald emphasizes that the relationship between theory and methodology is synergistic in nature. Theories drive research which produces data which results in further refinement and creation of theories. Therefore, it would be to the benefit of scientists to push for methodologies that are innovative in nature to help facilitate the movement of data. Methodology can be analogized to the size of a funnel. The size of the funnel limits the rate of content flow. If methodology does not expand and innovate, then flow of content will be severely limited. Eye-tracking is one step further in facilitating the flow of content.
References


Figure 1. Generation of FaceGen Face, with certain criteria.
Figure 2. Sample Array of three Black male faces. Position of face type (tone) varied.
<table>
<thead>
<tr>
<th>Arrangement 1</th>
<th>Dark</th>
<th>Medium</th>
<th>Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrangement 2</td>
<td>Medium</td>
<td>Light</td>
<td>Dark</td>
</tr>
<tr>
<td>Arrangement 3</td>
<td>Light</td>
<td>Dark</td>
<td>Medium</td>
</tr>
</tbody>
</table>

*Figure 3.* Latin Square arrangement of faces according to skin tone.
Figure 4. Sample picture of crowded “crime scene.”
Figure 5. The Tobii T60 XL Eyetracker.
Figure 6. Placement of the AOI (Area of Interest). The current image displays one AOI on one face that covers the whole face.
Figure 7. Deceptive element. The FaceGen was used to simulate “advance photo-imaging techniques” in order give more credibility to the bogus claim that photos from crime scenes were extracted for presentation. The faces in the array were said to be taken from the crime scene images using special software (in reality the faces were computer generated).
Appendix A

CONSENT DOCUMENT
Rhode Island College

Visual Attention to Faces

You are being asked to participate in a research study about visual attention to faces. You were selected as a possible participant because you are at least 18 years of age. Please read this form and ask any questions that you may have before agreeing to be in the research.

Dr. Thomas E. Malloy, Professor of Psychology, is the principal investigator in this project and is conducting the study in collaboration with Mr. Sathiarith Chau and Dr. John Bulevich, both of the Department of Psychology at Rhode Island College.

Background Information
The purpose of this research is study how people process information in human faces.

Procedures
If you agree to be a participant in this research, you will be asked to do the following things:
- Come to the laboratory at a pre-arranged time
- View sets of faces on a computer screen
- Identify faces you have seen previously

Voluntary Participation
Your participation is completely voluntary. If you choose not to participate in this research, there will be no negative consequences to your grades. Also, you can change your mind about participating at any time with no negative consequences. Choosing not to participate or changing your mind will not affect your relationship or standing with Rhode Island College.

Risks and Benefits to Being in the Study
The risks of participating in this research are minimal, meaning that they are about the same as what you would experience in your normal daily activities. There are no direct benefits to you, although the information collected may help us to understand how visual attention functions.

Initial here to indicate that you have read and understood this page.
Confidentiality
The records of this research will be kept private. In any sort of report that might be published, the researcher will not include any information that will make it possible to identify you. Research records will be kept in a secured file, and access will be limited to the researcher, the Rhode Island College review board responsible for protecting human participants, and regulatory agencies. All data will be kept for a minimum of three years, after which it will be destroyed.

Contacts and Questions
The researcher conducting this study is Dr. Thomas E. Malloy. You may ask any questions you have now. If you have any questions later, you may contact him at tmalloy@ric.edu or 456-8177 for information).

If the researcher cannot be reached, or if you would like to talk to someone other than the researcher about (1) your rights as a research participant, (2) research-related injuries or problems, or (3) other issues/concerns you have about your participation in this study, please contact the Chair of the Institutional Review Board at IRB@ric.edu, or by phone (401-456-8228), or by writing, Chair, IRB; c/o Office of Research and Grants Administration; Roberts Hall; Rhode Island College; 600 Mount Pleasant Avenue; Providence.

You will be given a copy of this form for your records.

Statement of Consent
I have read and understand the above information, and I agree to participate in this study. I understand that my participation is voluntary and can be withdrawn at any time with no negative consequences. I have received answers to the questions I asked, or I will contact the researcher with any future questions that arise. I am at least 18 years of age.

Print Name of Participant: ________________________________

Signature of Participant: ________________________________ Date: __________
Appendix B

Debriefing Statement

Thank you for participating in our study. The purpose of the study was to see how people process information in human faces using eye-tracking software. All the faces you saw were generated by software and they were not real people. You were told that a target face was either a “perpetrator” or a “victim” of a crime. This was untrue, but was necessary to see how these labels affect the processing of information about human faces.

If you would like to learn more about this topic you can go to the website below where there is information of eye-tracking research.


If participating in this study made you feel upset, you can talk to me about it now, or you can contact the campus counseling center at 456-8094.
Table 1.

*Visual Attention Varies as a Function of Skin Tone and Label Condition*

<table>
<thead>
<tr>
<th>Label Condition</th>
<th>Perpetrator</th>
<th>Victim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Tone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark</td>
<td>1.42</td>
<td>1.29</td>
</tr>
<tr>
<td>Medium</td>
<td>1.43</td>
<td>1.33</td>
</tr>
<tr>
<td>Light</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Fixation Duration (seconds)*</td>
<td>1.42</td>
<td>1.29</td>
</tr>
<tr>
<td>Fixation Count</td>
<td>4.07</td>
<td>3.94</td>
</tr>
<tr>
<td>Total Visit Duration (seconds)*</td>
<td>1.48</td>
<td>1.34</td>
</tr>
<tr>
<td>Visit Count*</td>
<td>2.50</td>
<td>2.49</td>
</tr>
<tr>
<td>Time to First Fixation (seconds)</td>
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<td>0.61</td>
</tr>
</tbody>
</table>

Note: Fixation Count was marginally significant with \( p = .09 \) and followed the general visual pattern of the other analyses.

\*\( p < .05 \)