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Attention to and Categorization of Monoracial and Racially Ambiguous Faces

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ABSTRACT PAGE

The current study aimed to extend past research on neural attention to monoracial and racially ambiguous faces during a social categorization and implicit affective task. Additionally, the study examined the role of implicit and explicit prejudice in neural processing of monoracial and racially ambiguous faces. White college student participants (n=45) completed a social categorization task in which they viewed monoracial and racially ambiguous faces and categorized them as either Black or White. They also completed the Affect Misattribution Procedure (AMP). EEG data were recorded for both tasks. Neural attention in the social categorization task reflected that participants processed racially ambiguous faces more similarly to White ingroup faces than Black outgroup faces. Neural components to the AMP, however, showed no differences, and were not correlated with ERPs in the social categorization task. ERP amplitude as well as behavioral AMP scores were correlated with individual difference measures of explicit prejudice. These results indicate a fundamental difference in the social categorization task and the AMP in that the categorization task causes participants to focus on category-relevant perceptual information while the AMP causes them to attend to more identity-relevant information.

COMPLIANCE PAGE

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Introduction

Over the last decade, researchers have examined the neural processing of faces that differ on the basis of social categories such as race. Evidence using electroencephalograph (EEG) has indicated that people attend to racial information as early as 200 milliseconds after seeing an unknown face (e.g., Dickter & Bartholow, 2007; Ito & Urland, 2003, 2005). Social neuroscience research examining event-related potentials (ERPs) has investigated the processing of individuals belonging to racial categories, and this work has demonstrated that the neural processing of racial outgroup targets diverges in several early ERP components associated with implicit attention (Dickter & Bartholow, 2007; Ito & Urland, 2003, 2005; Willadsen-Jensen & Ito, 2004, 2006). Although this work is in its infancy (see Bartholow & Dickter, 2011, for a review), it is an important area to explore as examining the neural processes involved in race perception can aid in the understanding of the processes associated with stereotyping and prejudice.

Several early attentional ERP components have been implicated in the processing of race. The P2 occurs around 200 ms post-stimulus, and is typically maximal at anterior and central locations. The P2 is typically thought of as a visual attentional component, such that a larger amplitude is associated with greater attention to a given stimulus (Hillyard & Munte, 1984; Luck & Hillyard, 1994; Ritter, Simson, & Vaughan, 1983; Wijers, Mulder, Okita, Mulder, & Scheffers, 1989). The P2 component has been shown to be larger when perceivers are engaging in racial outgroup processing relative to racial ingroup processing (Dickter & Bartholow, 2007; Dickter & Kittel, in press; Ito & Urland, 2003, 2005). The N2 component peaks at about 200-400 ms post-stimulus and is typically maximal at fronto-central scalp locations. The amplitude of the N2 is generally larger for racial ingroup faces compared to racial outgroup faces (Dickter & Bartholow, 2007; Ito & Urland, 2003, 2005). The P3 is strongest over the parietal lobe, occurring approximately 300-600 ms post-stimulus. P3 amplitude is sensitive to stereotype violations, such that incongruent trials produce a larger amplitude and longer latency (Ito & Bartholow, 2009; Bartholow, Dickter, & Sestir, 2006). The P3 is also a neural indicator of the evaluation and categorization of stimuli in that the P3 tends to be larger for complex or emotionally charged stimuli (Bartholow & Amodio, 2009; Bartholow & Dickter, 2007, 2011). P3 amplitude is generally larger to racial outgroup compared to racial ingroup faces (e.g., Dickter & Bartholow, 2007).

Most of the studies examining racial processing have focused on the neural processing associated with monoracial faces that can be easily identified into a racial group, but several recent studies have begun to examine the processing of faces that cannot be easily placed into one racial category. It is important to study individuals of this group, as population estimates indicate that the number of biracial and multiracial individuals has increased over 50% since 2000 (U.S. Census, 2010). Because of this large increase in the multiracial population, research on the processing of racially ambiguous faces is becoming increasingly relevant. Recent work has indicated that racially ambiguous faces are processed more similarly to ingroup faces than outgroup faces (Dickter & Kittel, in press; Willadsen-Jensen & Ito, 2006). These researchers have suggested that this occurs because perceivers are attending to features that differentiate outgroup members from ingroup members. That is, because racially ambiguous faces may share some of the same perceptual features as the ingroup faces, they are not processed as “different” from ingroup faces (Dickter & Kittel, in press; Willadsen-Jenses & Ito, 2006).

Behavioral work, however, has indicated that when asked to quickly categorize racially ambiguous faces, individuals tend to rely on the theory of hypodescent, or the “one-drop rule”, an idea dating back to the Civil War that suggests that a person with even one drop of Black blood tends to be categorized as Black (Banks & Eberhardt, 1998; Leyens & Yzerbyt, 1992; Peery & Bodenhausen, 2008). For example, studies have demonstrated that Black-White biracial faces tend to be racially categorized as Black much more often than White when forced to choose between Black and White categorization or when given additional options (e.g., “other”; Dickter, Kittel, & Newton, 2012). Although researchers are beginning to shed some light on the racial categorization and the neural processing of racially ambiguous individuals, more work needs to be done on the discrepancy between the neural processing of these faces and the behavioral racial categorization.

One factor that may affect the processing of monoracial and racially ambiguous faces is implicit prejudice. Implicit prejudice is defined as “actions or judgments that are under the control of automatically activated evaluation without that performer’s awareness of that causation” (Greenwald & Banaji, 1995, p. 7). Cunningham and colleagues (Cunningham, Johnson, Raye, Gatenby, Gore, & Banaji, 2004) found that participants higher in implicit prejudice showed greater amygdala activation in response to Black faces compared to White faces. A study by Hugenberg and Bodenhausen (2004) found that participants higher in implicit prejudice were more likely to categorize racially ambiguous faces as Black when the faces were angry compared to happy. Participants low in implicit prejudice showed no differences in categorizing racially ambiguous faces based on facial expression, but participants who scored high on implicit prejudice were more likely to categorize angry racially ambiguous faces as Black than White. This effect was not present for happy faces. The researchers suggested that because Blacks tend to be stereotypically associated with violence and hostility, participants who are high in prejudice let this stereotype control their categorization (Hugenberg & Bodenhausen, 2004). This previous study used the Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) to measure implicit attitudes by pairing categories (e.g., Black names and White names) with evaluative words (e.g., good and bad), and having participants sort the words into their proper categories. Reaction time differences between congruent (e.g. White and good) trials and incongruent trials (e.g Black and good) are expected to reveal levels of implicit prejudice (Greenwald, McGhee & Schwartz). However, critics of the IAT have suggested that it does not measure implicit prejudice but rather cognitive task-switching abilities (Mireke & Klauer, 2001; Bredl, Markman & Messer, 2001; Gawronski, 2002) or familiarity (not necessarily endorsement) of the cultural stereotypes (e.g., Dasgupta, Greenwald, & Banaji, 2002). A more reliable and valid test of implicit prejudice, the Affect Misattribution Procedure (AMP), was designed by Payne and colleagues (2005) to examine implicit attitudes by investigating the misattributions people make about their affective reactions to stimuli. In this paradigm, participants are shown a photograph prime followed by a Chinese pictograph and asked to rate it as pleasant or unpleasant. Because the target stimuli are inherently neutral to people with no prior knowledge of Chinese language, participants implicitly base their evaluation of the target picture on the preceding prime. AMP results show that White participants tend to rate pictographs following White primes more positively than those following Black primes (Payne, Cheng, Gorovun, & Stewart, 2005), demonstrating Whites' implicit bias towards Blacks. This effect is correlated with explicit prejudice towards Blacks, such that participants who show a greater bias on feeling thermometers for Blacks and a lower score on the Internal Motivation to Respond without Prejudice scale showed a greater bias against Blacks on the AMP (Payne et al., 2005). The current study aimed to examine the relationship between implicit and explicit prejudice and the processing and categorization of monoracial and racially ambiguous faces.

The current study was also designed to investigate the effect of task parameters on early attention to monoracial and racially ambiguous faces by using both a social categorization task and the AMP. Social categorization tasks ask the participant to make a racial judgment, causing the participant to attend to category-relevant features (Hugenberg, Young, Bernstein, & Sacco, 2010), while the AMP asks participants to make evaluative judgments, activating identity-relevant information (Hugenberg, et al., 2010). This study aimed to examine whether the same monoracial and racially ambiguous faces would be processed differently when participants were racially categorizing the faces versus when they were engaging in an implicit affective task. To examine processing, early attentional ERPs were examined during both tasks. We expected to replicate previous work showing that in the social categorization task, racial ingroup and outgroup faces would be processed differently in these early ERP components (e.g., Dickter & Bartholow, 2007; Ito & Urland, 2003, 2005) and the processing of racially ambiguous faces would not differ from that of ingroup faces (Dickter & Kittel, in press;

Willadsen-Jensen & Ito, 2006). Because participants are making evaluative judgments in the AMP, we expected no differences between target race in the processing of the faces.

Another goal of this study was to examine the relationship between the neural processing of monoracial and racially ambiguous faces and prejudicial responses on behavioral tasks. Research has demonstrated that, as a result of racial categorization, schemas are activated which contain both positive and negative stereotypes about that category (Brewer, 1988). Thus, activating a social category may lead the perceiver to activate and ascribe traits associated with the category to the individual being perceived (Darley & Gross, 1983; Fiske & Neuberg, 1990), and this stereotype activation can have consequences for behavior (Bargh, Chen, & Burrows, 1996). For example, laboratory studies have shown that participants are quicker to identify words consistent with a Black stereotype (e.g., violent, lazy) when the 'Black' category is activated in memory than when the 'White' category is activated (e.g., Fazio, Jackson, Dunton, & Williams, 1995). However, less research has examined whether differences in racial processing leads to differences in explicit prejudicial behavior. Explicit prejudicial behavior is difficult to assess in a laboratory setting, but a variety of tasks have been developed to assess behavior in this way. Of interest for this study are the sentencing decision tasks (e.g. Gordon, Bindrim, McNicholas, & Walden, 1988) and the job applicant selection task (e.g. Dovidio & Gaertner, 2000). In the sentencing decision task designed by Gordon and colleagues (1988), participants read a series of descriptions of crimes in which the race of the defendant and the type of crime (burglary or embezzlement) are manipulated. Participants then rate the severity of the crime, decide how long they the defendant should be in jail, and how likely the defendant is to commit the crime again. Explicit prejudicial behavior against Blacks is determined by responses on these measures to Black defendants relative to White defendants. Previous work has found that regardless of the crime, participants rated Black perpetrators as more likely to offend again compared to White perpetrators. They also gave Black defendants longer sentences when they read the burglary scenario. This task has been repeated and used in a variety of studies throughout the field of psychology (see Merrall, Dhami, & Bird, 2010 for a review.) The job applicant task created by Dovidio and Gaertner (2000) gives participants a resume to evaluate for a student peer counselor position. The resume is manipulated to be strong, ambiguous, or weak, and the race of the applicant is manipulated in a list of student activities to reflect racial information (e.g., Black Student Organization). Participants are then asked how qualified the candidate was for the position and whether or not they would recommend the student for the position. Participants' ratings of the Black compared to the White candidate are indicative of explicit prejudicial behavior against Blacks. Previous work has found that though the participants rated the candidates with the strong resume as more qualified than either the ambiguous or weak resumes, Black candidates whose resumes were ambiguous were recommended less strongly than White candidates with similar resumes (Dovidio & Gaertner, 2000). Both of these tasks aim to assess prejudicial behavior in a controlled lab setting, and help shed light on racial information in decision making. The current study aimed to investigate whether the neural processing of monoracial and racially ambiguous faces would affect prejudicial responses on behavioral tasks. One previous study by Dickter and Bartholow (2007) found that the early processing of target race facilitates later racial categorization, suggesting that this could have implications for prejudicial behavior, but no studies have examined whether this is the case. Based on this finding, we expected to find a relationship between the neural processing of the target faces and explicit prejudicial behavior such that greater differences in ingroup-outgroup processing in the early attentional components would lead to greater bias against Black compared to White individuals in the explicit tasks. However, given the nature of the explicit prejudicial tasks, it is possible that a self-presentation bias may obscure this effect.

Finally, explicit individual difference measures have been indicated to play a role in the processing of monoracial (Kreindler, 2005; Amodio, Harmon-Jones & Devine, 2003) as well as racially ambiguous faces (Dickter & Kittel, in press). For example, for monoracial faces, Amodio and colleagues (2003) found that participants who had a higher Internal Motivation to Respond Without Prejudice (IMS; Plant & Devine, 1998) showed a decreased affective response to Black faces compared to those who scored lower on IMS. With racially ambiguous faces, participants who were high in the ambiguity (i.e. had a lower tolerance for ambiguity), order (i.e., had a higher preference for structure), and predictability (i.e., have a high need for predictability) subscales of the Need for Closure (Kruglanski, 1993) were more likely to categorize a racially ambiguous face as Black following a negative stereotypic prime compared to a positive stereotypic prime (Dickter & Kittel, in press). Additionally, another study found that participants high on the Social Dominance Orientation (i.e., had a high preference for social hierarchies and inequalities; Sidanius & Pratto, 1999) were more likely to categorize racially ambiguous faces as Black following a Black stereotype prime compared to a White stereotype prime (Dickter, Kittel, & Newton, 2012). Because these previous studies suggest that individual differences in explicit prejudice may moderate racial categorization, this study aimed to further investigate the role of individual difference measures in the processing and categorization of monoracial and racially ambiguous faces in both the social categorization task as well as the implicit affective task. Thus, we conducted an exploratory analysis of a series of personality traits and prejudice measures to investigate this relationship.

Method

Participants

Participants were 45 (26 female) White undergraduates from a medium-sized liberal arts college between the ages of 17 and 22 ($M = 18.71$, $SD = 0.97$). None of the participants reported previous head trauma, and all were right-handed. Participants were given partial course credit for participation. All procedures were approved by the school's Protection of Human Subjects committee, and written consent was obtained from each participant.

Stimuli

Photographs of 23 White and 23 Black males, as well as 20 racially ambiguous digital morphs of males featuring head shots with a white background were used. Each face displayed a neutral expression and no identifying clothing or jewelry was visible. The face made up approximately 70% of the picture area. All individuals in the pictures had a neutral facial expression and direct eye gaze. The racially ambiguous faces were created by digitally morphing a Black parent face with a White parent face using Morpheus Software *(www.morpheussoftware.net).* All of the faces were previously pilot tested to assure consistency in attractiveness and familiarity, as well as ambiguity in the biracial faces; the results are reported in a previous paper (Dickter & Kittel, in press).

Categorization Task

Participants completed a categorization task in which they were presented with a photograph of a White, Black, or racially ambiguous face and were asked to categorize the face as either Black or White with a key press (counterbalanced across participants). Each trial contained a fixation cross which appeared on the screen for 500ms, followed by the target photograph, which was was presented on the screen until the participant categorized the face. There were a total of 66 trials with an intertrial interval that varied between 500ms, 750ms, and 1000ms.

Affect Misattribution Procedure (AMP)

This task was designed to examine implicit affective responses to stimuli (Payne et al., 2005). It has been previously used to investigate implicit racial attitudes towards White and Black faces and is more reliable and has greater validity than other implicit affective tasks such as the Implicit Association Task (Payne, et al., 2005). The AMP in the current study consisted of a prime photograph (i.e., facial stimuli described above) presented for 200ms, followed by a blank screen for 125ms, and then a target picture (i.e., Chinese pictograph). This was modified from the original timing of the AMP paradigm, in which the prime is presented for 75ms, followed by a blank screen for 125ms, a target picture for 100ms, and then a "mask" until the participant categorizes the target. The timing was modified in the current study to be able to examine early attention to the primes and to examine neural processing of the picture without interference from stimulus offset. Target pictures consisted of 66 Chinese pictographs selected for neutral content by Payne, Cheng, Govorun, and Stewart (2005). The target picture remained on the screen until the participant indicated whether they felt the pictograph was pleasant or unpleasant by a key press on the keyboard (counterbalanced across participants). Because participants who are not familiar with Chinese do not have any previous emotional associations with these pictographs, the evaluation of the pictograph is implicitly related to the preceding prime. All participants who indicated familiarity with Chinese were excluded from the analyses.

Behavioral Measures

Two behavioral measures were created to examine the relationship between prejudice against Blacks and attentional processing in the EEG. These measures consisted of a job applicant task and a sentencing decision task. These tasks were chosen because they are a good measure of behavioral prejudice against Blacks (Whitley & Kite, 2006). The job applicant task was based on a similar task used by Dovidio and Gaertner (2000). Participants were asked to read the resume of two job applicants, one of whom was applying to a research assistant position, and one who was applying for a peer counselor position. Both resumes contained similar information about GPA, leadership experience, and extracurricular activities, but the names of the applicants were changed to reflect race. Brett O'Connell was used to signify a White applicant, and Tyrone Washington was used to signify a Black applicant. These names were chosen because they are considered common names for their respective race (Social Security Administration, 2011). In addition, these names were pilot-tested to ensure that participants recognized the names as belonging to Black or White targets; results are reported in a previous paper (Newton, Dickter, & Gyurovski, 2011). Participants were asked how qualified they believed the applicant was for the position and how strongly they would recommend the applicant using a Likert scale that ranged from 1 ("not at all") to 10 ("very much"). They were also asked whether or not they would recommend the applicant for the position, and on what they based their decision. Raw scores for how qualified the applicant was and how strong they would recommend the applicant, as well as difference scores calculated from subtracting scores from the Black applicant from scores from the White applicant were used in the analysis as indices of prejudice.

The sentencing decision task was based on work by Gordon and colleagues (Gordon, Bindrim, McNicholas, & Walden, 1988). Participants were given descriptions of four fictional crimes. Two of the stories described situations where the perpetrator broke in to a home and stole $10,000 worth of positions, and two described situations in which the perpetrator had been drinking and was involved in a serious car accident where another party was seriously injured. The names of the perpetrators reflected whether the perpetrator was White or Black. Names were chosen in the same way as the job applicant task. Participants were asked to rate the severity of the crime on a scale from 1 ("not severe at all") to 10 ("extremely severe") and assign the perpetrator a prison sentence between 1 and 99 years. An average severity score and average sentence was created for both race and crime type categories. Difference scores were also created by subtracting the average severity score or sentence for Blacks from the same score for Whites. Higher sentences for the Black compared to the White perpetrators were indicative of more relative explicit prejudice to Black versus White individuals.

Questionnaires

Several personality measures were used: the Need for Closure Scale (NFC), the Social Dominance Orientation Scale (SDO), the Motivation to Respond without Prejudice Scale (MRPS), the Attitudes Toward Blacks scale (ATB), a feeling thermometer scale, an outgroup familiarity scale adapted from Brigham (1993) and Walker, et al. (2008). These scales were completed as one questionnaire on a computer after the participant completed the categorization task.

The NFC (Kruglaski, 1993; α=.84) is a 47-item measure that identifies the participants' need for clarity in rules and answers through a 6-point scale ("disagree strongly" to "agree strongly"). Five factors of this need for closure are measured: order (e.g "I think that having clear rules and order at work is essential for success"), predictability (e.g. "I don't like to go into a situation without knowing what I can expect from it."), decisiveness (e.g. "I usually make important decisions quickly and confidently"), ambiguity (e.g. "I feel uncomfortable when I don't understand why an event occurred in my life."), and closed-mindedness (e.g. "I dislike questions that could be answered in many different ways.". Participants scoring high on this scale possess a need for clarity and predictability.

SDO (Sidanius & Pratto, 1999; α =.92) is an indicator of an individual's preference for social inequalities. This was assessed through the 16-item scale that measures domination and discrimination. Participants answered questions such as "some groups of people are simply inferior to other groups" on a 7-point scale that ranged from "very negative" to "very positive", indicating their attitude about the statement. High scores are related to high levels of outgroup bias.

The MRPS (Devine & Plant, 1998; α=.81) consists of two scales designed to measure the degree to which participants wished to appear non-prejudiced. The Internal Motivation Scale (IMS) measures personal motivation for responding without prejudice (e.g "I attempt to act in non-prejudiced ways toward Black people because it is personally important to me."). The External Motivation Scale (EMS) measures external pressures to respond without prejudice (e.g. "I try to hide any negative thoughts about Black people in order to avoid negative reactions from others."). Each statement was rated on a 7-point scale from "strongly disagree" to "strongly agree." A high need and motivation to appear non-prejudiced was indicated by a higher score.

Self-reported racial prejudice was measured by the ATB (Brigham, 1993; α=.88). This measure was 20 items long and assessed the agreement with statements such as "Black and Whites are inherently equal" (reverse-coded) on a 7-point scale ("strongly disagree" to "strongly agree"). Higher scores on the ATB reflected higher levels of explicit racial prejudice against Blacks.

The feeling thermometer measure was composed of three scales—a thermometer for White, Black, and multiracial individuals. Participants were asked to rate how warm or cold they felt toward to each of these groups on a scale from 0 to 10. Individual scores on each feeling thermometer reflected the degree of warmth for each racial group. Difference scores were also calculated by subtracting the rating for either Black or multiracial individuals from the rating for Whites. A higher difference score indicates a greater degree of warmth towards Whites compared to Blacks and multiracial individuals. A difference score was also calculated by subtracting the rating for multiracial individuals from the rating for Blacks. A higher difference score here indicates a greater degree of warmth towards Blacks compared to multiracial individuals.

Finally, the outgroup familiarity scale combined and adapted both Brigham's (1993) outgroup familiarity scale and Walker, et al.'s (2008) quality of social contact measure to identify familiarity with Whites, Blacks, and multiracial individuals as well as the quality of contact with these individuals. Participants were asked both about the proportions of Blacks, Whites, and multiracial individuals in their elementary, middle and high schools, as well as their current experiences with both Black and multiracial individuals (e.g."How many Blacks do you know on a first name basis?").

Participants were also asked several demographic questions, including gender, age, race, and sexual orientation, and were asked about their familiarity with Chinese language.

Procedure

Testing was conducted with one participant at a time. Upon arriving in the laboratory, participants completed an informed consent form and the EEG procedure was explained. Participants were seated in front of a computer in a Faraday cage and all the electrodes were attached and tested to assure low impedances. Participants sat approximately 70 cm from the computer screen and were instructed to stay as still as possible during the trials in order to reduce noise in the EEG data. After this preparation, participants first completed a categorization task, where they were presented with a photograph of a White, Black, or racially ambiguous face and were asked to categorize the face as either Black or White with a key press. After this task, participants then completed the AMP. Instructions were presented on the screen informing participants to identify the Chinese pictograph as either pleasant or unpleasant by pressing one of two keys on a computer keyboard. The task included one block of 66 trials and lasted approximately 10 minutes. After completing the task, the electrode cap was removed and participants completed the personality measures on the computer using Qualtrics survey software (www.qualtrics.com). When participants were finished with the online questionnaire, they were debriefed, thanked, and dismissed.

Electrophysiological Recording and Analysis

EEG data were recorded using a DBPA-1 Sensorium Bioamplifier (Sensorium Inc., Charlotte, VT) with an analog high-pass filter of 0.01 Hz and a low-pass filter of 500 Hz (four-pole Bessel). The EEG was recorded from 74 Ag-AgCl sintered electrodes in an electrode cap, placed using the expanded International 10-20 electrode placement system. All electrodes were referenced to the tip of the nose and the ground electrode was placed in the middle of the forehead, slightly above the eyebrows. Eye movement and blinking were recorded from bipolar electrodes placed on the lateral canthi and peri-occular electrodes on the superior and inferior orbits, aligned with the pupils. Before data collection was initiated all impedances were adjusted to within 0-20 kilohms. EEG was recorded continuously throughout the computer task, and was analyzed offline using EMSE software (Source Signal Imaging, San Diego, CA). Data were undersampled at 500 Hz. The data were segmented between 200 ms prior to stimulus onset and 1000 ms post stimulus onset. After baseline correction over the pre-stimulus interval segmented data was averaged for each subject in each of the conditions. Sample-wide ERPs were identified from the grand-averaged waveforms.

Results

Analyses were conducted with participant gender as a between-subjects variable for all of the following analyses, but no significant differences were found, so gender effects are not discussed further.

Psychophysiological Responses to Categorization Task

Five participants were excluded from EEG analysis because of excessive noise in the data. Analyses were conducted with the remaining 40 participants. Visual inspection of the grand averaged waveforms across all participants identified that the categorization task elicited P2, N2, and P3 components. P2 was maximal at the FPz electrode, and was thus quantified as the average amplitude at that electrode between 108ms and 192ms. The N2 component was quantified between 144ms and 240ms as the average amplitude between the FT7, FT9 and FT10 electrodes. The P3 component was quantified at the FPz electrode between 196ms and 580ms. In order to examine differences in early attention to the targets, a repeated measures ANOVA for each ERP component was conducted with target race as the independent variable.

P2. The effect of target race on P2 amplitude was significant, $F\ (2, 76) = 5.60$, p=.005, η^2=.128. As shown in Figure 1, tests of simple main effects reveal that the P2 amplitude was greater in response to Black targets (M=1.91, SD=0.71) than to either White (M=-0.34, SD=0.64), t(38)=2.81, p=.008, or racially ambiguous targets (M=-0.31, SD=0.73), $t(38) = 3.09$, p=.004, indicating that participants demonstrated greater attention to the Black targets than either the White or racially ambiguous targets. There was no significant difference between White and racially ambiguous targets, t(39)=0.00, p=.999.

N2. For the N2 component, the effect of target race was significant, F(2, 76)=7.30, p=.001, η^2=.161. As displayed in Figure 2, tests of simple main effects revealed that N2 amplitude was larger to White targets (M=-1.28, SD=0.76) than to Black targets, (M=1.22, SD=0.63), t(38)=3.27, p=.002. The amplitude was also larger to racially ambiguous targets (M=-1.00, SD=0.54) compared to Black targets, t(38)=3.43, p=.001.

There were no significant difference in N2 amplitude between White and racially ambiguous targets, $t(39)=-0.63$, $p=.530$

P3. For P3 amplitude, the effect of target race was significant, $F(2,76)=11.95$, $p<.001$, $\eta^2=0.239$. Tests of simple main effects indicated that P3 amplitude was larger to Black targets ($M=6.19$, $SD=1.12$) than to White targets ($M=1.64$, $SD=0.72$), $t(38)=4.40$, $p<.001$ and racially ambiguous targets ($M=1.97$, $SD=1.12$), $t(38)=3.83$, $p<.001$. There was no significant difference in P3 amplitude between White and racially ambiguous targets, $t(39)=-0.13$, $p>.897$.

Behavioral Responses to Categorization Task

To examine whether racial categorization (i.e., Black, White response) would differ based on the type of trials, response proportions were calculated by dividing the number of Black and White responses by the total number of trials for each condition. Data from one participant were excluded because of a failure to follow instructions. To examine the effect of target race on response, a repeated measures ANOVA was conducted. This test revealed a significant target race x response race interaction, $F(2, 88)=1247.31$, $p<.001$, $\eta^2=0.966$, Tests of simple main effects revealed that White faces were more often categorized as White ($M=0.97$, $SD=0.01$) than Black ($M=0.03$, $SD=0.01$), $t(44)=73.01$, $p<.001$, and Black faces were more often categorized as Black ($M=0.97$, $SD=0.00$) than White ($M=0.03$, $SD=0.00$), $t(44)=108.41$, $p<.001$. However, despite processing the racially ambiguous faces more similarly to White faces, participants tended to categorize these faces as Black ($M=0.74$, $SD=0.02$) more often than White ($M=0.26$, $SD=0.02$), $t(44)=10.49$, $p<.001$.

To examine whether reaction time would differ based on condition and response, response times were averaged across Black and White responses for each target race condition. Monoracial trials were not included in the analysis because response rates were extremely high in identifying White and Black monoracial faces, and most participants thus had an extremely small number of trials (if any) for the incorrect responses (mean error rate = 5%). Therefore, a paired-samples t-test was conducted to examine the effect of response race on reaction time for the racially ambiguous trials. Results revealed that participants were significantly faster when categorizing racially ambiguous targets as Black (M=767.72, SD=34.67) than as White (M=940.61, SD=72.84), $t(42)=3.35$, $p=.002$.

Furthermore, to test whether reaction times would vary as a function of the race of the target, RTs for each condition (Black, White, racially ambiguous) were averaged across all responses and a repeated measures ANOVA with target race as the independent variable was conducted. Results revealed that there were significant differences in reaction time across all races, $F(2, 84) = 39.97$, $p<.001$, $\eta^2=.488$. Participants were faster to categorize Black targets (M=565.49, SD=15.50) than either White targets (M=631.67, SD=22.46), $t(44)=4.04$, $p<.001$ or racially ambiguous targets (M=854.17, SD=50.89), $t(42)=7.07$, $p<.001$. Participants were also faster to categorize White targets compared to racially ambiguous targets, $t(42)=5.83$, $p<.001$.

Psychophysiological AMP Data

The P2, N2, and P3 components for the AMP were examined to test whether amplitude to the White, Black, and racially ambiguous faces would differ as a function of race. The P2 component was quantified at electrode Pz between 256ms and 380ms. The

N2 component was quantified at electrode Fz between 324ms and 476ms. The P3 component was quantified at electrode Pz between 384ms and 784ms. Results revealed no significant differences between any of the three race conditions on any of the components.

Behavioral AMP Data

Data from four participants were excluded due to familiarity with the Chinese language ($n = 2$) or a failure to follow the instructions for the task ($n = 2$). Thus, analyses were conducted with 41 participants. Similar to Payne and colleagues (2005), the proportion of pleasant responses to each target was calculated, and a repeated-measures ANOVA was used to examine whether the proportion of pleasant responses would differ as a function of prime race (White, Black, racially ambiguous). Results indicated a main effect for Prime Race, $F(2, 80) = 4.81$, $p = .011$, $\eta^2 = .107$. Simple main effects revealed that the proportion of pleasant responses to White targets (M=0.54, SD=0.13) was smaller than the proportion of pleasant responses to racially ambiguous targets (M=0.61, SD=0.12), $t(41)$=-2.95, p=.005 or Black targets (M=0.61, SD=0.15), $t(41)$=-2.09, p=.043. Proportions of pleasant responses to Black and racially ambiguous targets did not differ from one another, $t(41) = -0.27$, p>.05.

Explicit Behavioral Tasks

Job Applicant Task. Paired samples t-tests were conducted to examine differences between ratings of the White and Black job applicants. Participants rated the Black job applicant (M=6.81, SD=0.24) as more qualified for the position than the White job applicant (M=5.81, SD=0.30), $t(44) = -3.57$, p=.001. They also recommended the

Black job applicant (*M*=6.56, *SD*=0.25) more strongly than the White job applicant (*M*=5.44, *SD*=0.25), $t(44) = -3.44$, $p=.001$.

Sentencing Decision Task. A repeated measures ANOVA was conducted to examine the effect of perpetrator race and crime on ratings of severity. A significant main effect for race was found, $F(1, 43)=9.48$, $p=.004$, $\eta^2=0.181$, such that ratings of severity were higher for White perpetrators (*M*=7.34, *SD*=0.15) than for Black perpetrators (*M*=6.96, *SD*=0.16). There was also a main effect for type of crime, $F(1, 43)= 46.46$, $p>.001$, $\eta^2=0.519$, such that ratings for severity were higher for drunk driving (*M*=7.96, *SD*=0.18) than for burglary (*M*=6.35, *SD*=0.19). The interaction between race and crime was not significant.

A second repeated measures ANOVA was conducted to examine the effects of race and crime type on sentence length. The main effect for race was marginally significant, $F(1, 43) = 3.96$, $p=.053$, $\eta^2=.084$, such that White perpetrators (*M*=17.69, *SD*=1.99) were given higher sentences than Black perpetrators (*M*=15.40, *SD*=1.91). There was also a significant main effect for crime type, $F(1.43) = 20.25$, $p<.001$, $\eta^2=.320$, such that higher sentences were given for drunk drivers (*M*=23.46, *SD*=3.29) than those who committed burglary, (*M*=9.34, *SD*=0.90). The interaction between race and crime type was not significant.

Individual Differences

Means and standard deviations of all individual difference variables are presented in Table 1.

Correlations between Measures

In order to examine correlations between individual differences measures and the AMP, three separate difference scores were obtained to provide measurements of bias between different racial groups. The first difference score (White – Black) was calculated by subtracting the proportion of pleasant responses to Black targets from the proportion of pleasant responses to White targets. A larger difference score indicated a greater bias toward White faces. The second score (White – Ambiguous) was calculated for White and racially ambiguous targets. A more positive difference score indicated greater bias toward the White targets. A final difference score (Black – Ambiguous) was also calculated by subtracting the proportion of pleasant responses to racially ambiguous targets from the proportion of pleasant responses to Black targets. A larger score indicated greater bias toward Black faces. The White – Black and White – Ambiguous bias scores were positively correlated with ATB, NFC Order, and SDO, and negatively correlated with IMS, social contact, individuating experience, and feeling thermometer ratings for Black and multiracial individuals. Additionally, the White-Ambiguous bias score was positively correlated with NFC Predictability, proportion of White friends, and childhood exposure to Whites. This bias score was also negatively correlated with the proportion of multiracial friends. Overall, more positive evaluations of Whites on the AMP were associated with higher levels of explicit prejudice and familiarity with Whites, and lower levels of familiarity with multiracial individuals. The Black – Ambiguous bias score was not significantly correlated with anything. All correlations are reported in Table 2.

Correlations between individual difference measures and the amplitude of each of the ERP components to each racial target condition were also calculated, using both the raw amplitude as well as the following bias difference scores. The first difference score (White – Black) was calculated by subtracting the amplitude to Black targets from the amplitude to White targets. The second bias score (White – Ambiguous) was calculated by subtracting amplitude to ambiguous targets from amplitude to White targets. A final difference score (Black – Ambiguous) was calculated by subtracting amplitude to ambiguous targets from amplitude to Black targets. Analysis of the raw amplitude to White and ambiguous targets revealed that all three components were negatively correlated with childhood exposure to Blacks. In addition, the White – Ambiguous P2 bias score was negatively correlated with NFC Order, $r(37)=-.416$, $p=.009$. All correlations are reported in Table 3. No other significant correlations were found.

Finally, correlations between the individual difference measures and the scores for both explicit behavioral tasks were analyzed, but none of these correlations reached significance.

Discussion

The goal of the current study was to extend past research by examining White college students' neural attention to and the categorization of monoracial and racially ambiguous faces during a racial categorization task and an implicit affective task. In addition, the current study was designed to examine whether this processing was related to implicit and explicit measures of prejudice. Results indicated that when simply asked to categorize target faces as White or Black, racially ambiguous faces were more often categorized as Black, but implicit attention, as measured by early attentional ERP components, was directed in a manner consistent with the White ingroup faces. Both the behavioral and psychophysiological results in the social categorization task are consistent with previous research (Dickter & Kittel, in press; Dickter, Kittel, & Newton, 2012; Willadsen-Jensen & Ito, 2006, 2008). On the other hand, when participants were completing the implicit affective task, no neural differences between target processing were evident, although behaviorally, participants had a higher proportion of pleasant responses to Black and racially ambiguous targets than they did for White targets. The behavioral findings are in direct conflict with previous work examining White participants' implicit affective responses to Black versus White individuals (Payne et al., 2005). Taken together, the findings from the current study suggest that White individuals process faces from racial categories differently based on the parameters of the task; in addition, differences between early attentional responses to the faces and later behavioral responses diverged.

One of the goals of the current study was to examine how early attention to race differs as a function of task parameters. The findings during the categorization task in which participants racially categorized the Black, White, and racially ambiguous faces as Black or White replicate previous findings that indicate that racially ambiguous faces are neurally processed more similarly to White faces within the first several hundred milliseconds (Dickter & Kittel, in press; Willadsen-Jensen & Ito, 2006, 2008). This supports the interpretation of these findings that individuals are attending to features that differentiate ingroup faces from outgroup faces at this early stage in face processing. That is, participants are only distinguishing outgroup faces as "different" because they do not share many perceptual features with the ingroup faces. This result also supports the race-feature hypothesis, which purports that racial outgroup faces are processed differently than racial ingroup faces, which may help explain the robust finding that White participants are quicker to identify an outgroup Black face among ingroup White faces than an ingroup White face among outgroup Black faces (Levin, 1996, 2000). Other recent research suggests that differences in the processing of social groups may not necessarily be driven by race. That is, fMRI data show differential processing in the fusiform face area not only between racial ingroup and outgroup faces (Golby, Gabrieli, Chiao, & Eberhardt, 2001) but also between ingroup faces representing a novel (non-racial) group compared to outgroup faces representing a different group (van Bavel, Packer, & Cunningham, 2008). Together, these findings suggest that neural differences in the processing of ingroup compared to outgroup members may reflect a general perceptual distinction between salient social categories

When participants were engaging in the implicit affective task, however, they showed no differences in any components in the processing of the faces from the three racial categories. These results may suggest that when participants were engaging in an implicit affective task, they are not attending to the racial categories of the target faces. Research indicates that when asked to make a category judgment of a face as in the social categorization task, perceivers attend to category-specific characteristics, which leads to activation of a social category (Hugenberg, Young, Bernstein, & Sacco, 2010). This happens very quickly and automatically because low-level characteristics that distinguish social categories are quickly identified by the visual system (e.g. Ito & Urland, 2003; Mouchetant-Rostaing & Girard, 2003; Hugenberg et al., 2010). However, when perceivers are asked to make an evaluative or individuating judgment, they attend to identity-specific characteristics, taking attention away from category-specific features (Macrae & Bodenhausen, 2000; Hugenberg et al., 2010). Thus, it is possible that during the social categorization task, participants in the current study attended to category-specific characteristics, allowing them to make a quick judgment about the race of the target face while in the AMP they may have attended to identity-specific characteristics due to a focus on affective responses and thus processed the faces as individuals rather than members of a racial category. However, future research should seek to replicate these effects before this conclusion can be definitively made. An alternative explanation for these findings could be that the timing of the AMP produced too much noise in the data to see any race effects. In fact, participants were actually viewing a blank screen during measurement of the P2 (between 256ms and 380ms), and viewing the Chinese pictograph during both the N2 (between 324ms and 476ms) and the P3 (between 384ms and 784ms). Participants were not actually viewing the racial prime during any of the components examined, which could have affected ERP amplitude. No previous work has examined ERP responses to the AMP so it is unclear whether these results were due to the altered timing of the AMP used in the current study or the general parameters of the AMP.

An additional goal of the current study was to examine how White participants categorized racially ambiguous faces compared to monoracial Black and White faces. Interestingly, results revealed that participants took longer to respond to the racially ambiguous faces than the monoracial faces overall. Although this replicates previous work showing that categorization takes longer to racially ambiguous than monoracial faces (Dickter et al., 2012), this effect has not been shown without the influence of contextual information, and thus adds to the previous work suggesting that participants respond slower because they are not immediately sure of the race of the target face. In addition, the current behavioral findings from the categorization task support hypodescent theory, in which multiracial faces that represent a minority as well as a majority racial category are categorized more consistently in line with the minority category (Banks & Eberhardt, 1998; Leyens & Yzerbyt, 1992; Peery & Bodenhausen, 2008). In the current study, the racially ambiguous faces that were created as Black-White morphs were categorized much more often as Black than White. This finding extends previous research demonstrating that racially ambiguous faces were categorized much more often as Black than White following a Black stereotype prime, and more often as White than Black following a White stereotype prime (e.g. Dickter, Kittel, & Newton, 2012; Peery & Bodenhausen, 2008). The current study thus suggests that, regardless of previously presented contextual information, Black-White biracial morphs are more likely to be categorized in line with the racial minority group than the racial majority group, providing additional support for the hypodescent theory of social categorization. One potential limitation, however, is that participants were only given two options to respond (i.e., "Black" or "White"), and they were not given an option of "other" or "neither." Though research has indicated that participants tend to categorize racially ambiguous faces as monoracial when asked to identify them quickly (e.g. Peery & Bodenhausen, 2008), other work has demonstrated that, given a third option and a longer time period, racially ambiguous faces are often categorized as "other" (MacLin & MacLin, 2010). However, previous work in our lab (Dickter, Kittel, & Newton, 2012) has indicated that even when given the option of "neither" in addition to "White" and "Black", participants still tend to categorize the racially ambiguous faces as Black more often than White or neither in a reaction time task similar to the current study.

Although the findings of the social categorization task are consistent with previous work, the behavioral results for the AMP did not replicate previous findings demonstrating that White participants have a higher proportion of pleasant responses to White primes than to Black primes (Payne et al., 2005). There are several reasons why the current study may have failed to replicate previous work. First, the AMP has not been previously conducted using both monoracial and racially ambiguous faces. All previous work with the AMP has used only dichotomous categories for the prime images (e.g. White and Black, pleasant or unpleasant, Republican or Democrat; Payne, et al., 2005), so it is possible that adding a third category of racially ambiguous primes may have disrupted the normal pattern of responses on the AMP. Second, the timing of the AMP was also changed so that the prime appeared on the screen for more than twice as long as in the original AMP timing and the Chinese pictograph was not covered with a mask as it was in the original AMP. Thus, these changes in the task parameters may have also affected the results although previous work in the addiction literature suggests that this altered timing produces similar behavioral responses to relevant stimuli (Haight, Dickter, & Forestell, 2012). Finally, it is possible that the White participants in the current study were less implicitly biased against Blacks than previous samples using the AMP. Indeed, their responses on the explicit behavioral tasks indicated that, similar to their responses to the AMP, they showed more favorable responses to Black targets than White targets. Future research to attempt to replicate these findings will help explain these results.

The current study was also designed to examine individual differences in categorization and neural responses to Black, White, and racially ambiguous faces. Results indicated that the N2 amplitude in the social categorization task to both White and racially ambiguous faces was negatively correlated with childhood exposure to Blacks, indicating that a greater level of exposure to Blacks in childhood was indicative of a smaller N2 amplitude to ingroup and racially ambiguous targets. Because the N2 is typically associated with ingroup processing (e.g., Dickter & Bartholow, 2007), this finding implies that greater childhood familiarity with Blacks leads to less pronounced ingroup processing. However, these results should be interpreted with caution, as this is the first study to report this relationship in White participants, and the expected relationship with exposure to Blacks would be in the neural processing of Black targets, not White and racially ambiguous targets. In addition, results also revealed that P2 and P3 amplitude to White faces was negative correlated with childhood exposure to Blacks; because these components are generally associated with outgroup processing, these correlations are extremely puzzling and again should be interpreted with caution, especially given that both of these amplitudes to Whites were also positively correlated with childhood exposure to Whites. That there are relationships for each of the three components with measures of familiarity supports the idea that implicit processing may be moderated by familiarity (Park, Felix, & Lee, 2007), but the direction of these correlations does not make theoretical sense and should thus be further investigated in future work. When relationships between the individual difference variables and the differences scores for ERP components for the social categorization task were examined, results revealed that the P2 White-racially ambiguous difference score was negatively correlated with the order and predictability subscales of the NFC, indicating that those with a greater bias towards Whites scored higher on both the order and predictability subscales. This replicates findings from Dickter and Kittel (in press), in which the researchers suggested that those who prefer structure and categorical thinking, and have a greater intolerance for ambiguity process racially ambiguous faces differently and rely more heavily on primes and contextual information to categorize racially ambiguous faces (Dickter & Kittel, in press; Webster & Kruglanski, 1994). Because of their low tolerance of the ambiguity of the target faces and their preference for clear categories, it is possible that participants high in NFC showed a greater bias towards the unambiguous monoracial White faces, evoking a greater P2 amplitude to the racially ambiguous faces.

Though the AMP behavioral findings in the current study did not replicate previous work, when converted into difference scores, results revealed similar correlations with individual difference measures as Payne and colleagues (2005) reported. We found a significant negative correlation between White - Black and White – Ambiguous AMP difference scores and ratings on a feeling thermometer for Black and multiracial individuals, as well as a significant negative correlation with the internal motivation to control prejudice, which is consistent with previous research indicating that higher levels of explicit prejudice are associated with more positive responses to Whites compared to Blacks on the AMP (Payne, et al., 2005). In addition to these findings, results also indicated relationships between White – Black and White – Ambiguous AMP difference scores and several other explicit racial measures, including Attitudes towards Blacks and Social Dominance Orientation, as well as measures of familiarity and contact such that participants who scored higher on SDO and ATB showed a greater bias towards Whites compared to Black or racially ambiguous targets. Participants who had a higher explicit prejudice against Blacks and a greater preference for social hierarchies showed more positive responses to Whites than Black or racially ambiguous targets. Measures of social contact and familiarity with multiracial individuals were negatively correlated with White – Ambiguous bias scores. These findings are in line with previous theories that suggest that familiarity with the outgroup can decrease explicit bias (e.g. Allport, 1954). For example, there have also been indications that exposure to positive information about the outgroup can reduce implicit bias (e.g., Devine, 1989; Park, Felix, & Lee, 2007; Wittenbrink, Judd, & Park, 2001; Powers & Ellison, 1995). Few studies, however, have investigated the role of familiarity in reducing implicit bias and this should continue to be investigated.

The AMP and the categorization task are fundamentally different measures. The categorization task asks participants to place the target into a racial category, while the AMP involves implicit measurement of affect towards a stimulus. In examining relationships between the processing of the racial groups between the two tasks, although the faces were identical, the neural processing of the faces across tasks were not correlated with each other. This may be due to the fundamental differences in these tasks. Further evidence for differential processing of the stimuli based on differences in the task parameters is supported by the different correlations with the self-report measures, such that it appears that the AMP is more susceptible to individual difference than the categorization task. However, based on a failure to replicate past behavioral findings with the AMP as well as a lack of overall ERP effects in the AMP, this conclusion is tentative and future research should further examine this.

Results on the explicit behavioral task demonstrated that the Black job applicant was rated higher than the White applicant, and that Black perpetrators were generally given lighter sentences and had their crimes rated as less severe. This finding is interesting and could have been caused by self-presentation bias. That is, there has been a dramatic change in the way White Americans present themselves in terms of racial attitudes over the last several decades (e.g. Devine & Plant, 1998), such that self-reported attitudes towards Blacks have become increasingly positive (e.g. Greeley & Sheatsley, 1971; Kluegel & Smith, 1986; Schumann, Steeh, & Bobo, 1985). This increase in explicit positive attitudes towards Blacks has affected Whites' responses on behavioral tasks, and several studies have reported more positive ratings for Blacks compared to Whites (e.g. Harber, 1998; Hodson, Dovidio, & Gaertner, 2002). It is likely because of this self-presentation bias that the explicit behavioral tasks were not correlated with either the psychophysiological measures or the AMP. Implicit measures tend to be protected from self-presentation bias, as the participant does not usually have access to their own implicit attitudes. Thus, implicit measures are able to identify effects that participants would otherwise not be willing or able to report.

This study had several limitations. First, the racially ambiguous faces were digitally created using White and Black photographs and morphed at a 50/50 ratio. This method of creating racially ambiguous faces was chosen for the greatest level of internal control, and the faces were pilot tested to ensure that they appeared ambiguous. However, future studies should look at using photographs of individuals who are actually biracial or multiracial, as well as images that vary in their ambiguity by using morphs at different levels. Second, only male target faces were used in both the categorization and AMP tasks. Additionally, only male names were used in both the behavioral tasks. Examining the role of gender in attentional and affective processing, as well as the role of gender in the behavioral tasks, is an important next step, particularly since current research has indicated that ambiguous race males may be processed differently than ambiguous race females (Ho, Sidanius, Levin, & Banaji, 2011). Participants were also only given the option to categorize faces as White or Black, and were not given a third option of "neither" or "other". This choice was based on previous work in both our lab (Dickter & Kittel, in press; Dickter, Kittel, & Newton, 2012) as well as by other researchers (Peery & Bodenhausen, 2008) indicating that participants tend to quickly categorize ambiguous faces as monoracial, unless they are given extended time to consider the options and make a controlled choice. However, some research does indicate that when participants are presented with a third option, racially ambiguous faces may not be categorized as monoracial (e.g. MacLin & MacLin, 2010). This may have affected the processing of the racially ambiguous faces and should be addressed in future studies. Finally, in the current study, only White participants were used. Because previous research has shown that White and Black participants attend differently to racially distinct faces (Dickter & Bartholow, 2007), an important future direction of this work would be to examine Black participants' attention and responses to the targets in this work.

The findings from the current study suggest that monoracial and racially ambiguous faces are attended to differently as a function of task parameters in implicit affect and social categorization tasks, which lends support to the categorization-individuation model (Hugenberg, et al., 2010). That is, when participants are asked to make a social categorization judgment, their early attention to target faces differs as a function of whether they are a racial ingroup or outgroup member, while when they are asked to make an evaluative judgment, early attention to faces does not differ as a function of group membership. This may have important implications for improving intergroup contact, as it supports the idea that thinking of others as individuals rather than category members can reduce the effect of stereotypes on judgments (e.g. Bodenhausen, 1988; Bodenhausen & Lichtenstein, 1987; Bodenhausen, Kramer, & Susser, 1994). This study also shed some light on differences in the racial categorization and attentional processing of racially ambiguous individuals compared to monoracial individuals, which is becoming increasingly important given the growing population of biracial and multiracial individuals in United States and in the world. Future work should continue to examine the relationships between attention to and implicit and explicit prejudice towards individuals of different monoracial and multiracial groups, and further examine how these processes affect behavior towards these individuals.

References

Banks, R.R., & Eberhardt, J.L. (1998). Social psychological processes and the legal bases of racial categorization. In J.L. Eberhardt & S.T. Fiske (Eds.), *Confronting racism: The problem and the response* (pp. 54–75). Thousand Oaks, CA: Sage.

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology, 71*, 230–244. doi: 10.1037/0022-3514.71.2.230.

Bartholow, B.D. & Amodio, D.M. (2009). Using event-related brain potentials in social psychological research: A brief review and tutorial. In E. Harmon-Jones, & J.S. Beer (Eds.), *Methods in social neuroscience.* (pp. 198-232). New York: Guilford Press.

Bartholow, B. D., & Dickter, C. L. (2011). Person perception. In J. Decety, & J. Cacioppo (Eds.), *The oxford handbook of social neuroscience* (pp. 404-418). New York: Oxford University Press.

Bartholow, B.D., Dickter, C.L., & Sestir, M.A. (2006). Stereotype activation and control of race bias: Cognitive control of inhibition and its impairment by alcohol. *Journal of Personality and Social Psychology, 90*(2), 272-287.

Bodenhausen, G.V. (1988). Stereotypic bias in social decision making and memory: Testing process models of stereotype use. *Journal of Personality and Social Psychology, 55*(5), 726-737.

Bodenhausen, G.V., Kramer, G.P. & Susser, K. (1994). Happiness and stereotypic thinking in social judgment. *Journal of Personality and Social Psychology, 66*(4), 621-632.

Bodenhausen, G.V. & Lichtenstein, M. (1987). Social stereotypes and information processing strategies: The impact of task complexity. *Journal of Personality and Social Psychology, 52*(5), 871-880.

Brendl, C. M., Markman, A. B., & Messner, C. (2001). How do indirect measures of evaluation work? Evaluating the inference of prejudice in the Implicit Association Test. Journal of Personality and Social Psychology, 81, 760Ð773.

Brewer, M.B. (1988) A dual process model of impression formation. In T.K. Srull & R.S. Wyer (Eds) *Advances in Social Cognition* (pp. 1-36). New Jersey: Lawrence Erlbaum.

Brigham, J. (1993). College students' racial attitudes. *Journal of Applied Social Psychology*, *23*, 1933–1967. doi: 10.1111/j.1559-1816.1993.tb01074.x.

Darley, J.M. & Gross, P.H. (1983). A hypothesis-confirming bias in labeling effects. *Journal of Personality and Social Psychology, 44*(1), 20-33.

Dasgupta, N., Greenwald, A.G., & Banaji, M.R. (2003). The first ontological challenge to the IAT: Attitude or mere familiarity? *Psychological Inquiry, 14*(3-4), 238-243.

Devine, P.G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology, 56*(1), 5-18.

Dickter, C. L., & Bartholow, B. D. (2007). Racial ingroup and outgroup attention biases revealed by event-related brain potentials. *Social Cognitive and Affective Neuroscience*, 2(3), 189-198.

Dickter, C.L. & Kittel, J.A. (in press). The Effect of Stereotypical Primes on the Neural Processing of Racially Ambiguous Faces. *Social Neuroscience.*

Dickter, C.L., Kittel, J.A., & Newton, V.A. (2012). Contextual Stereotypic Information Influences the Categorization of Racially Ambiguous Targets. Manuscript under review.

Dovidio, J.F. & Gaertner, S.L. (2000). Aversive racism and selection decisions: 1989 and 1999. *Psychological Science, 11*(4), 315.

Fazio, R.H., Jackson, J.R., Dunton, B.C., & Williams, C.J. (1995). Variability in automatic activation as an unobtrusive measures of racial attitudes: A bona fide pipeline? *Journal of Personality and Social Psychology, 69*(6), 1013-1027.

Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. *Advances in Experimental Social Psychology, 23*, 1–74. doi:10.1016/S0065-2601(08)60317-

Gawronski, B. (2002). What does the implicit association test measure? Test of convergent and discriminant validity of prejudice related IATs. *Experimental Psychology, 49*(3), 171-180.

Golby, A. J., Gabrieli, J. D. E., Chiao, J. Y., & Eberhardt, J. L. (2001). Differential responses in the fusiform region to same-race and other-race faces. *Nature Neuroscience, 4*, 845-850.

Gordon, R.H., Bindrim, T.A., McNicholas, M.L. & Walden, T.L. (1988). Perceptions of blue-collar and white-collar crime: The effect of defendant race on simulated juror decisions. *The Journal of Social Psychology, 128*(2)., 191.

Greeley, A.M. & Sheatsley, B.H. (1971). Attitudes towards racial integration. *Scientific American, 225*(6), 13-19.

Greenwald., A.G., & Banaji, M.R. (1995). Implicit social cognition: Attitudes, self-esteem, & stereotypes. *Psychological Review, 102*(1), 4-27.

Greenwald, A.G., McGhee, D.E., & Schwartz, J.L.K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74*(6), 1464-1480.

Haight, J., Dickter, C.L., & Forestell, C.A. (2012). A comparison of daily and occasional smokers' implicit affective responses to smoking cues. *Addictive Behaviors, 37*(3), 234-239.

Harber,K.D. (1998). Feedback to minorities: Evidence of a positive bias. *Journal of Personality and Social Psychology, 74*(3), 622-628.

Ho, A.K., Sidanius, J., Levin, D.T., & Banaji, M.R. (2011). Evidence for hypodescent and racial hierarchy in the categorization and perception of biracial individuals. *Journal of Personality and Social Psychology*, *100* (3), 492-506. doi: 10.1037/a0021562.

Hodson, G., Dovidio, J.F., & Gaertner, S.L. (2002). Processes in racial discrimination: Differential weighting of conflicting information. *Personality and Social Psychology Bulletin, 28*(4), 460-471.

Hugenberg, K., & Bodenhausen, G. V. (2004). Ambiguity in social categorization. *Psychological Science*, *15*(5), 342 -345. doi:10.1111/j.0956-7976.2004.00680.x.

Hugenberg, K., Young, S.G., Bernstein, M.J., & Sacco, D.F. (2010). The categorization-individuation model: An integrative account of other race recognition deficit. *Psychological Review, 117*(4), 1168-1187.

Ito, T.A. & Bartholow, B.D. (2009). The neural correlates of race. *Trends in Cognitive Sciences, 13*(12), 524-531.

Ito, T. A., & Urland, G. R. (2003). Race and gender on the brain: Electrocortical measures of attention to the race and gender of multiply categorizable individuals. *Journal of Personality and Social Psychology*, *85*(4), 616-626. doi:10.1037/0022-3514.85.4.616

Ito, T.A., & Urland, G.R. (2005). The influence of processing objectives on the perception of faces: An ERP study of race and gender perception. *Cognitive, Affective, and Behavioral Neuroscience, 5*, 21-36.

Kluegel, J.R. & Smith, E.R. (1986). Affirmative action attitudes: Effects of self-interest, racial affect, and stratification beliefs on Whites' views. *Social Forces, 61*(3), 797-824.

Kruglanski, A. W., Webster, D. M., & Klein, A. (1993). Motivated resistance and openness to persuasion in the presence or absence of prior information. *Journal of Personality and Social Psychology, 65*, 861-876.

Leyens, J.P., & Yzerbyt, V.Y. (1992). The ingroup overexclusion effect: Impact of valence and confirmation on stereotypical information search. *European Journal of Social Psychology*, *22*, 49–569.

Levin, D. T. (1996). Classifying faces by race: The structure of face categories. *Journal of Experimental Psychology: Learning, Memory and Cognition, 22*, 1364-1382.

Levin, D. T. (2000). Race as a visual feature: Using visual search and perceptual discrimination tasks to understand face categories and the cross-race recognition deficit. *Journal of Experimental Psychology: General, 129*, 559-574.

MacLin, O.H., & MacLin, M. K. (2010). The role of racial markers in race perception and racial categorization. In R. Adams, N. Ambady, K. Nakayama, & S. Shimojo (Eds.). *The Science of Social Vision.* Oxford University Press.

Macrae, C. N., & Bodenhausen, G. V. (2000). Social cognition: Thinking categorically about others. *Annual Review of Psychology*, *51*, 93-120.

Merrall, E.L.C., Dhami, M.K., & Bird, S.M. (2010). Exploring methods to investigate sentencing decisions. *Evaluation Review, 34*(3), 185-219.

Mierke, J., & Klauer, K. C. (2001). Implicit association measurement with the IAT: Evidence for effects of executive control processes. Zeitschrift für Experimentelle Psychologie, 48, 107Ð122.

Mouchetant-Rostaing, Y. & Girard, M.H. (2003). Electrophysiological correlates of age and gender perception on human faces. *Journal of Cognitive Neuroscience, 15*(6), 900-910.

Newton, V. A., Dickter, C. L., & Gyurovski, I. I. (2011). The effects of stereotypical cues on the social categorization and judgment of ambiguous-race targets. *Journal of Interpersonal Relations, Intergroup Relations and Identity.*

Park, J., Felix, K., & Lee, G. (2007). Implicit attitudes towards Arab-Muslims and the moderating effects of social information. *Basic and Applied Social Psychology, 29*(1), 35-45.

Payne, B.K., Cheng, C.M., Gorovun, O., & Stewart, B.D. (2005). An inkblot for attitudes: Affect misattribution as implicit measurement. *Journal of Personality and Social Psychology, 89*(3), 277-293.

Peery, D., & Bodenhausen, G. V. (2008). Black + White = Black: Hypodescent in reflexive categorization of racially ambiguous faces. *Psychologic Science*, *19*, 973–977.

Plant, E.A. & Devine, P.G. (1998). Internal and external motivation to respond without prejudice. *Journal of Personality and Social Psychology, 75*(3), 811-832.

Powers, D.A. & Ellison, C.G. (1995). Interracial contact and Black racial attitudes: The contact hypothesis and selectivity bias. *Social Forces, 74*(1), 205-226.

Schuman, H., Steeh, C., & Bobo, L. (1985). *Racial Attitudes in America: Trends and Interpretations.* Cambridge, MA: Harvard University Press.

Sidanius, J. & Pratto, F. (1999). *Social Dominance: An Intergroup Theory of Social Hierarchy and Oppression*. New York: Cambridge University Press.

Van Bavel, J. J., Packer, D. J., & Cunningham, W. A. (2008). The neural substrates of in-group bias: A functional magnetic resonance imaging investigation. *Psychological Science, 19*, 1131-1139.

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Journal of Personality and Social Psychology, 67*, 1049-1062.

Whitley, B.E. & Kite, M.E. (2006). *The Psychology of Prejudice and Discrimination.* Belmont, CA: Thomson-Wadsworth.

Willadsen-Jensen, E.C. & Ito, T.A. (2006). Ambiguity and the timecourse of racial perception. *Social Cognition*, *24*, 580-606.

Willadsen-Jensen, E.C. & Ito, T.A. (2008). A foot in both worlds: Asian Americans' perceptions of Asian, White, and Racially Ambiguous Faces. *Group Processes and Interpersonal Relations*, *11*, 182-200.

Wittenbrink, B., Judd, C. M., & Park, B. (1997). Evidence for racial prejudice at the implicit level and its relationship with questionnaire measures. *Journal of Personality and Social Psychology*, *72*, 262–274.

Table 1 *Means and Standard Deviations of Individual Difference Measures*

Measure	Mean	S.D.
ATB	2.28	0.97
Feeling Thermometer – Black	8.16	1.85
Feeling Thermometer – White	8.64	1.73
Feeling Thermometer – Multiracial	8.38	1.80
EMS	22.42	7.92
IMS	36.93	9.22
SPS	41.35	11.97
SDO	35.17	19.22
NFC Total	158.78	23.94
NFC Order	36.48	7.52
NFC Closed-Mindedness	23.91	6.11
NFC Ambiguity	37.28	6.76
NFC Predictability	28.33	7.27
NFC Decisiveness	25.75	6.24
Proportion of Black Friends	0.09	0.09
Proportion of White Friends	0.73	0.21
Proportion of Multiracial Friends	0.11	0.09
Social Contact	3.72	0.81
Individuating Experience	3.35	0.69
Childhood Exposure – Black	16.83	13.19
Childhood Exposure – White	72.43	16.51

Table 2 *Correlations between AMP Bias Scores and Individual Difference Measures*

Measure	White-Black	White-Ambiguous	Black-Ambiguous
ATB	.491**	.390*	-.206
IMS	-.463**	-.414*	.180
EMS	.163	.179	-.064
SPS	-.284†	-.124	.204
SDO	.365*	.387*	-.107
NFC Total	.302†	.263	-.108
NFC Order	.327*	.321*	-.097
NFC Predictability	.201	.320*	.052
NFC Decisiveness	.189	.023	-.196
NFC Ambiguity	.131	.185	.020
NFC Close-Mindedness	.252	.295†	-.013
Proportion of White Friends	.245	.350*	.036
Proportion of Black Friends	.018	-.149	.316
Proportion of Multiracial Friends	-.308†	-.365*	.024
Social Contact	-.327*	-.375*	.039
Individuating Experience	-.316*	-.393*	.007
Childhood Exposure-White	.168	.315*	.095
Childhood Exposure-Black	.013	-.172	-.172
Feeling Thermometer –Black	-.358*	-.507**	-.048
Feeling Thermometer –White	-.063	-.253	-.161
Feeling Thermometer – Multiracial	-.296†	-.470**	-.087

Table 3 *Correlations between Childhood Exposure to Blacks and ERP Amplitude*

Component	White	Ambiguous
P2	-.394*	-.300†
N2	-.424**	-.335*
P3	-.354*	-.235

Figure 1 *Positive ERP Components in the Social Categorization Task*

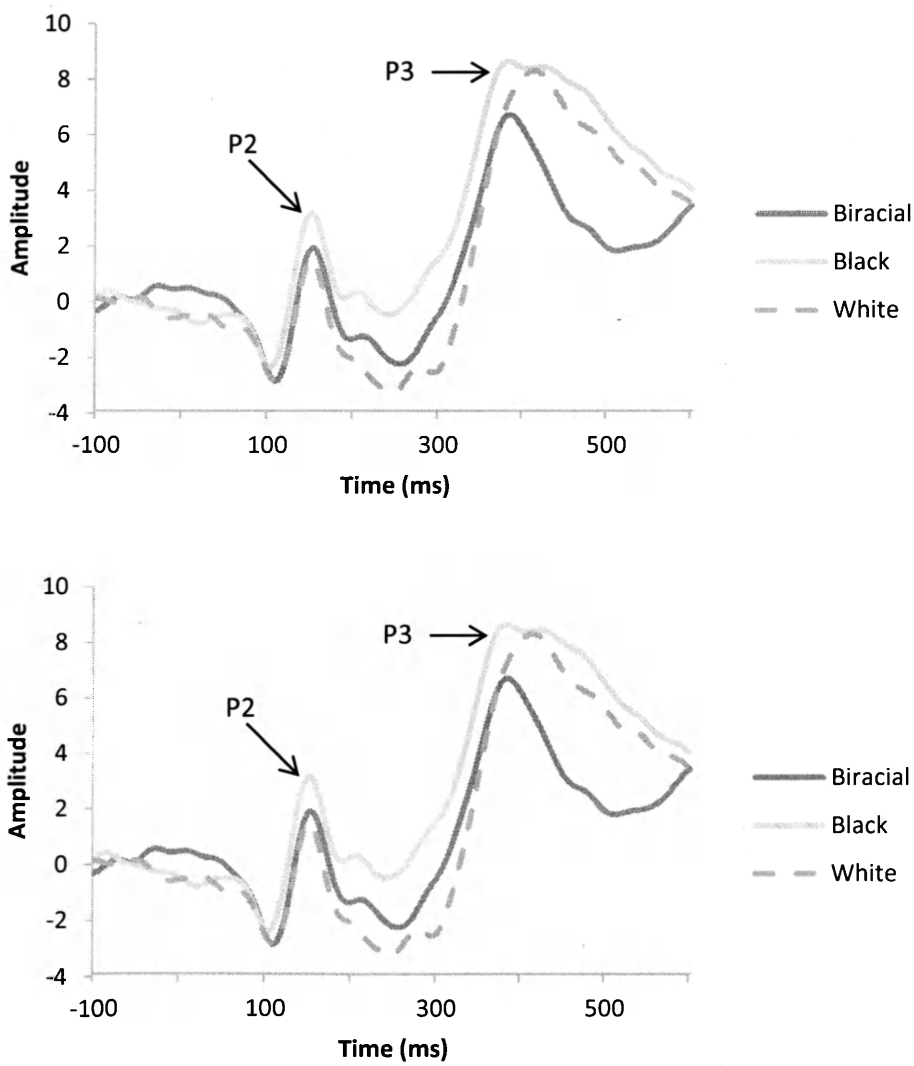


Figure 2 *N2 Component in the Social Categorization Task*

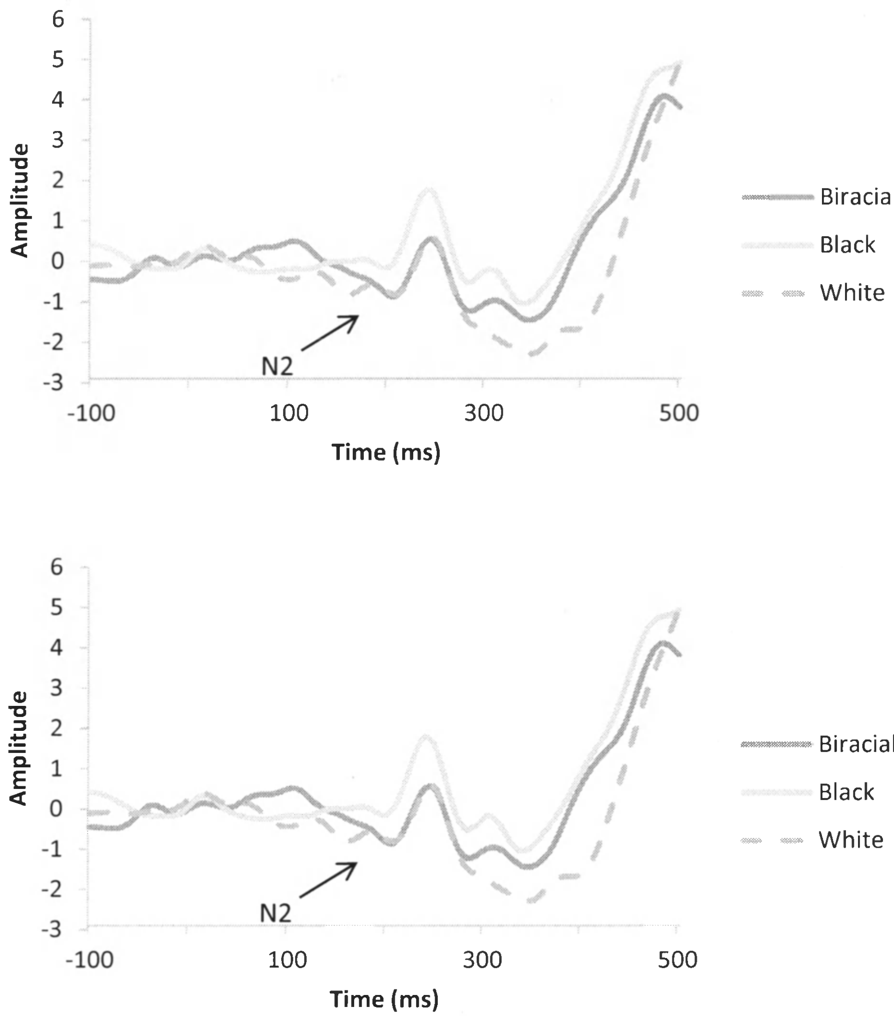
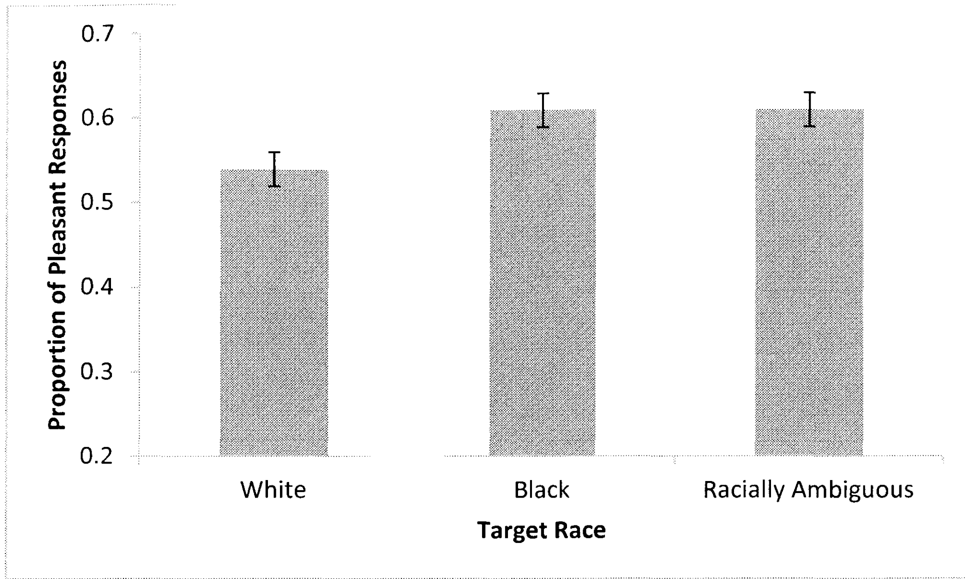


Figure 3 *Proportion of Pleasant Responses on the AMP*



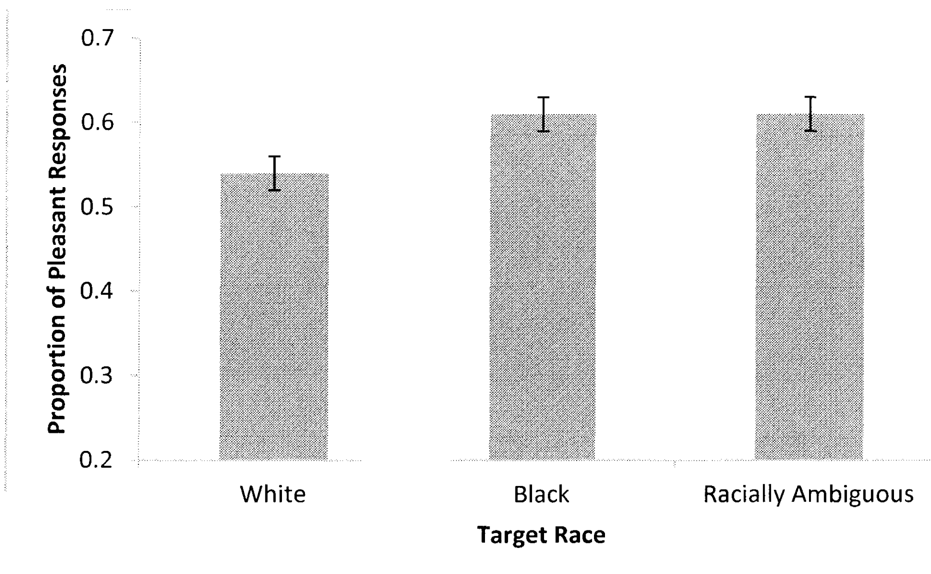
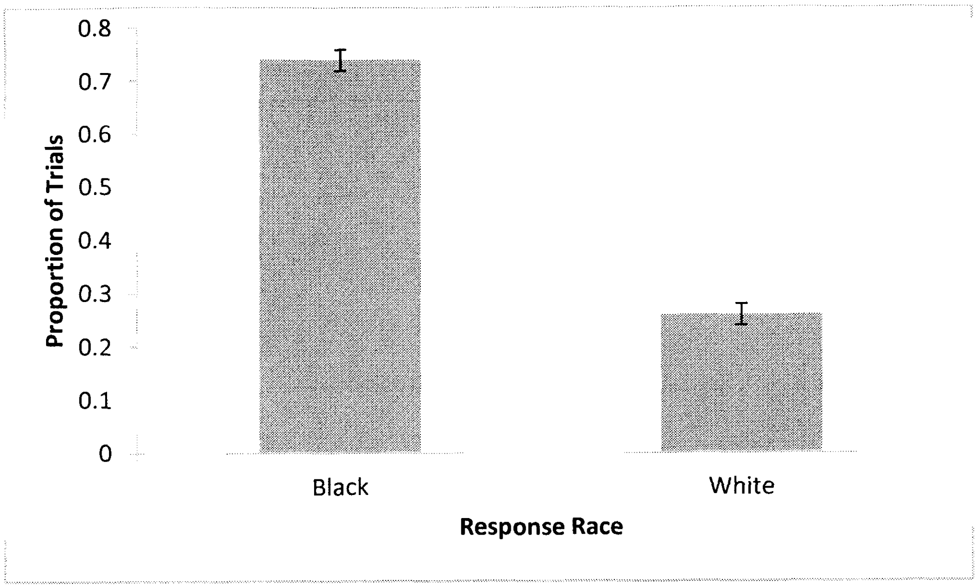


Figure 4 *Proportion of White and Black Responses to Racially Ambiguous Faces*



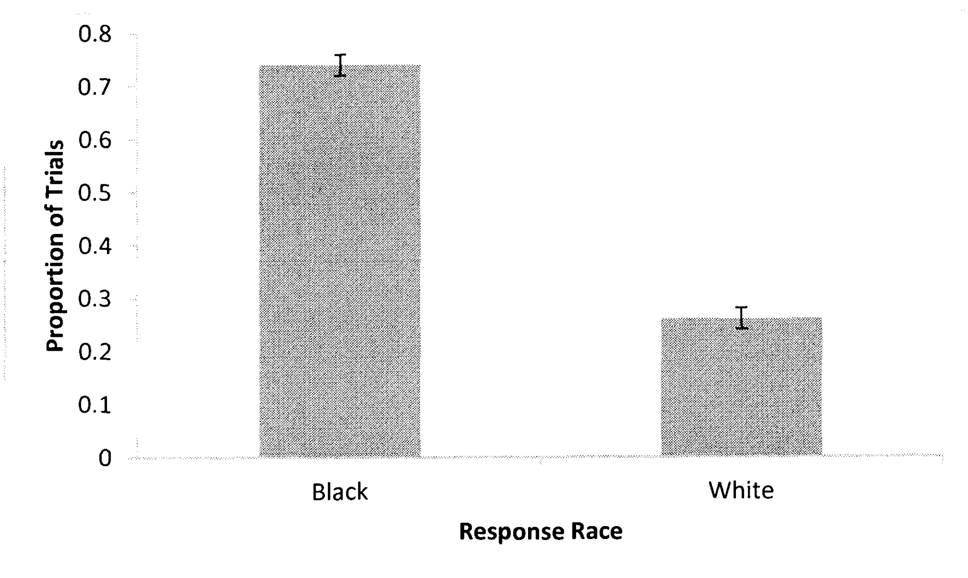


Figure 5 *Reaction Time to Racially Ambiguous Targets in the Categorization Task*