THE EFFECTS OF CONTEXTUAL INFORMATION IN PROCESSING RACE: EXPLORING THE NATURE OF THE BLACK AS FEAR STEREOTYPE

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ABSTRACT

CHERYL L. DICKTER: The Effects of Contextual Information in Processing Race: Exploring the Nature of the Black as Fear Stereotype
(Under the direction of Bruce D. Bartholow)

The current research was conducted in order to test the effects of contextual information on the social categorization process and to examine the nature of the Black stereotype. Two studies sought to accomplish these goals by using a modified flanker paradigm in which participants categorized targets as Black or White while context information, determined by emotion words (Experiment 1) or stereotype-related words (Experiment 2), was simultaneously presented. Additionally, participants in each study completed a well-established test of racial bias (weapons task; Payne, 2001) to try to ascertain possible connections between the categorization of racial cues amid distracting context information and automatic and controlled components of racial bias. Behavioral and physiological results indicated that White participants did not process contextual information until later stages of processing and attended first to Black targets and then to White targets. Finally, although not fully supported, there was some preliminary evidence that a stereotype involving fear may be more connected to the Black social category than are other negative stereotypes.

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DEDICATION

This document is dedicated to my father, who always encouraged me to do my best and follow my dreams. His courage and strength have inspired me and have been the keys to my success, and his love for life and his family constantly remind me of what is important.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Anti-Black Stereotypes and Social Categorization

The problem of anti-Black prejudice and stereotyping has been of concern to social psychologists for decades. The area has captured the attention of basic and applied researchers alike, and has important implications for Blacks and other minority group members, as well as for the society in which we live. Researchers have come to regard stereotyping and prejudice as the result of social categorization (Hogg, 2004; Macrae, Milne, & Bodenhausen, 1994), which occurs when we think of a person not as an individual, but as a member of a particular social group or groups. Theoretically, social categorization allows perceivers to minimize the amount of effort required to negotiate the social world by compartmentalizing social information (Bodenhausen, 1990; Fiske & Taylor, 1991). Studies have suggested that categorization takes place extremely quickly, often within a few hundred milliseconds (e.g., Giner-Sorolla, Garcia, & Bargh, 1999; Ito & Urland, 2003). Thus, social categorization can be seen as adaptive -- and perhaps necessary -- for functioning in a complex world because it helps us make judgments about and easily respond to those whom we encounter (Fiske & Neuberg, 1990; Macrae et al., 1994).

Research examining the social categorization process has shown that categorization activates schemas, which are mental representations that contain cognitive and affective information about a stimulus (Moscovici, 1984). The schemas that are activated along with the social category contain both positive and negative information about that category

(Brewer, 1988). Schemas also often contain stereotypes, such that 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). Research has shown that stereotypes become automatically activated along with categorization (Devine, 1989; Dovidio, Evans, & Tyler, 1986), and that 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). Stereotype activation can also have negative consequences for behavior in more applied settings, such as an employer interviewing a Black job candidate (Jussim, Palumbo, Smith, & Madon, 2000) or a police officer deciding whether or not to shoot a Black suspect (Correll, Park, Wittenbrink, & Judd, 2002; Payne, 2001). In such cases, the negative stereotypes that are automatically activated upon perception of the target may lead perceivers to take actions based upon the incomplete, over-generalized information provided by stereotypes.

The Automatic and Controlled Components of Anti-Black Stereotypes

Over the past 60 years, opinion surveys have documented substantial changes in racial attitudes among White Americans, suggesting that anti-Black sentiment has been in decline (Biernat & Crandall, 1999; Devine & Elliott, 1995; Schuman, Steeh, & Bobo, 1997; Wittenbrink, Judd, & Park, 1997). Dovidio and Gaertner (2000), for instance, found that participants in 1998-1999 reported lower levels of prejudice than had participants ten years earlier. Madon and colleagues (2001) also found that between 1933 and 2000, almost all of the stereotypes that White Americans held about Black Americans have changed; that is, the content of the African American stereotype has changed over time, and overall has become less negative. However, the results from these studies involving self-reported levels of prejudice are inconsistent with results from experimental studies using more indirect measures of racial attitudes, which illustrate that Whites' automatic evaluations of Blacks are still negative (Bargh & Chen, 1997; Devine, 1989; Fazio et al., 1995; Kawakami, Dion, & Dovidio, 1998; Maddux, Barden, Brewer, & Petty, 2005; Wittenbrink et al., 1997). Because of this inconsistency, researchers have concluded that self-report methods may be susceptible to bias. That is, participants may not be willing to report their true attitudes because they may be sensitive to societal norms of equality (Dovidio & Gaertner, 2000), or they may hold a positive attitude toward a social group (and report them on a racism scale, for example) and still be influenced by negative group stereotypes (e.g., Devine, 1989; Plant & Devine, 1998).

The conflicting results from studies involving different methods highlight a common distinction in the social psychological literature: that between automatic and controlled processes. Automatic processing refers to the effortless, spontaneous activation of learned information, whereas controlled processing is a result of intentional control and conscious thought (e.g., Bargh, 1997; Wittenbrink et al., 1997). This distinction between the automatic and controlled components of stereotypes and prejudice has become a popular one within the field. In a landmark paper, Devine (1989) provided evidence that Whites, regardless of prejudice level, automatically activate stereotypic information about others. She contends that these stereotypes exist in memory and are the result of repeated activation of learned associations. However, Devine's research indicates that individual prejudice level is not determined by these automatic associations, but instead is determined by more controlled, conscious processes. In her study, Devine used a priming procedure in which participants were subliminally primed with social categories (e.g., Blacks) or stereotypes (e.g., lazy). They were later asked to read a paragraph describing a race-unspecified target person and his ambiguously hostile behaviors (Srull & Wyer's [1979] "Donald" paragraph), and then rate this target person on several trait scales. Devine found that all participants, both high and low in self-reported prejudice, produced stereotype-congruent responses on the trait scales, such that when primed with words related to the social category and the stereotype of Blacks, participants judged the target to be more hostile. Thus, all participants, regardless of prejudice level, incorporated these well-learned stereotypes into their characterization of the Black target. This research is particularly important in illustrating the automatic activation of stereotypes because the participants were unaware that they were seeing any racial information. In a more recent refinement of Devine's (1989) work, Lepore and Brown (1997) primed only the social category of Blacks and found that targets were judged as more negative only among participants who had high self-reported prejudice. However, both high- and low-prejudiced participants increased their negative ratings of a target when valenced stereotype content was also primed. Taken together, these studies demonstrate that activating the social category of "Blacks" tends to lead people to interpret an ambiguous target as more negative and, specifically, more violent (Correll et al., 2002).

Thus, automatic stereotype activation may influence our thoughts and behaviors, in that when we see a Black target we automatically activate the racial stereotypes ingrained in our memories (Devine, 1989; Dovidio et al., 1997; Gaertner & McLaughlin, 1983). Furthermore, although individuals who may have a motivation to be non-prejudiced may try to inhibit their racial stereotypes from affecting their behavior, these efforts are often unsuccessful (Amodio, Harmon-Jones, Devine, Curtin, Hartley, & Covert, 2004; Devine &

Monteith, 1999). To summarize, "several lines of research have shown that group stereotypes may be activated outside of awareness and may influence behavior without the knowledge or intent of the perceiver" (Payne, 2001, p. 181).

Implicit Measures of Anti-Black Stereotyping

Because of the automatic nature of stereotype activation, much recent research has moved away from traditional self-report methods (thought to index conscious processing) and towards more implicit measures (associated with automatic processing). Priming paradigms like those used in the research just described have dominated the field of implicit attitude measurement. In these paradigms, participants are presented with a stimulus meant to bring category information to mind (the prime), followed quickly by a target that participants must act upon (e.g., classifying a letter string as a word or non-word; Higgins, Bargh, & Lombardi, 1985). Because priming paradigms involve stimuli being processed extremely quickly so that the participant cannot easily control thinking about them, or even so rapidly that the participant cannot consciously recognize them, many priming studies are thought to measure automatic processing, and thus can be used to identify automatic stereotype activation (Bargh, 1997). Priming studies have demonstrated that categorizing a target letter string as a word (as opposed to a nonword) is facilitated when the prime is related to that word (e.g., is a characteristic of the target's category; Higgins et al., 1985). These paradigms have been extended to person perception studies as well. For example, when primes are presented to participants directly before they make judgments about a target, participants are more likely to judge the target in terms of the primed concept (e.g., Srull & Wyer, 1979). Additionally, priming has been shown to affect behavior. For example, Kawakami, Young, and Dovidio (2002) found that when participants were primed with pictures of elderly faces, they categorized the photographs more slowly than did participants primed with younger faces. In a related study, participants first primed with elderly concepts walked more slowly away from the laboratory at the conclusion of the study than did participants who had been primed with neutral concepts (Bargh, Chen, & Burrows, 1996). Given the subtle nature of these measures and that their association with the primed concepts was not obvious, such results are thought to demonstrate the automatic, unconscious influence that primed categories have on perceivers' behavior.

The experiment by Wittenbrink et al. (1997) used a priming paradigm as an implicit measure and self-reported racial attitudes as an explicit measure to assess the relationship between implicit and explicit forms of prejudice. Specifically, participants were subliminally primed with either the word "Black" or the word "White." They then viewed a string of letters that they identified as a word or non-word as quickly as possible. There were two types of trials of interest to the experimenters. The first were "compatible" trials, in which the category label stereotypically "matched" the target word (e.g., "White" with "intelligent"). The contrasting "incompatible" trials were those in which the category label did not stereotypically match the target word (e.g., "White" with "poor"). The researchers found that participants identified letter strings faster on compatible trials (e.g., when positively valenced White American traits followed the "White" prime and when negatively valenced Black American traits followed the "Black" prime) than on incompatible trials. Furthermore, these results were correlated positively with self-reported racist attitudes. Taken together, the above studies demonstrate that priming studies can be a good tool to measure the automatic activation of racial stereotypes and that the activation of the social category "Blacks" automatically leads to the activation of negative concepts associated with the group.

The Implicit Association Test (IAT) is another implicit measure designed to assess the automatic activation of stereotypes. The IAT (Greenwald, McGhee, & Schwartz, 1998) uses response latency to indirectly measure the strength of association between concepts. In the race IAT, participants classify faces or first names representing racial groups (e.g., Black and White) and evaluative attributes (e.g., pleasant and unpleasant words). Responses are considered automatic in that participants are ostensibly unable to control their biased responses (Dasgupta, McGhee, Greenwald, & Banaji, 2000). Participants taking the race IAT generally respond more quickly when pleasant attributes are paired with the same response as White faces or names and when unpleasant attributes are paired with the same response as Black faces or names (Greenwald et al., 1998). Thus, the IAT is thought to show evidence for the automatic preference for Whites such that positive attributes are more strongly associated with Whites than Blacks. However, it is important to note that there is not consensus on the psychometric properties of the IAT (Blanton & Jaccard, 2006).

The Role of Contextual Information in Social Categorization

Although many studies using implicit measures have demonstrated the automatic nature of social categorization, less research has focused on how contextual information may affect the social categorization process. Several researchers (e.g., Macrae, Bodenhausen, & Milne, 1995; Smith & Zarate, 1992) have suggested that contextual information may affect the categorization process. Macrae et al. (1995) found that subliminally priming participants with different social categories affected how they categorized a picture of a person. Participants in their study had to categorize a Chinese woman, who obviously could be categorized by either her ethnicity or her gender. Results indicated that when participants were subliminally primed with the social category “woman,” they were quicker to categorize the target person as having female rather than Chinese traits. In contrast, participants who were subliminally primed with “Chinese” were more likely to categorize the target as Chinese. According to Macrae et al., the contextual information that was primed before categorization led participants to attend to certain category information and inhibit other category information.

But what would happen if contextual information did not activate the specific social category but instead activated a stereotype or trait that was either consistent or inconsistent with the social category? For example, if Macrae et al.’s (1995) participants had been subliminally primed with a Chinese stereotype versus a female stereotype, would the effects remain the same? Like Macrae et al.’s (1995) research, this question has theoretical implications for real-world behavior. When we perceive a person as a member of a social category, stereotype-related contextual information with which we are presented may affect our processing of the target individual and, by extension, our own subsequent behavior.

Another issue pertinent to the discussion of context effects concerns when, in the course of processing, context information is presented. The study by Macrae et al. (1995) used a priming procedure in which the context was established by a prime stimulus that temporally preceded the onset of the target. Similar paradigms have been used in recent years by researchers interested in the neural activity associated with categorization (to be reviewed later), in which a target representing a social category is presented after a context established by several preceding stimuli (e.g., a Black face preceded by a number of White faces or vise-versa). Such paradigms provide information concerning how a prior context influences processing of a given target, but less is known about the effects of context information presented simultaneously with a target, a situation that more closely resembles people as they are encountered in real life. This issue has important practical as well as theoretical implications, some of which are discussed next.

As reviewed above, numerous studies have demonstrated that implicit measures of categorization show facilitation of responses to stereotype-consistent stimuli and impaired responding to stereotype-inconsistent stimuli (e.g., Wittenbrink et al., 1997). The Spreading Activation Model, which assumes that RT is facilitated when two concepts are linked closely in semantic memory, has traditionally been used to explain such findings. However, more recent research suggests an alternative explanation based on the control of attention in cognitive processing through models such as the Continuous Flow Model and Response Conflict Theory.

Response Conflict Theory (RCT) grew out of the Continuous Flow Model, originally proposed by Donders (1969). The Continuous Flow Model proposes that as information about stimuli accumulates gradually in the visual system, responses are primed or partially activated and thus response activation begins as soon as a stimulus is perceived. When stimuli are perceived, input channels begin a system of elementary processes that operate serially in which output is transferred to feature detectors, which then feed the output to form units, which in turn act as a priming device to activate flow to the response system. When the flow reaches this final level, a response is made (Eriksen & Schultz, 1977). The Continuous Flow Model suggests that as this processing cycle goes on, a wide range of responses are initially primed, but the priming flow becomes restricted to fewer responses as more information accumulates about the stimulus. Thus, initially, the responses that are all activated at the same time are in competition with one another (Coles, Gratton, Bashore, Eriksen, & Donchin, 1985). Additionally, the model suggests that there is a certain threshold that must be crossed in order for an overt response to be made. Before this threshold is crossed, responses that are primed are held back by inhibitory processes, but when the overt response reaches the threshold, the inhibition is overcome and hence a response is made (Eriksen & Schultz, 1977).

RCT assumes that there is a pairing between the processor that analyzes the stimuli and the response activation process. Thus, RCT suggests that because two or more responses can be activated simultaneously, it is often necessary to make a choice between these two conflicting responses. For example, when one is faced with an aggressive perpetrator, it is often necessary to decide whether to fight or run away. Similarly, as is illustrated in the categorization literature, we often make choices while perceiving other people in everyday situations. It is often necessary to decide whether a person is trustworthy or dangerous, for example, and we often have limited information about that person's characteristics. RCT assumes that we are often making choices between a prepotent, or well-learned response (e.g., one has learned over the years to run away at the sight of an aggressive other) and a less well-learned response (e.g., choosing to fight an aggressive other because you realize that he might be faster, but that you are stronger). RCT suggests that responding with the less dominant response requires control and, thus, more time (Coles et al., 1985). This explanation has been supported with the use of the Stroop color-naming task (Stroop, 1935), in which it is easier to identify the color red when the word says "RED" than when the word says "BLUE" because word reading is the prepotent response. Thus, color-naming requires control.

Additionally, RCT can be used to explain the findings of priming studies in that incompatible trials can lead both the prepotent (but incorrect) response and the correct response to be activated, slowing reaction time. Thus, when an incompatible trial is presented the incorrect response can be activated first, prior to activating and implementing the correct response. For example, both Whites and Blacks can be dangerous, but the link between Black and the concept “dangerous” is prepotent (due to stereotypes) and therefore is activated first. Thus, in order to identify a Black person as “safe”, it is necessary to first override the initial dominant response (dangerous) to make the correct response. Correcting the dominant, incorrect response and activating the correct one can take more time, thus leading to longer reaction times on correct incompatible trials that ultimately are responded to correctly.

Support for RCT comes from cognitive research illustrating that response competition occurs when subjects must quickly categorize numerous kinds of stimuli among distracting information (e.g., Eriksen, O’Hara, & Eriksen, 1982). The flanker task was developed by Eriksen and Eriksen (1974) for assessing the control of attention to information presented among distracters (often target letters presented among other letters). In the flanker task, participants respond to a centrally-located target stimulus presented among an array of other contextual stimuli (i.e., the flankers). In a typical flanker task, the flankers are mapped to one response or the other (in the 2-choice versions of the task), such that they elicit either the same response as the target (i.e., compatible with correct response) or the opposite response (i.e., incompatible with correct response; Bartholow et al., 2005; Coles et al., 1985; Gratton et al., 1988, 1992; Sanders & Lamers, 2002). Because compatible flankers elicit the same response as the target, processing compatible flankers facilitates the correct response. On the other hand, the response activated by incompatible flankers is the opposite of the one elicited by the target, so participants need to control their attention and focus on the target in order to make a correct response. Because of this processing conflict, incompatible flankers have been shown to slow participants' speed in responding to the target (Dallas & Merickle, 1976; Eriksen & Eriksen, 1974; see also Coles et al., 1995). The difference in reaction times based on the compatibility of the flankers is called the *noise-compatibility effect*, first noted by Eriksen and Eriksen (1974). The size of the noise-compatibility effect is thought to index the degree of response conflict between two response options.

Besides using simple stimuli such as letters or numbers, the noise-compatibility effect has been replicated with socially-relevant stimuli. Using such stimuli can help researchers to understand the control of attention in social categorization. In the case of categorizing by race, if participants are automatically activating racial stereotypes upon perceiving a target person, it should be easier for participants to categorize the target when stereotype-consistent flankers are visually presented, as opposed to when stereotype-inconsistent flankers are presented. In other words, to the extent that a cue (target) and a stereotype-related trait (flanker) activate different response tendencies (e.g., a Black face and a counter-stereotypical word), a noise-compatibility effect should be evident in response latency. A recent series of studies by Dickter and Bartholow (2006) illustrates how flanker paradigms can help explore the role of attention during social categorization. In these studies, participants categorized targets according to race (Experiment 1) or gender (Experiment 2) as quickly as possible in the presence of distracting flanker information. Participants were faster to categorize targets when distracters represented the same racial or gender category as the target, and appeared to strategically control their attention to distracters. Physiological data indicated differential allocation of attention to ingroup and outgroup targets on the basis of race. That is, White participants paid more attention first to Black targets and later to White targets but Black participants paid more attention first to White targets and later to Black targets, as indexed by particular components of their brain waves (to be discussed in more detail later).

Another experiment using the flanker paradigm to study social stimuli (in this case, gender) was conducted by Macrae, Bodenhausen, and Calvini (1999). In this study, participants indicated whether names were male (e.g., Peter) or female (e.g., Angela). The names were presented centrally, and on some trials were flanked by laterally-presented names representing the opposite category of the target, which they referred to as "mismatching" trials. In accordance with the noise-compatibility effect, Macrae et al. found that response times were slowed on mismatching trials compared to control trials (in which flanker words were household objects), at least when flankers were presented in close proximity to the target names. This finding supports the idea that local context can influence social categorization processes, but suggests that attention to context information is automatic. Taken together, results from these studies suggest that flanker paradigms can be used to understand more about the social categorization process as well as to examine the control of attention to various social categories, most notably race.

The Nature of Anti-Black Stereotypes

Taken together, research involving implicit prejudice procedures and social categorization studies indicate that White American participants automatically activate negative stereotypes about Blacks, and to some extent Black Americans hold similar negative stereotypes about their ingroup (Correll et al., 2002). However, despite the voluminous research on stereotype activation and its effects, the exact nature of these stereotypes has remained unclear. In Devine's (1989) classic experiment, participants were asked to list common cultural stereotypes about Blacks. Some common negative stereotypes identified by the participants were: poor, aggressive/tough, criminal, low intelligence, uneducated, lazy, sexually perverse, ostentatious, inferior, and dirty/smelly. Negative stereotypes identified by participants in Lepore and Brown's (1997) study included: lazy, violent, criminal, poor, uneducated, sexist, rude, unintegrated, smelly, persecuted, and superstitious. Priming studies that have presented racial stereotypes about Blacks have used similar words to elicit the automatic activation of stereotypes in their participants. For example, Dovidio and colleagues (1997) used the following negative Black stereotypes as primes: crime, stupid, poor, messy, violent, lazy, danger, threat, rude, loud, harm, and deceive. Clearly, both participants and researchers have used a variety of negative words as "typical" characteristics identified as stereotypes about Black Americans.

However, there is limited research focused on which of these aspects of the stereotype is the most prevalent or most tightly coupled with the category. Is one Black stereotype more common than another? Which stereotype is immediately activated upon perceiving a Black person? Some researchers have suggested that the most prevalent Black stereotype is that African-Americans are more likely to have violent and criminal dispositions (Quillian & Pager, 2001). In fact, many studies have identified violent traits such as hostility, aggression and criminality as the most prevalent stereotype for Blacks (Devine & Elliot, 1995; Payne, 2001). Americans consistently rate Blacks as more violent than any other ethnic groups; in one study, 52% of Whites rated Blacks a 6 or higher on a 1-10 scale of aggressiveness (Sniderman & Piazza, 1993). The stereotype of Blacks as violent is widely known and has not changed through the decades, regardless of individual prejudice level (Devine & Elliot, 1995). In fact, surveys have found that the "aggression and violence" stereotype is the most frequently endorsed racial stereotype for Blacks among White Americans (Sniderman & Piazza, 1993).

Why would the stereotype of violence be the one most tightly paired with the category of Blacks? Some researchers have suggested that there is a symbolic association among human beings that links darkness with evil, threat, and danger (e.g., Schaller, Park, & Mueller, 2003) and that this symbolic association has psychological consequences that lead people in many cultures to favor lighter-skinned people over darker-skinned individuals; this has been found even among young children (Iwawaki, Sonoo, Williams, & Best, 1979). Thus, those with a darker skin tone might activate a fear response at a basic level, suggesting that the association between Blacks and fear is adaptive. Other theorists suggest that a threat response may be partially due to general dissimilarity, as minorities may be seen as a threat to individuals' self-identities and/or group identities (e.g., Strauss, Connerley, & Ammermann, 2003), contributing again to the idea that holding these stereotypes may be adaptive.

The stereotype of Blacks as violent and the response of fearfulness among Whites in response to this stereotype leads to extremely harmful interactions between Blacks and individuals who activate these stereotypes. Unfortunately, these situations are not limited to the laboratory in that there are many cases of police officers making quick judgments about shooting an alleged perpetrator with incomplete information. The most notable of these cases have involved the shooting and killing of unarmed Black suspects who acted in an ambiguous manner that the police decided, in the heat of the moment, was potentially dangerous. One such example occurred in 1999 when four plain-clothes White New York police officers shot and killed Amadou Diallo, an unarmed Black man. The police officers were searching for a suspect in a Bronx neighborhood who was accused of rape. After the shooting, the officers claimed that Diallo resembled the rape suspect. According to witnesses, Diallo was standing in the doorway of his apartment building when the police approached and ordered him to "freeze." Diallo, an immigrant, reached into his pants pocket in an action the officers misunderstood as an effort to pull out a gun. As Diallo's hand entered his pocket, the officers opened fire in a hail of 41 bullets, killing Diallo. Only later were they able to determine that he had been unarmed. After the case, the officers were met with a slew of public and professional allegations, including charges of racial profiling. All of the officers were later acquitted of all charges – they were found to have been justified in their actions because Diallo had moved when they told him to stay still. This real-world tragedy is particularly interesting in the current context in that it demonstrates the impact that automatic cognition can have on behavior in an ambiguous situation, or in a situation in which there is incomplete information. Thus, the officers in this case could have, upon seeing Diallo, automatically categorized him as belonging to the category "Black," and subsequently activated the stereotype of "violent," leading them to interpret Diallo's ambiguous actions as violent.

In fact, laboratory research has also offered support for this very point. Keith Payne (2001) conducted a priming study inspired by the Diallo shooting in which participants were shown photographs of White and Black male faces followed by pictures of target objects, either handguns (violent stimuli) or hand tools (neutral stimuli). Participants were asked to respond not to the face stimuli, but only to the pictures of guns or tools. The experimenters informed the participants that the faces were only there to signal that the pictures of the target objects were about to be presented on the screen. The task of the participants was to identify the target objects as either a gun or a tool by pressing one of two keys; they were told to respond as quickly as possible. As expected, participants made more errors in identifying tools as guns when primed with a Black face than with a White face, and were also faster to correctly identify guns when they were primed with Black faces. Racial bias in performance on the priming paradigm was not related to explicit racial attitudes, as measured by a self-report racism scale.

In a similar study entitled "The Police Officer's Dilemma," White participants completed a task in which they had to decide whether to shoot White or Black armed or unarmed male targets in a computer simulation game (Correll et al., 2002). Results indicated that participants were faster to shoot Black targets than White targets and faster to decide not to shoot White targets than Black targets. Participants also made more errors when they chose to shoot Black targets; that is, they required less time and had a higher error rate when deciding to shoot Black targets, regardless if the target was armed or unarmed. Interestingly, the researchers' reported index of shooter bias (reaction time) was stronger in participants who self-reported being aware that there is a strong stereotype that Blacks were aggressive, violent, and dangerous; shooter bias was also stronger in participants who self-reported more contact with Blacks. No correlation was found, however, among reaction time and prejudice level or motivation to control prejudice. These findings offer support for Devine's (1989) theory that stereotypes are the result of learning over time and can be automatically activated regardless of prejudice level. Thus, simply being aware of a stereotype is enough to induce biased behavior. Finally, this study replicated the results with Black participants, finding equivalent levels of bias among the two groups, further suggesting that awareness of the stereotype and not prejudice level is causing automatic racial bias. Taken together, the above studies offer evidence that the "violent" stereotype is the stereotype most associated with the category of Blacks and is automatically activated upon perceiving a Black target. Additionally, the activation of this stereotype may have behavioral implications in the lab and the real world.

Psychophysiological Measures of Stereotyping

Although reaction time studies that measure the implicit activation of racial stereotypes have provided important information about the properties of stereotyping, such studies are limited in a number of ways. For example, although often discussed as reflecting cognitive processes, reaction time data actually reflect the outcome of some cognitive operation(s) rather than those operations themselves. That is, RT data confound concept activation with response output processes (Ito, Thompson, & Cacioppo, 2004). Thus, behavioral data such as RTs cannot indicate the level at which stereotype activation occurs because reaction time is confounded by the speed of motor-related response processes (Bartholow, Dickter, & Sestir, 2006). It is often desirable and perhaps necessary to expand the behavioral research on stereotype activation to a methodology that allows the examination of multiple components of the stereotype activation process. Psychophysiological measures can provide a multifaceted look at the underlying neural events associated with the activation of stereotypes.

Recently, prominent social psychologists have adopted psychophysiological methods because of the additional information they can provide over more traditional behavioral methods. First, physiological measures can be used to identify the effects of a stimulus that participants are unable or unwilling to report (for a review, see Guglielmi, 1999). When studying stereotypes, this can be extremely useful as participants often have egalitarian beliefs, or may be unwilling to admit racist attitudes. Additionally, physiological changes can often be temporally related to observable stimuli, making it possible to assess exactly when an effect occurred and to separate component processes in the stream of information processing (Stern, Ray, & Quigley, 2001). Measures that are temporally accurate are important in studying racial categorization in that they can distinguish between automatic and controlled processes. Finally, physiological measures are linked to cognitive processing as well as affective changes that are of interest to social psychologists (Hugdahl, 1995).

Although a variety of physiological measures have been used to study racial attitudes going back many decades (e.g., Rankin & Campbell, 1955), researchers interested in the time course of cognitive activity associated with categorization and stereotyping in recent years have measured event-related brain potentials (ERPs). ERPs are determined by averaging electroencephalogram (EEG) signals obtained from the scalp over time and across multiple presentations of stimuli. This signal averaging technique ultimately separates activity associated with stimulus processing from spontaneous, background EEG activity (Cacioppo, Crites, Gardner, & Berntson, 1994; Stern, Ray, & Quigley, 2001). ERPs are generally described in terms of components, which typically include information about polarity (positive and negative deflections from baseline) and temporal order relative to event onset (milliseconds [ms] post-stimulus at which they occur). For example, the P300 component is a prominent positive deflection in the waveform that occurs approximately 300 ms (or later) following stimulus onset (see Hugdahl, 1995). Each component is thought to reflect engagement of a particular cognitive process or information-processing event. The amplitude of components is thought to reflect the degree to which a particular information-processing operation is engaged (Fabiani & Donchin, 1985) while the latency at which a component peaks reflects the speed with which a stimulus is categorized and its evaluative implications processed (Rugg & Coles, 1995). Importantly, the latency of most components is independent of response latency, allowing researchers to separate relevant concept activation and irrelevant response preparation and implementation processes (see Ito et al., 2004). Additionally, these components can be either exogenous, in which case they reflect the automatic processing of the physical characteristics of an external stimulus or endogenous, which are associated with activation of higher cognitive processes like attention and memory (Fabiani, Gratton, & Coles, 2000).

ERPs are an important measurement tool in studies involving stereotype activation because they can identify the cognitive processes that mediate between the presentation of a stimulus and overt behavior and the representations on which these processes operate (Rugg & Coles, 1995). In addition to not being dependent on the speed of motor processes and task requirements (Ito & Cacioppo, 2000), ERPs are useful because of their excellent temporal resolution; that is, the ERP is time-locked to the presentation of a specific event or stimulus, and thus is a direct manifestation of processing related to that event or stimulus (or lack of a stimulus). Once a stimulus is presented, ERPs illustrate precisely, on the order of milliseconds, when particular aspects of information processing are carried out.

Several studies involving ERPs provide preliminary evidence that fear may be underlying White's reactions to Black stereotypes. Specifically, ERP research has demonstrated that White participants direct more early attention implicitly to Black faces than to White faces, particularly to Black males (Ito & Urland, 2003; Dickter & Bartholow, 2006). Although some researchers suggest that Black males may capture more attention because they differ from the White male norm framework (Smith & Zarate, 1992), it may be the case that more attention is directed toward Blacks, and especially Black males, because of the threatening stereotype associated with that social group. Thus, because of the prevalence of stereotypes about Blacks (especially Black males) in our culture including information about violence and aggression (Ito & Urland, 2003), Black targets might elicit fear in perceivers, causing them to direct more attention toward these faces. Consistent with this idea, recent research has demonstrated that participants give greater attention to threatening facial expressions than faces with neutral or happy expressions (Lundqvist & Ohman, 2005). Additionally, a review chapter summarizing years of research on threat responses concluded that the cognitive processing of threat leads to heightened attention to threat cues (Mogg & Bradley, 2005). Thus, when a stimulus is perceived as threatening, people direct more attention to it. In this way, then, it may be adaptive for individuals to attend more to Black faces if the stereotype they activate upon perceiving a Black person is threatening, such as one of violence or aggression (Ito & Urland, 2003; but see Dickter & Bartholow, 2006 and more discussion below).

Research involving other physiological techniques has also shown support for the “Black as violent” stereotype as underlying these findings. Functional magnetic resonance imaging, or fMRI, has also been used to examine the automatic activation of racial stereotypes (Hart, Whalen, Shin, McInerney, Fischer, & Rauch, 2000; Phelps, O’Connor, Cunningham, Funayama, Gatenby, Gore, & Banaji, 2000; Richeson, Baird, Gordon, Heatherton, Wyland, Trawalter, & Shelton, 2003). Briefly, fMRI measures blood flow to parts of the brain, which researchers have associated with various neural and cognitive activity. Although the technique has poor temporal resolution compared to ERPs (i.e, it has the resolution of seconds, as compared to milliseconds), fMRI has better spatial resolution than ERPs, allowing for identification of specific brain structures involved in neural activity. Several researchers have examined the link between the amygdala and the processing of race information. Neuroscientists have long believed the amygdala to be implicated in the production of behaviors associated with fear and fear-related memory storage (Gale, Anagnostaras, Godsil, Mitcell, Nozawa, Sage, Wiltgen, & Fanselow, 2004). The amygdala, located in the anterior region of the temporal lobes, has been shown to be activated when participants are conditioned to be fearful of a neutral stimulus that has been paired with an aversive stimulus, and is thought to be an index of the detection of threat (e.g., LeDoux, 1996). In fact, when lesions are made to the amygdala, they produce large deficits in fear responses to auditory, visual, and contextual stimuli (Kim & Davis, 1993). Phelps and colleagues have shown that in humans, the amygdala is also associated with "the expression of learned emotional responses that have been acquired without direct aversive experience" (Phelps et al., 2000, p. 730; see also Phelps, LaBar, Anderson, O'Connor, Fulbright, & Spencer, 1998). Furthermore, the amygdala is specifically involved in perceiving faces, and has been shown in fMRI studies to distinguish between faces exhibiting fear as opposed to other emotions, even when these faces are presented subliminally (Phelps et al., 2000).

In one study in which activation of the amygdala was assessed with fMRI techniques, White American participants viewed photographs of Black and White male faces with neutral facial expressions (Phelps et al., 2000). In this study, participants exhibited different strength amygdala activation to Black versus White faces. This pattern was only achieved, however, when participants viewed pictures of unfamiliar Blacks and Whites. That is, when pictures of famous, well-liked Blacks and Whites were viewed, these patterns were not replicated. Similar results were found in a later study when individual differences in the motivation to respond without prejudice (an explicit measure) were shown to moderate startle eyeblink responses to pictures of Black and White faces (Amodio et al., 2003). In a typical startle eyeblink study, participants experience a startle probe such as a burst of white noise, and larger startle eyeblink responses are associated with negative affective states (Amodio et al., 2003). Interestingly, Amodio and colleagues did not find group differences in startle eyeblink responses to Asian faces. Since this finding could not be explained by unfamiliarity of the outgroup given that Asians are just as unfamiliar as Blacks, the authors attributed their effects to the fact that the Asian stereotype does not include threatening attributes, where the Black stereotype does.

Taken together, the results from the above two studies suggest that the amygdala's response to faces of different races is not a function simply of race, but of stereotypes that are automatically activated when perceiving an unfamiliar Black person. These results support the idea of the Black as fear stereotype theory in that unfamiliar Black targets elicit a larger fear reaction in White participants than unfamiliar White targets or familiar Black targets. Additionally, because familiar Black targets elicit less amygdala activation than unfamiliar Black targets or Asian targets, these findings do not support the theory that viewing outgroup members elicits greater attention because they deviate from a cultural norm, as suggested by others (Ito & Urland, 2003; Smith & Zarate, 1992). Finally, because amygdala activation to Black and White targets was correlated with a measure of implicit race bias (the startle reflex), but not a measure of explicit race bias (a self-reported racism scale), this suggests a moderating role of prejudice level on racial bias at the automatic level. Taken together, the results from these two studies offer support for the idea that stereotype-consistent information is encoded and retrieved relatively automatically, and may be separate from self-report levels of prejudice which involve a more controlled process.

The Current Research

The first objective in designing the current research studies was to examine the effects of contextual information on the social categorization process at the behavioral and the neural level. That is, at which point in the social categorization process does contextual information affect processing? Previous research has suggested that providing contextual information can lead participants to identify a multiply-categorizable individual in different ways by activating a particular category (Macrae et al., 1991). However, less research has demonstrated how activating stereotypes or other concepts consistent or inconsistent with social categories will affect the categorization process. The following studies were designed to examine the timecourse of this process – to understand when, in the course of information processing, contextual information has an impact. Therefore, a modified flanker paradigm was utilized in which faces of Black and White males were presented as target stimuli and words related to emotions (Experiment 1) and stereotypes (Experiment 2) were presented as flankers (distracters). It was expected that, because of the concepts that these flanker words activate, this information would affect the speed at which participants racially categorized the targets. That is, it was expected that incompatible trials (negative emotions or stereotypes paired with Whites; positive emotions or stereotypes paired with Blacks) would be processed more slowly than compatible trials (negative words with Black faces; positive words with White faces). Additionally, it was hypothesized that incompatible trials would elicit more response conflict and that this effect would be manifest in both behavior and eletrocortical responses (see below).

Secondly, this research was designed to explore the role of attention in the categorization process. As reviewed previously, studies have found that White participants allocate more attention to Black targets early in processing, while directing more attention to White targets at later processing stages (e.g., Dickter & Bartholow, 2006; Ito & Urland, 2003, 2005). Although this finding has been consistent across several studies, the mechanisms driving these differences are still unclear, as is their functional significance for behavior. For example, it may be the case that early attention to Blacks is due to a fear-related stereotype that is activated upon perception of a Black face. If this hypothesis is correct, then it would be expected that attention to Black faces might predict behavior on a racial bias task. Alternatively, participants may first be attending more to outgroup members and then they may shift to their attention to ingroup members, so that stereotype activation does not necessarily influence early processing. In this case, it would not be expected that attention to racial groups would predict behavior on a racial bias task. In order to test competing hypotheses, participants completed the flanker task described above as well as the Payne (2001) weapons task. As reviewed previously, the weapons task provides separate estimates of automatic and controlled aspects of race bias. To the extent that race processing differences evident in ERPs have some functional significance for race bias, there should be an association between the size of the ERP effects in the Flanker task and the amount of race bias shown in the weapon task, particularly the automatic component.

The final goal of the current research was to examine the nature of the Black stereotype. It is clear from RT studies, psychophysiological experiments, and self-report studies that the category of Blacks is activating a schema involving violence, which in turn produces a fearful response in perceivers. However, although many studies have documented the association of the social group “Blacks” with fearful traits such as violence or aggressiveness, it is still unclear if this stereotype is more associated with Blacks than are other negative stereotypes. In other words, there are no studies directly comparing the automatic activation of negative stereotypes to each other to identify differences in the activation potential of different aspects of the Black stereotype. This distinction may be theoretically important in terms elucidating of the nature of the Black stereotype, and may have practical significance in terms of providing insights into how to combat anti-Black stereotypes. A key hypothesis of the current research is that the stereotype most linked with Blacks is the one that activates a fear response in individuals. Because of theories linking darkness with threat (e.g., Schaller et al., 2003) that suggest that a fear reaction to the group might be adaptive (Hurwitz & Peffley, 1997), it is hypothesized that these strong reactions will lead threatening stereotypes to be more pervasive and more associated with Blacks.

Due to the limited available data on this issue, a pilot study was conducted in order to examine the hypothesis that fear-related Black stereotypes will differ from the non-fear-related Black stereotypes at the automatic level in their degree of association with the Black category. In the pilot study, 48 participants engaged in a computer RT task where they identified strings of letters as either words or non-words (i.e., lexical decision task) following the brief (300 ms) presentation of a Black or White male face (i.e., prime). The letter strings made up 5 different conditions: Black fear-related stereotypes (e.g., aggressive, hostile), Black negative non-fear-related stereotypes (e.g., lazy, stupid), positive words (e.g., smart, honest), neutral words (e.g., average, moderate), and non-words (e.g., sarf, philst).

In order to reduce the positive skew common to RT data, outliers below 300 ms and above 1000 ms were removed for the analyses. The remaining RTs were log-transformed, and these logged data were used for all analyses. The data were analyzed with a repeated measures ANOVA with 10 within-subjects conditions, yielding a 2 (race of prime: Black or White) x 5 (word: fear, negative, neutral, positive, or non-word) design. As expected, the analysis showed a significant main effect for word type, F (4, 44) = 14.90, $p < .001$. Planned comparisons were conducted to examine specific predictions. These comparisons examined the means for the fear words compared to each other word type within and across target race. Comparisons revealed a significant difference between the fear word condition and the neutral word condition for Black prime trials, t (48) = 3.63, $p < .01$, but not for White prime trials, t (48) = 0.07, $p > .10$ (see Table 1 for RT differences). This finding suggests that fear words are processed significantly faster than neutral words after presentation of a Black target but not a White target, indicating that there is a strong association between Blacks and a fear response compared to Whites. Furthermore, there was a marginal difference between Black and White targets in the fear condition (t [48] = 1.42, $p < .07$) but not in the negative condition (t [48] = 0.00, $p > .10$), suggesting that fear is associated with Black targets more so than other negative stereotypes. The results from the pilot study provide preliminary evidence that the stereotype that is automatically activated upon presentation of a Black target is specifically a fear response, more so than just a negative stereotype.

Based on the promise in these pilot results, two studies were designed that employed the flanker paradigm and the weapons task in order to accomplish the goals of the current research. This research was designed around the idea that a combined behavioral and electrocortical approach to measurement would provide a more comprehensive understanding of categorization and stereotype activation than has been possible with either measure alone.

This research involved the examination of several different ERP components related to the current goals. These components fall into 2 categories: early attention and later evaluative processes. The short-latency early attentional endogenous components of the ERP that were explored include the N100, P200, and N200. Research involving these early components has suggested that the categorization of a person into a generic category takes place in the first 100-200 ms after the stimulus (Ito & Urland, 2003). Thus, early after stimulus presentation, participants are attending to social stimuli presented in the visual field. The N100 usually peaks at about 100 ms post-stimulus while the P200 has its peak at about 200 ms. The P200 has recently been specifically linked to perceptions of threat (Ito & Correll, under review) as well as the identification of angry faces (Schutter, de Haan, & van Honk, 2004). Thus, it is expected that the P200 should be larger for threatening stimuli, such as Black faces, particularly when Black faces are flanked by threat-related words.

The N200 has been associated with the avoidance of inappropriate responses, which may occur when there is response conflict between prepotent but inappropriate response tendencies and alternative responses (Bartholow, Pearson, Dickter, Sher, Fabiani, & Gratton, 2005; Nieuwenhuis, Yeung, van den Wildenberg, & Ridderinkhoff, 2003). Thus, trials in which flanker words subtly activate racial categories that are incompatible with the racial category of the target should elicit larger N200s. For example, recent research has indicated that the amplitude of the N200 is larger when a tool is misidentified as a gun following a Black face prime (in the Payne [2001] weapon identification task) than following a White face prime (Bartholow, Payne, & Henry, 2005). This finding suggests that the conflict inherent in attempting to overcome a tendency to "shoot" is greater on Black prime trials than on White prime trials.

Another endogenous component of the ERP is the P300, which is a component associated with later evaluative processing. The P300 usually peaks between 300 and 600 ms post-stimulus and takes place when the participant is actively attending to the stimulus. The P300 is largest following a novel or surprising stimulus, such as an expectancy violation (Bartholow, Fabiani, Gratton, & Bettencourt, 2001; Hugdahl, 1995). Additionally, stimuli that elicit large P300s are generally remembered better than stimuli that elicit smaller P300s (Fabiani & Donchin, 1995; Bartholow et al., 2001). Such findings have led to the hypothesis that the P300 is a manifestation of working memory updating (Donchin & Coles, 1988). Large P300s also occur when there is a difference between the evaluative categorization of a target stimulus and the stimulus that would be expected based on a pre-established context (Cacioppo et al., 1993). Research has suggested that the P300 is also an index of task irrelevant categorization processes (Ito & Cacioppo, 2000). That is, it may be an index of implicit cognitive processes to which the participant is not explicitly attending such as the categorization and recognition of race and gender (Ito & Urland, 2003). Finally, P300 latency has been linked to stimulus evaluation or categorization time. Specifically, studies have shown that the correlation between P300 latency and reaction time is stronger when participants are given accuracy as opposed to speed instructions and that as categorization becomes more difficult, P300 latencies become longer. Thus, P300 latency can serve as an indicator of the categorization of racial groups or stereotypes which, unlike RT, is not dependent upon the duration of response-related motor processes or task-relevant response selection requirements (Kutas, McCarthy, & Donchin, 1977; McCarthy & Donchin, 1981; Smid, Mulder, Mulder, & Brands, 1992).

In summary, the following hypotheses were advanced for this research:

1. Context information was expected to affect the processing of target stimuli in the flanker task at all stages of processing. That is, behavioral results as indexed by reaction time were expected to be facilitated when flanker words were compatible with the target race, but inhibit reaction time when flanker words were incompatible with the target race. It was also expected that psychophysiological data would be affected by context information as well, in that incompatible conditions would lead to larger N200s, which signify response conflict.
2. It was also hypothesized that participants would allocate more attention to Black targets than to White targets early in processing, regardless of context information. Thus, early attentional components of the ERP were expected to be larger to Blacks than Whites. It was also hypothesized that attention would then shift to White targets, again indexed by early attentional components.
3. A third hypothesis was that the stereotype most linked with Blacks would be a fear-related stereotype. Thus, participants were expected to have quicker reaction times to trials in which fear-related words were presented simultaneously with Black faces, relative to other trials, including those involving negative words.
4. Because the P200 has been associated with threatening stimuli, it was expected that conditions that contain threatening stimuli would elicit larger P200s. Thus, larger P200 amplitudes were expected for conditions that involved Black targets as well as those conditions with fear-related words.

5. Finally, an exploratory hypothesis advanced for this research was that ERP measures of differential attention to race, assessed during the flanker task, would correlate with behavioral manifestations of race bias assessed by the weapons task. This hypothesis was based on the notion that early attention to race should have implications for behavioral manifestations of race bias. That is, the same automatic process was expected to play a role in both neurological components during the categorization task and the behavioral results of the weapons task.

CHAPTER II

EXPERIMENT 1 METHOD

Participants

Thirty-seven White undergraduates from the University of Missouri-Columbia completed this experiment for course credit in an introductory psychology class. All participants were healthy adults between the ages of 18 and 25 and were right-handed. Participants signed up for the experiment using a web-based system in which prerequisites stated that individuals with health problems and those who were left-handed were ineligible. In addition, upon arrival at the lab, participants were required to complete and sign an informed consent form (see Appendix I) and the experimenter made sure that all participants were healthy and right-handed. The health requirement was necessary for the study due to the psychophysiological nature of the recording devices. That is, individuals with serious health difficulties, particularly neurological disease or head trauma, often show abnormal response patterns on ERP measures. Only right-handed participants were used to ensure that hemispheric motor cortex development would be similar across all participants, and to eliminate the need to add another between-subjects factor to the analyses to control for handedness.

Materials and Experimental Paradigm

Stimuli and Paradigm: Flanker Task. Pictures of 6 White male faces and 6 Black male faces, all of which had been used as targets in a previous study (Ito & Urland, 2003), were used as target stimuli in this experiment. Each photograph displayed a face of either a

Black or a White man or woman and was cropped so that only the facial area was shown, in order to control for the influence of extraneous information such as jewelry, clothing, or background. All pictures were pre-tested for attractiveness and likeability, and had at least 80% agreement in race judgments. Additionally, all targets had a neutral expression on their faces and all pictures were of equal size.

Flanker stimuli were words that fit into 6 different categories of emotion: anxiety, anger, fear, happiness, sadness, and disgust. Words were chosen to be synonyms of each emotion and all words were matched across condition in word length and frequency in the English language (see Appendix II for a list of words used; Kucera & Francis, 1982). There were 12 within-subjects conditions in this experiment: each of the six emotion categories was paired with an equal number of Black and White targets during the task.

Stimuli were presented in a modified flanker task (Eriksen & Eriksen, 1974). On each trial, a target face was displayed in the middle of the screen and 4 flanker words were simultaneously displayed above, below, and on either side of the target face. Each trial consisted of a 200 ms pre-stimulus baseline period followed by presentation of the stimulus array, which appeared on the screen for 500 ms with a random inter-trial interval ranging from 1000-1200 ms. Participants completed 12 blocks of 72 trials each. At a viewing distance of approximately 90 cm, the stimulus arrays subtended a visual angel of approximately 30 degrees. Participants were instructed to categorize the target according to race (Black or White) by pressing one of two keys (counterbalanced across participants) and were told to ignore the flanker words. Care was taken to ensure that no objects were in the participants' peripheral vision and that the screen was the only salient visual image.

Stimuli and Paradigm: Weapons Task. All stimuli were identical to the weapons paradigm designed by Payne (see Payne, 2001). Pictures of two Black males and two White males were used as primes. The faces were cropped so that extraneous information could not be seen and each person was wearing a neutral expression. Target stimuli were four pictures of tools and four pictures of handguns, all equal in size.

In accordance with Payne's (2001; Experiment 2) procedure, stimuli were presented in trials that consisted of a prime face quickly followed by a target stimulus (i.e., a gun or a tool). Each prime was presented for 100 ms and was immediately replaced by the target stimulus, which appeared on the screen for 200 ms. The only difference between Payne's procedure and the one used here is the timing of stimulus presentation. That is, the inter-stimulus interval in the present experiment was 1000 ms (in Payne's [2001] study, it was 500 ms) and no responses were accepted after 500 ms, which was necessary in order to measure stimulus-locked ERP components. Participants were told that the face prime would signal that the target stimulus was about to appear and they were instructed to classify the target as either a gun or a tool by pressing one of two buttons on the response box. Participants were required to respond quickly and accurately. If they did not respond within 500 ms, the message "Respond Faster!" appeared on the screen in red letters until the next trial. The paradigm consisted of 288 trials, which were presented in 4 blocks of 72 trials each. There were 4 trial conditions: Black prime with gun; Black prime with tool; White prime with gun; and White prime with tool. Participants were encouraged to take a short break to rest between each block.

Psychophysiological Data Collection and Reduction

The electroencephalogram (EEG) was recorded from 28 scalp sites using tin electrodes sewn into an electrode cap (Electrocap, International, Easton, OH), according to an extended 10/20 system (American Encephalographic Society, 1991). Active scalp sites were referenced online to the right mastoid; an average mastoid reference was derived off-line. Vertical and horizontal movements (EOG) were recorded with electrodes placed above and below the left eye and on the outer canthus of each eye. Electrode impedances were kept below 5 KΩ at all sites. EEG was sampled at 250 Hz using Neuroscan Synamps (Compumedics USA, El Paso, TX) amplifiers and was filtered online at .01 to 40 Hz. A regression-based procedure was used to remove the effects of ocular artifacts (Semlitsch, Anderer, Schuster, & Presslich, 1986). Trials containing voltage deflections of ± 75 microvolts (μV) were removed prior to averaging. Averages were further filtered offline at 12 Hz. Finally, the data were averaged according to participant, electrode, and stimulus condition.

Procedure

After participants completed the consent form, the experimenter explained that the purpose of the study was to assess facial recognition amid distraction. Participants were seated with both feet on the ground in front of a computer in a comfortable chair where they familiarized themselves with the response box, which contained two buttons, each mapped on to one target response (i.e., Black or White). The button associated with each response was counter-balanced across participants. The experimenter explained the instructions for the flanker task and then attached and tested the electrodes. Participants were instructed to only respond to the race of the target face and to ignore the flanker words. They were told to respond as quickly as possible to the target faces and to try to stay alert throughout the duration of the task. Additionally, the experimenter explained that a small video camera would be used to monitor coughing, sneezing, excessive blinking, and sleepiness, as these behaviors can affect EEG activity. Before beginning the actual trials, participants completed 20 practice trials in which the experimenter was able to check that the equipment was working properly and that participants understood the task. No participants had trouble understanding the task. When it was determined that participants were completing the trials in a quick and accurate manner, the experimenter left the room and participants started the experimental trials. During the task, participants moved at their own pace between blocks, allowing time to rest their eyes.

After the first task was completed, participants were allowed to rest for a few minutes before beginning the second task. After the period of rest, the experimenter explained the instructions for the weapons task and the participant was left alone again to complete it. For both parts of the experiment, the responses were recorded in milliseconds (ms) by Presentation software (Neurobehavioral Systems, Inc.), which also recorded the number of misses, hits, and false alarms. After the trials of the weapons task were completed, the experimenter carefully removed all the electrodes and the participants were given time to clean up in a private room with a sink. The experimenter then carefully debriefed each participant (see Appendix III for debriefing). Each participant was in the laboratory for approximately 2 hours.

CHAPTER III

EXPERIMENT 1 RESULTS

Flanker Task: RT Data

Only correct trial reaction times (RTs) were used in the analyses reported here. RTs ± 3 SD from the mean also were eliminated prior to analyses (see Fazio, 1990). The remaining average RTs were then subjected to a 6 (Emotion: anxiety, anger, fear, happiness, sadness, disgust) x 2 (Target Race: Black or White) repeated measures ANOVA. Mean RTs in each condition are displayed in Table 1.

As predicted, the ANOVA showed an Emotion x Target Race interaction, $F(5, 185) = 2.61, p < .026$, suggesting that contextual information (i.e., flanker words) affected the correct categorization of target faces by race. This overall ANOVA was followed by planned contrasts examining conditions of interest, that is, contrasting fear with happiness (see Hypothesis 3). This contrast also produced a significant Emotion x Target Race interaction, $F(1, 27) = 6.76, p < .013$ (see Figure 1). However, inspection of the means associated with this contrast indicated an unpredicted pattern. Specifically, RTs were significantly longer when White targets were flanked by happiness-related words ($M = 450.01$) compared to fear-related words (M = 441.90). RTs to categorize Black targets did not differ in the happiness ($M = 441.70$) and fear ($M = 442.67$) word conditions. Both the main effects of Emotion ($F[5, 185] = .89, p = .49$) and Race ($F[1, 37] = .74, p = .39$) were nonsignificant.

Accuracy was also examined by calculating the percentage of hits for each condition and was subjected to a 6 (Emotion: anxiety, anger, fear, happiness, sadness, disgust) x 2

(Target Race: Black or White). There was no significant main effect of Emotion, $F(5, 185) = .47$, $p = .79$ but there was a marginally significant effect for Target Race, $F(1, 37) = 2.68$, $p = .11$, such that participants were slightly more accurate when categorizing White targets (M = 84.82%) than Black targets (M = 83.03%). The interaction between Emotion and Target Race was not significant, $F(5, 185) = .73$, $p = .60$.

Flanker Task: ERP Data

Due to a large number of EEG artifacts, ERP data from one participant were discarded. Thus, analyses of ERP data were based on 36 participants. As in previous research (see Ito & Urland, 2005), analyses of all ERP component amplitudes were conducted at the electrode at which the component was maximal, using a series of 6 (Emotion: anxiety, anger, fear, happiness, sadness, disgust) x 2 (Target race: Black or White) repeated measures ANOVAs. Analyses including data from 15 major electrode sites (i.e., using a 6 [Emotion] x 2 [Target Race] x 15 [Electrode] design) resulted in the same general pattern of effects reported here. Quantification of ERP components of interest was based on visual inspection of single-participant averaged waveforms across the scalp. The N100 component was largest at the frontal midline site (Fz) and so was quantified as the average voltage value between 25 and 135 ms post-stimulus at Fz. The P200 was largest at the midline parietal (Pz) electrode and was quantified as the average voltage between 135 and 230 ms at that site. The N200 component was largest at Fz and was quantified as the average voltage between 230 and 315 ms post-stimulus at that site. The P300 was largest at Pz and was quantified as the average voltage between 315 and 515 ms at that site. Finally, P300 latency was quantified as the largest positive peak at the Pz electrode between 300 and 800 ms post-stimulus.

Early effects: N100, P200, N200. Analyses of N100 amplitude showed no significant effects. The Emotion main effect indicated similar N100 amplitudes for all emotions, $F(5, 180) = 1.14$, $p = .34$ and there also was no significant Target Race effect, $F(1, 36) = .52$, $p = .48$. The interaction involving Target Race and Emotion also was nonsignificant, $F(5, 180) = .14$, $p = .98$.

P200 amplitude analyses revealed a significant Target Race main effect, $F(1, 36) = 67.17$, $p < .001$. As shown in Figure 2, P200 amplitudes were larger for Black targets ($M = 4.78$ μV) than for White targets ($M = 3.44$ μV), consistent with numerous previous reports (Dickter & Bartholow, 2006; Ito & Urland, 2003, 2005; Ito et al., 2004). The main effect for Emotion did not reach significance, $F(5, 180) = 1.53$, $p = .18$, nor did the interaction between Target Race and Emotion, $F(5, 180) = .66$, $p = .66$.

Several planned comparisons were performed in order to examine the role that the P200 plays in processing threat (see Hypothesis 4). In support of this idea, targets surrounded by anger words ($M = 4.41$ μV) produced larger P200 than targets surrounded by happy words ($M = 3.73$ μV), $F(1, 36) = 5.39$, $p < .03$. Also, although not significant, the means for anxiety ($M = 4.24$ μV) and fear ($M = 4.09$ μV) were also larger compared to happiness, $F(1, 36) = 2.89$, $p = .10$ and $F(1, 36) = 1.63$, $p = .21$, respectively. Finally, when all negative emotion words were combined, the mean for this composite ($M = 4.21$ μV) was marginally larger than the mean for happiness, $F(1, 36) = 3.86$, $p = .06$.

Analysis of the N200 also showed a significant main effect for Target Race, $F(1, 36) = 63.26$, $p < .001$ (see Figure 2). However, in contrast to the P200, the N200 was larger for White targets ($M = -3.33$ μV) compared to Black targets ($M = -1.70$ μV), again consistent with previous reports (Dickter & Bartholow, 2006; Ito & Urland, 2003, 2005; Ito et al., 2004). The main effect of Emotion was not significant, $F(5, 180) = .72$, $p = .61$, nor was the interaction between Emotion and Target Race, $F(5, 180) = 1.00$, $p = .42$.

Later evaluative processes. The ANOVA on P300 amplitude showed a significant main effect of Target Race, $F(1, 36) = 33.36$, $p < .001$, such that the P300 was larger for Black targets ($M = 9.61$ µV) than White targets ($M = 7.91$ µV). The overall Emotion x Target Race interaction was not significant, $F(5, 180) = 1.11$, $p = .36$. However, when only fear and happiness trials were included, a contrast of primary interest to the present research (Hypothesis 3), the main effect of Target Race was qualified by a marginally significant Emotion x Target Race interaction, $F(1, 36) = 3.36$, $p < .075$, revealing a larger difference between Black and White targets for fear trials (M difference = 1.88, $t(36) = 4.69$, $p < .01$) than for happiness trials (M difference = .84, $t(36) = 1.39$, $p = .17$; see Figure 3). There was no Emotion main effect for the P300 amplitude, $F(5, 180) = 1.12$, $p = .35$.

The full ANOVA of P300 latencies showed no significant effects. That is, the Race main effect yielded no differences between Black and White targets, $F(1, 36) = 1.76$, $p = .19$ and the Emotion main effect also failed to reach significance, $F(5, 180) = 1.58$, $p = .17$. Finally, the interaction between Target Race and Emotion also was nonsignificant, $F(5, 180) = .64$, $p = .67$. However, when specific race contrasts were computed in each flanker word condition, a significant main effect emerged for the fear word condition, $F(1, 36) = 4.59$, $p < .04$. Inspection of the means showed that P300 latency was shorter when Black targets were flanked by fear words ($M = 405.05$) than when White targets were flanked by fear words ($M = 417.11$). Specific race contrasts in the other emotion word conditions showed no significant differences as a function of target race (Fs < 1.35, ps > .40).

Weapons Task: RT Data

Analyses of RTs for the weapon task were conducted according to Payne (2001). Therefore, RT trials that exceeded 1000 ms and that were less than 100 ms were eliminated from data analysis, as were incorrect responses. Additionally, 1 participant had so many errors that the data were dropped from analyses, leaving 36 participants. Mean RTs were computed for each trial type: Black prime-gun, Black prime-tool, White prime-gun, and White prime-tool. Data were then analyzed using a 2 (Prime: Black or White) x 2 (Target: gun or tool) repeated measures analysis of variance (ANOVA).

Consistent with Payne's (2001) results, a significant Prime x Target interaction was found, $F(1, 35) = 6.19$, $p < .02$ (see Figure 4). Examination of the means suggested that participants identified guns faster following a Black face ($M = 362.20$) than a White face ($M = 365.33$), although the simple effect test of these means did not reach significance, $F(1, 35) = 1.27$, $p = .27$. Additionally, participants were quicker to identify tools following a White face ($M = 356.52$) than following a Black face ($M = 366.85$), $F(1, 35) = 5.25$, $p < .03$ (see Table 2). Both main effects were nonsignificant – for Prime, $F(1, 35) = 1.94$, $p = .17$, and for Target, $F(1, 35) = .26$, $p = .61$.

Weapons Task: Accuracy Data

Accuracy rates for each condition were calculated and were relatively low (66%). The accuracy data were analyzed using a 2 (Prime: Black or White) x 2 (Target: gun or tool) repeated measures analysis of variance (ANOVA). Results indicated no main effect for Prime, $F(1, 35) = 2.00$, $p = .17$. However, consistent with Payne (2001), there was a main effect of Target, $F(1, 35) = 18.01$, $p < .001$, indicating that participants had lower accuracy towards responding to tool trials ($M = 51\%$) than they did to gun trials ($M = 66\%$). This main effect was qualified by a significant Prime x Target interaction, $F(1, 35) = 14.77$, $p < .001$. Simple effects tests revealed that participants were more accurate at categorizing guns after seeing a Black prime (M = 69%) than a White prime (M = .63%), $F(1, 35) = 7.54$, $p < .01$. Additionally, participants were more likely to mistakenly identify a tool as a gun when primed with a Black face than a White face, $F(1, 35) = 14.19$, $p < .001$. That is, the accuracy rate for the Black-tool condition (M = 46%) was significantly lower than the White tool condition (56%). These accuracy results are consistent with the findings from Payne (2001).

Weapons Task: Automatic and Controlled Components

In addition to analyzing RT on correct trials, it is also possible to extract estimates of the influence of automatic and controlled processes on responses in this task. This is done with the process dissociation procedure (PDP), first used by Jacoby (1991). The PDP allows one to estimate the unique contributions on task performance from the automatic bias and controlled perception that may contribute to differences in RTs and error rates. As in Payne's (2001) analyses, each estimate was calculated differently for Black and White prime trials based on the congruency of each condition, which was determined by the stereotypic match between race of prime and target. A trial in which a tool is preceded by a Black prime was considered an incongruent condition. A congruent condition was considered a trial in which a gun was preceded by a Black prime. Thus, the controlled estimate for Black primes (C_B) was computed by subtracting the proportion of incorrect tool trials from correct gun trials. The automatic estimate for Black primes (A_B) was reached by subtracting ($1/C_B$) from the incorrect tool trials. For White primes, the controlled estimate (C_W) was calculated by subtracting the proportion of incorrect gun trials from the proportion of correct tool trials. The automatic estimate for White primes (A_W) was computed by subtracting ($1/C_W$).

When subjected to a 2 (Race: Black vs. White) x 2 (Estimate: Automatic vs. Controlled) repeated measures ANOVA, a main effect of Estimate emerged, in which automatic estimates (M = .78) were larger than controlled estimates (M = .53), $F(1,35)$ = 124.00, $p < .001$. There was also a marginally significant Race main effect, which was larger for White (M = .55) than Black (M = .35), $F(1,35)$ = 3.68, p = .06. The Race x Estimate interaction failed to reach significance, $F(1,35)$ = 2.84, p = .10. Because the data were structured by using the automatic and controlled estimates for each race condition, it was possible to directly compare automatic and controlled estimates across race. When this was computed, planned comparisons revealed that the automatic estimate was slightly smaller for the Black prime condition (M = .64), compared with the White prime condition (M = .91), $F(1, 35)$ = 3.37, $p < .07$. Consistent with Payne's (2001) results, this difference disappeared in the control estimate, $F(1, 35)$ = 2.00, p = .17. Thus, it appears that priming affected automatic processing, but not controlled processing.

Weapons Task: ERP Data

The N200 component of the ERP was analyzed. Due to an error, only 19 participants' N200 data were available. In this study, the N200 was quantified as the largest negative amplitude between 0-300 ms post-stimulus on correct trials. Although the N200 was largest at the CP4 and C4 electrodes, analyses isolated at these electrodes failed to produce any effects, so analyses were conducted with an array including 15 electrodes (F3, FZ, F4, FC3, FCZ, FC4, C3, CZ, C4, CP3, CPZ, CP4, P3, PZ, P4). At this level of analysis, a repeated measures ANOVA yielded a main effect for Prime, demonstrating that participants had larger N200s on trials with Black primes than with White primes, $F(1,18)$ = 7.80, $p < .01$. The Target main effect was not significant, $F(1, 18)$ = .38, p = .55, nor was the interaction between Prime and Target, $F(1, 18) = .57$, $p = .46$. There was also a main effect of electrode, which is often the case with ERP analyses, but is theoretically uninteresting, $F(14, 252) = 2.37$, $p < .01$. There were also significant interactions for Prime x Electrode, $F(14, 252) = 2.51$, $p < .01$ as well as Target x Electrode, $F(14, 252) = 4.46$, $p < .01$. Finally, there was no significant three-way interaction among all variables, $F(14, 252) = .78$, $p = .69$. Again, because there were no location-specific hypotheses for these data, the Electrode main effect and interactions involving Electrode are uninteresting and will not be discussed.

Individual Difference Measures

Prior to the experiment, most of the participants ($N = 25$) completed questionnaire measures of familiarity with Blacks as part of a mass survey administered online early in the semester (see Appendix IV). For the analyses related to this experiment, responses to these questions were combined into a single score, termed "familiarity" ($M = 27.16$) and the data were re-analyzed with the familiarity term as a predictor variable. Familiarity was not a significant predictor of any variable in the flanker task (all *p*s > .1).

For the weapons task, a measure of racial bias was calculated for each participant. As demonstrated in Payne's (2001) paper, racial bias was determined by subtracting RTs for identifying guns in the Black prime condition from identifying guns in the White prime condition. Higher scores on this measure are an index of greater racial bias. The mean for racial bias was 5.87 for participants in the first experiment, with scores ranging from -30.27 to 31.46. When a regression analysis was performed in order to predict racial bias from familiarity, no significant effects were found (all βs -.17-.05; *p*s > .05).

Correlations between Flanker Task ERPs and Weapons Task Performance

Besides examining effects within each task, separate analyses were performed that combined data from the two tasks to test for connections between brain activation during social categorization and a separate behavioral index of racial bias. Thus, ERP component amplitudes measured during the flanker task were correlated with behavioral effects in the weapons task, including RT to each condition as well as automatic and controlled effects to Black and White faces and finally a behavioral index of racial bias measured by the weapons task (see Table 4 for correlation matrix). Significant correlations were found between RT to White-tool trials in the weapons task with N200 activation in the flanker task to Black targets ($r = -.44$, $p < .05$) and White targets ($r = -.48$, $p < .05$), suggesting that a larger N200 to Black targets in the flanker task is correlated with slower RT to White-tool trials in the weapons task. Additionally, there were significant correlations between P300 amplitude on Black target trials in the flanker task and RT on trials in the weapons task that involved Blacks followed by guns ($r = -.42$, $p < .05$) and Blacks followed by tools ($r = -.49$, $p < .05$). P300 amplitude on Black target trials also was negatively correlated with trials on the weapons task that had Whites followed by guns ($r = -.38$, $p < .05$) and Whites followed by tools ($r = -.45$, $p < .05$). P300 amplitude in the flanker task on White trials was also negatively correlated with Black-tool trials ($r = -.41$, $p < .05$) and White-tool trials ($r = -.41$, $p < .05$). Finally, behavioral racial bias as indicated by subtracting RTs on White-weapon conditions from Black-weapon conditions was significantly negatively correlated with the estimate for White control ($r = -.38$, $p < .05$) and RT on the White-weapon condition on the weapons task, but was not correlated with any ERP components in the flanker task.

Correlational analyses were also conducted between N200 amplitude and measures of behavioral bias and automatic and controlled estimates in the weapons task in order to establish possible relationships between ERP components and racial biases indices. However, the only significant correlation that emerged was between N200 for Black-tool trials and the White automatic estimate ($r = .47$, $p < .05$).

CHAPTER IV

EXPERIMENT 1 DISCUSSION

Experiment 1 involved a paradigm designed to examine the effects of contextual information on the processing of Black and White faces in a flanker paradigm. Participants engaged in a social categorization task in which they classified the race of the target person as Black or White while contextual information was presented on either side of the target picture, designed to elicit emotional associations. In addition, the same participants completed the weapons task (Payne, 2001) in which they responded to gun or tool stimuli which were preceded by either a Black or a White male face.

Analyses examining the interaction between contextual words and target race in the flanker task emerged for the most part only in the behavioral data. This interaction suggests first that participants were unable to ignore the contextual information at this stage in processing and that attending to this information affected their responding at the behavioral level (RT). The interaction for RT data was inconclusive in that no specific pattern emerged with relation to hypotheses of the current paper, other than that participants were quickest to respond to White targets embedded in happiness-related information. There were no significant contrasts including Black targets, and there were no differences between compatible and incompatible conditions, as had been predicted. These findings may suggest that emotions as flanker information may not affect the processing of racial information in the same way that stereotype- or race-related distracter information may affect this processing.

Although context information in the form of flanker words obviously affected behavior, although not in a systematic way, it did not seem to affect the physiological processes during the task. The lack of differences between compatible and incompatible conditions at the neurological level may be due to the nature of the flanker paradigm used in the present study. Previous research has demonstrated that when the flanker stimuli are not mapped on to an experimentally defined response, differences emerge on response-related measures, but may not occur on stimulus-related measures like the ERP components measured here (Smid, Lamain, Hogeboom, Mulder, & Mulder, 1991).

However, important race main effects did emerge in the ERP data. These effects indicated that participants gave more attention to Black targets in early stages of processing (P200) and more attention to White targets later (N200). These results replicate previous findings suggesting that participants attend differently to racial ingroup and outgroup targets at different stages of processing (Dickter & Bartholow, 2006; Ito & Urland, 2003, 2005) and also support Hypothesis 2 proposed by the current paper. Additionally, these data provide some evidence for Hypothesis 3, that Black targets may elicit a threatening or fear-related response. Thus, the larger P200 amplitudes found for Black targets may be due to White participants attending more first to the outgroup, perhaps because outgroup members (or Blacks per se) are more threatening than ingroup members. Additional evidence that White participants may have found Black targets more threatening comes from the P300 latency data, which indicated that participants processed Black targets surrounded by fear-related words more quickly than White targets surrounded by fear-related words. This finding suggests that the Black target and fear-related words may be activating congruent or compatible concepts. Although this finding did not clearly emerge in the RT data, it may be the case that the ERP effects are more sensitive and are a more direct measure of this activation than are RT measures. That is, P300 latency may be a more pure measure of processing speed because it is not confounded by response output processes, as RT is. However, P300 latency may also be tapping into the same construct as RT, in that the two tend to be correlated.

This data also provided information about the nature of negative versus positive emotion-related words that were presented as flanker information. That is, anger-related words yielded significantly larger P200s than happiness-related words, and all negative words elicited larger P200s than the happiness condition, although not all effects were significant. This illustrates that negative words elicit more threat than positive words. Thus, this study provides additional support for Hypothesis 4, that the P200 is an index of threatening stimuli. .

Experiment 1 yielded a partial replication of the weapons effect, first noted by Payne (2001). Participants were faster to respond to trials in which weapon targets were preceded by Black primes compared to White primes, although this difference did not reach statistical significance in this study. Accuracy data also revealed that participants were more likely to falsely identify a tool as a gun when the target was primed with a Black face compared with a White face, also consistent with Payne's (2001) findings. Additionally, the results showed a difference between automatic estimates for Black versus White trials but not for controlled estimates; this also replicates Payne's (2001) research, suggesting that the racial primes influenced responses regardless of whether processing information in this way would help or hinder performance on the task. It was also predicted that there would be greater N200 amplitudes for incongruent trials on the weapons task, because increases in N200 have been attributed to increases in response conflict, but the only significant finding was a main effect for race. These results may have failed to replicate other experiments because of certain timing differences between the current weapons paradigm and the original one. First of all, participants in the current study were given a time limit. That is, no responses were accepted after 500 ms; this speed constraint may have affected processing during EEG recording. Additionally, the interstimulus interval was very long in the current research compared to the original weapons paradigm, again due to necessities for EEG recording. In this study, the interstimulus interval was 1000 ms, and in Payne's (2001) study, the targets were presented immediately following the primes. Taken together, these two timing differences may have led to different results than the original paradigm. More research will be needed to further explore this possibility.

One of the purposes of administering two tasks for Experiment 1 was to compare behavioral and physiological responses across the flanker task and the weapons task to explore whether ERP measures of differential attention to race, assessed during the flanker task, would correlate with behavioral manifestations of race bias assessed by the weapons task. This hypothesis was based on the notion that early attention to race should have implications for behavioral manifestations of race bias. Although there were some significant correlations between ERP amplitudes in the flanker task and behavioral responses in the weapons task, no interesting effects emerged between tasks. However, within the weapons task, a measure of racial bias did correlate negatively with RT to conditions involving a White prime and as well as the White controlled estimate. These findings suggest that racial bias as indexed by performance on the gun conditions of the weapons task is negatively related to RT in conditions in which participants have to use controlled processing. That is, as racial bias increases, controlled processing decreases when White targets are being processed, yielding quicker RTs when Whites are involved, but not when Black targets are involved. Another purpose of the current research was to examine potential effects of an individual difference measure of familiarity with Blacks on the tasks. In both tasks, familiarity with Blacks was not related to behavior or racial bias in any way.

CHAPTER V

EXPERIMENT 2 METHOD

Participants

Thirty-eight White undergraduates from the University of Missouri-Columbia completed this experiment for course credit in an introductory psychology class. As in the first experiment, all participants signed up for the experiment online and were healthy, right-handed adults.

Materials and Experimental Paradigm

Stimuli and Paradigm: Flanker Task. This study employed a modified flanker task identical to that of Experiment 1 with the exception of the flanker words used. For this experiment, the flanker words were stereotypes that represented 5 categories: fear, Black negative, Black positive, White positive, and White negative. All words were selected from a pilot study in which participants rated a series of words on their valence as well as their stereotypicality for Whites and Blacks. The stereotypes that were chosen were words that the participants consistently rated most strongly valenced and most typical of a social group. As in the first experiment, all words were matched across condition for word length and frequency in the English language (see Appendix V for a list of words used). In Experiment 2, there were 10 possible trial conditions: each stereotype condition was paired with each of the two race conditions.

Stimuli and Paradigm: Weapons Task. The weapons task was identical to that of Experiment 1.

Procedure

As in the first study, participants first completed the flanker task and then the weapons task. All instructions and procedures were identical to Experiment 1.

CHAPTER VI

EXPERIMENT 2 RESULTS

Flanker Task: RT Data

Similar to the first experiment analyses, only correct trial RTs ± 3 standard deviations from the mean were used in the analyses. However, in the second experiment, these RTs were analyzed with a 5 (Stereotype: fear, Black negative, Black positive, White positive, White negative) x 2 (Target Race: Black or White) repeated measures ANOVA.

In the RT analyses, the main effect for Stereotype did not reach significance, $F(4, 152) = 1.08$, $p = .37$, nor did the Target main effect, $F(1, 38) = .93$, $p = .34$. However, there was a significant interaction of Stereotype x Target Race, $F(4, 152) = 2.98$, $p < .021$ (see Table 5 for means). Planned comparisons were conducted in each Stereotype condition to examine possible differences between means as a function of target race. The only condition to produce a significant contrast was that for White positive stereotypes, $F(1, 38) = 5.07$, $p < .03$, such that trials in which White targets were presented with White positive stereotypes were processed more quickly ($M = 442.93$) than trials in which Black targets were presented with White positive stereotypes ($M = 451.28$).

Another way to cast these data is in terms of valence rather than stereotypicality. Previous studies have shown connections between race and valence (generally Blacks are associated with negative valence and Whites are associated with positive valence; e.g., see Dovidio et al., 1986). To test for a similar possibility here, the negative traits (Black negative, White negative) were collapsed to form a “negative” composite, and the positive traits (Black positive, White positive) were collapsed to form a "positive" composite. The RT data were then re-analyzed using a 3 (Stereotype: fear, negative, positive) x 2 (Target Race: Black, White) ANOVA design. This analysis yielded a significant interaction, $F(2, 76) = 5.78$, $p < .01$. The means associated with this interaction are shown in Figure 5. None of the target race contrasts within specific word conditions were significant, though participants were marginally faster to categorize White targets than Black targets in the positive word condition, $F(1, 38) = 3.28$, $p = .078$. However, examination of the separate linear contrasts for Black target and White target trials across word types revealed a significant increase in RT for Black targets, $F(1, 38) = 11.04$, $p < .01$, indicating increasingly longer RTs from the fear ($M = 442.93$) to negative ($M = 446.14$) to positive ($M = 448.94$) conditions, and a marginally significant decrease in RT for White targets across these same conditions (*M*s = 445.51, 444.07, & 442.43, respectively), $F(1, 38) = 3.64$, $p = .063$.

Accuracy means were calculated for each condition across participants and were subjected to a 5 (Stereotype: fear, Black negative, Black positive, White positive, White negative) x 2 (Target Race: Black or White) repeated measures ANOVA. There was no main effect for Stereotype, $F(4, 152) = .52$, $p = .72$. However, there was a main effect of Target Race, $F(1, 38) = 6.24$, $p < .02$, revealing that participants were more accurate categorizing White targets ($M = 90.62\%$) than Black targets ($M = 89.24\%$). This pattern replicates the accuracy results found in Experiment 1. There was no interaction between Stereotype and Target Race, $F(4, 152) = 1.18$, $p = .32$. Additionally, when the conditions were collapsed according to valence, as was done with the RT means, similar results were found, as there was no significant main effect of Stereotype ($F[2, 76] = .76$, $p = .47$) but there was a Target

Race main effect, $F(1, 38) = 4.49$, $p < .05$. Finally, no interaction was found, $F(2, 76) = 1.95$, $p = .15$.

Flanker Task: ERP Data

ERP data from one participant were discarded because of EEG artifacts so analyses were based on data from 37 participants. As in the first experiment, all ERP analyses were conducted at the electrode at which the component was maximal. Each component was analyzed using a series of 5 (Stereotype: fear, Black negative, Black positive, White positive, White negative) x 2 (Target Race: Black or White) repeated measures ANOVAs. Quantification of components differed from Experiment 1 in the following ways. The N100 component was quantified as the average voltage value between 50 and 150 ms post-stimulus at Fz. The P200 was quantified as the average voltage between 150 and 215 ms at Pz. The N200 component was largest at Fz and was quantified as the average voltage between 215 and 300 ms post-stimulus at that site. The P300 was largest at Pz and was quantified as the average voltage between 300 and 650 ms at that site. Finally, P300 latency was quantified as the largest positive peak at the Pz electrode between 300 and 800 ms post-stimulus.

Early effects: N100, P200, N200. Analyses of N100 amplitude showed a marginally significant main effect of Stereotype, $F(4, 148) = 2.34$, $p < .058$. Planned comparisons indicated that targets surrounded by White positive words ($M = -3.05$) yielded marginally larger N100 amplitudes than targets surrounded by White negative words ($M = -2.02$), $F(1, 37) = 1.37$, $p = .06$, but that no other contrasts approached significance. The main effect for Race was not significant, $F(1,37) = .07$, $p = .80$, and the interaction also did not reach significance, $F(4, 148) = 1.36$, $p = .25$.

P200 amplitude analyses revealed a significant Target Race main effect, $F(1, 37) = 21.24$, $p < .001$. Consistent with the results of Experiment 1, data revealed larger amplitudes for Black ($M = 3.31$ µV) targets compared to White ($M = 2.35$ µV) targets (see Figure 6). The Stereotype main effect did not reach significance, $F(4, 148) = .29$, $p = .89$, and the Stereotype x Target interaction was also nonsignificant, $F(4, 148) = .74$, $p = .56$.

Also consistent with Experiment 1, the analysis of the N200 component showed larger amplitudes for White targets ($M = -4.79$ µV) compared to Black targets ($M = -3.64$ µV), $F(1, 37) = 28.67$, $p < .001$ (see Figure 6). There was not a significant main effect for Stereotype, $F(4, 148) = 1.11$, $p = .35$. Unlike Experiment 1, however, this main effect was qualified by a Stereotype x Target Race interaction, $F(4, 148) = 3.78$, $p < .006$. Although this interaction was mainly driven by the Stereotype main effect, planned comparisons revealed that there were two stereotype conditions that differed depending on the target race. There were larger amplitude N200s on trials in which fear-related words were presented with White targets (-5.31 µV) than when they were presented with Black targets ($M = -3.15$ µV), $F(1, 37) = 16.29$, $p < .01$. Additionally, White targets presented among White positive stereotypes elicited larger N200 ($M = -5.82$ µV) than did Black targets presented among White positive stereotypes ($M = -3.60$ µV), $F(1, 37) = 19.50$, $p < .01$.

Later evaluative processes. P300 amplitude analyses indicated a significant main effect for Stereotype, $F(4, 148) = 3.24$, $p < .014$. Examination of the means indicated that there were large amplitude P300s on trials in which fear ($M = 8.30$ µV), White positive ($M = 8.26$ µV), and White negative stereotypes ($M = 8.09$ µV) were presented, compared to trials in which Black negative ($M = 7.91$ µV) and Black positive stereotypes ($M = 7.49$ µV) were shown. Planned comparisons indicated that the only significant differences between conditions were between the Black positive condition and three other Stereotype conditions: fear, $F(1, 37) = 13.00$, $p < .01$, White positive, $F(1, 37) = 8.95$, $p < .01$, and White negative, $F(1, 37) = 6.11$, $p < .02$. Additionally, there was a main effect for Target Race, $F(1, 37) = 19.40$, $p < .001$, such that the P300 was larger for Black targets ($M = 8.58$ µV) than White targets ($M = 7.44$ µV) (see Figure 6). Although a significant interaction did not emerge, $F(4, 148) = .52$, $p = .72$, planned comparisons indicated differences between Black and White targets for all stereotypes except for Black positive (all *F*s > 6, all *p*s < .05), suggesting that Black targets consistently produced larger amplitude P300s than White targets.

The full ANOVA of P300 latencies showed a significant effect for Target Race, $F(1, 37) = 10.60$, $p < .002$, indicating longer latencies to White targets ($M = 423.63$) than Black targets ($M = 400.11$). There was also a marginally significant Stereotype main effect, $F(4, 148) = 2.04$, $p = .09$, in which latencies were longest for targets flanked by Black positive words ($M = 425.26$) compared to fear ($M = 410.21$), Black negative ($M = 413.51$), White positive ($M = 402.70$), and White negative words ($M = 407.66$). Planned comparisons revealed that the only significant differences between conditions were between the fear and Black positive conditions, $F(1, 37) = 4.11$, $p < .05$, and the Black positive and White positive conditions, $F(1, 37) = 4.62$, $p < .05$. The interaction between Stereotype and Target Race was not significant, $F(4, 148) = .75$, $p = .56$. Finally, the P300 latency data were collapsed across valence of conditions as in the RT data to form three Stereotype conditions: fear, negative, and positive. When the data were analyzed with these variables, no new results emerged. As reported above, there was a Race main effect, $F(1, 37) = 9.32$, $p < .01$, but no main effect for Stereotype, $F(2, 74) = .24$, $p = .79$ or interaction, $F(2, 74) = .46$, $p = .63$.

Weapons Task: RT Data

As in Experiment 1, RT analyses on the weapons task included correct trial RTs between 100 ms and 1000 ms. Data were analyzed using a 2 (Prime: Black or White) x 2 (Target: gun or tool) repeated measures ANOVA. Unlike Experiment 1, this analysis revealed 2 main effects but no interaction (see Table 6 for means). However, consistent with Payne's (2001) findings, a Target main effect yielded faster responses to gun trials (M = 338.56) than tool trials (M = 353.76), $F(1,38) = 5.80$, $p < .02$. A significant Prime main effect showed that participants were faster when primed with a White face (M = 343.57) than a Black face (M = 348.76), $F(1,38) = 5.80$, $p < .02$. The interaction was not significant, $F(1, 38) = 2.72$, $p = .15$.

Weapons Task: Accuracy Data

Accuracy rates for each condition were calculated and, as in Experiment 1, were relatively low (59%). The accuracy data were analyzed using a 2 (Prime: Black or White) x 2 (Target: gun or tool) repeated measures analysis of variance (ANOVA). Results indicated a main effect for Prime, $F(1, 38) = 8.27$, $p < .01$, revealing that participants were more accurate at identifying Targets after they had been primed with a White face (M = 61%) than a Black face (M = 56%). There was also a main effect of Target, $F(1, 38) = 16.76$, $p < .001$, indicating that participants has lower accuracy towards responding to tool trials (M = 52%) than they did to gun trials (M = 66%). This main effect was qualified by a significant Prime x Target interaction, $F(1, 38) = 29.41$, $p < .001$. Simple effects tests revealed that participants were slightly more accurate at categorizing guns after seeing a Black prime (M = 68%) than a White prime (M = 63%), $F(1, 38) = 3.14$, $p = .08$. Additionally, participants were more likely to mistakenly identify a tool as a gun when primed with a Black face than a White face, F(1,

38) = 35.34, $p < .001$. That is, the accuracy rate for the Black-tool condition ($M = 44\%$) was significantly lower than the White tool condition (52%). These accuracy results are consistent with the findings from Payne (2001) as well as the findings from Experiment 1.

Weapons Task: Automatic and Controlled Components

Automatic and controlled estimates for Experiment 2 were calculated using the same formulas in Experiment 1 (see Table 7 for means). The estimates were subjected to a 2 (Race: Black or White) x 2 (Estimate: Automatic vs. Controlled) repeated measures ANOVA. This analysis yielded a significant main effect for estimate, $F(1,38) = 11.80$, $p < .001$ such that automatic estimates ($M = .65$) were larger than controlled estimates ($M = .18$), regardless of race. There was no significant main effect for race, $F(1,38) = .30$, $p = .59$ and the interaction between Race and Estimate was also nonsignificant, $F(1,38) = .09$, $p = .77$. Planned comparisons directly comparing Black vs. White within automatic and controlled estimates showed differences between Black ($M = .12$) and White ($M = .23$) on the controlled estimate, $F(1,38) = 8.27$, $p < .01$ but no differences between Black ($M = .64$) and White ($M = .67$) on the automatic estimate, $F(1,38) = .01$, $p = .91$, revealing the opposite pattern of Experiment 1.

Weapons Task: ERP Data

The N200 component was analyzed as in Experiment 1, except that in this case the N200 was quantified as the largest negative amplitude 0-300 ms post-stimulus at CZ, where the component was largest. Due to an error, N200 data was only available for 18 participants for the weapons task. The N200 was investigated using a 2 (Prime: Black or White) x 2 (Target: gun or tool) repeated measures ANOVA. No significant main effects were found for Prime, $F(1, 17) = .61$, $p = .44$ or Target, $F(1, 17) = .01$, $p = .91$. However, the analyses revealed a significant Prime x Target interaction, $F(1, 17) = 8.65$, $p < .01$. Planned comparisons showed that guns elicited similar N200 amplitude ($M = -.70$) than did tools ($M = -1.76$) when following White primes, $F(1, 17) = 3.05$, $p = .10$, but following Black primes guns ($M = -3.00$) elicited larger N200s than did tools ($M = -1.60$), $F(1, 17) = 7.40$, $p < .01$.

Correlations Between Flanker Task and Weapons Task

As in Experiment 1, correlations were examined comparing ERPs measured in the flanker task with behavioral effects in the weapons task, including RT to each condition as well as automatic and controlled effects to Black and White faces. Although there were several significant correlations between N200, P200, and P300 components within the flanker task, these are to be expected with ERP effects and thus are theoretically uninteresting (see Table 8 for full correlation matrix). Significant correlations also emerged within the weapons task between automatic and controlled components and Target trial type, but again, these are less interesting than potential correlations that may have arisen between flanker task ERPs and measures of racial bias in the weapons task. Finally, there were also significant correlations between the racial bias measure and RT for Black-tool, White-gun, and White-tool conditions (rs = -.37, $p < .05$), but these are to be expected given the way that the racial bias measure was calculated (i.e., by taking RT differences between conditions). Therefore, these correlations will not be discussed further.

Correlational analyses were also conducted between N200 amplitude and measures of behavioral bias and automatic and controlled estimates within the weapons task in order to establish possible relationships between ERP components and racial bias indices. Interestingly, a significant correlation emerged between behavioral racial bias on the weapons task and N200 amplitude with both Black-gun (r = .64, $p < .05$) and Black-tool (r = .62, $p < .05$) conditions.

Individual Difference Measures

As in the first experiment, most participants in second experiment (N = 28) completed a questionnaire with "familiarity" items relating to their experiences with Blacks (M = 29.71) and the data were re-analyzed with the familiarity term as a predictor variable. Familiarity was not a significant predictor of any variable in the flanker task. Familiarity was also included as a factor in the analysis of race bias in the weapons task and, like Experiment 1, no significant effects were found.

CHAPTER VII

EXPERIMENT 2 DISCUSSION

Experiment 2 involved the same basic flanker and weapons paradigms as Experiment 1, but used stereotypes as flanker words instead of emotion-related words. The use of stereotypes in this modified flanker paradigm allowed for the examination of attention to and activation of these stereotypes while participants were racially categorizing Black and White faces. As in Experiment 1, the results of the second study illustrated that, in the flanker task, contextual information (i.e., stereotype-related flanker words) did not affect categorization of the target faces until later processing stages. That is, there were no interactions between target race and flanker words in early ERP components in the flanker task. However, the RT data told a different story. Consistent with Experiment 1, the RT results indicated a significant interaction, suggesting that the flanker words affected speed with which participants categorized the target faces.

The RT analyses in the flanker paradigm also revealed interesting patterns between stereotype conditions. Participants were slowest to correctly categorize White faces when they were surrounded by fear-related words but RT was facilitated when White faces were flanked by positive words. Additionally, participants were quickest to correctly categorize Black faces when they were embedded in fear-related words but RT was slowed when positive distracter information was present. These results suggest that participants were attending to the flanker information and that the stereotypes presented are activated during each trial and had an effect on categorization speed, based upon stereotype compatibility.

That is, responses were facilitated when stereotypes presented were compatible with target race (e.g., Black-fear), but responses were slowed when stereotypes were incompatible with target race (e.g., Black-positive). This pattern of results also suggests that the activation of the fear stereotype may be more closely linked to Blacks than is the activation of negative stereotypes, given that RTs to Black targets were faster when paired with fear words than with other negative words. Interestingly, the reverse pattern was seen for White targets. This pattern of results provides preliminary evidence that the Black-fear pairing may be more strongly linked in memory than either the Black-negative pairing or the Black-positive pairing, supporting Hypothesis 3. Further support for this hypothesis comes from the N200 findings reported in Experiment 2. In this analysis, N200 amplitudes were larger for the White-fear condition than the Black-fear condition, indicating greater conflict for the "incompatible" condition in which White targets were paired with fear-related words. The smaller N200 amplitude for the Black-fear pair may indicate relatively less conflict and thus a stronger association between the social category of Black and fear.

Another finding of interest from Experiment 2 was the replication of attention effects to Black versus White targets, as indexed by early ERP components (i.e., P200, N200), supporting Hypothesis 2. As in the first study, participants showed greater attention first to Black targets and then to White targets. As discussed in previous research (Dickter & Bartholow, 2006), these effects are theoretically linked to the race of the participant and likely represent an ingroup-outgroup attention bias. That is, the particular pattern of effects seen here is likely attributable to the fact that White participants were used; the opposite pattern of effects would be predicted for Black participants (see Dickter & Bartholow, 2006). Additionally, as was cited in Experiment 1, the larger P200 amplitudes to Black targets may be an indication that Black targets were perceived as more threatening than White targets, as the P200 has been described as an index of threat perception. This finding, taken together with the behavioral data and the N200 data, provides further evidence that White participants may have a stronger association between the category Black and a fear-related stereotype than other stereotypes (i.e.., other negative stereotypes).

Analysis of the weapons task data indicated that participants were quicker to identify weapons than tools, a finding consistent with previous research (Payne, 2001). However, unlike previous studies, the analysis failed to reveal a significant interaction between prime and target, although results indicated that there was a race difference on the controlled estimate and not the automatic estimate, which is inconsistent with previous research. Further analyses showed that participants allocated the most attention to trials in which a tool was presented after a White prime. These findings were not predicted and are inconsistent with several other studies that have utilized this exact paradigm; as in the Experiment 1 weapons task, these discrepancies may be due to the response deadline imposed on the participants. There was also a significant correlation between N200 amplitude for Black-gun and Black-tool trials in the weapons task with racial bias. This finding is interesting in that it suggests that the response conflict indicated by N200 amplitude may be related to a behavioral index of racial bias. Finally, as in Experiment 1, the individual difference measure of familiarity with Blacks did not affect any of the other measured variables.

CHAPTER VIII

GENERAL DISCUSSION

Two experiments were conducted in order to examine the effects of context information, here represented by emotion-related and stereotype-related concepts, on the racial categorization process. Another objective of the present research was to explore attentional effects that emerge in racial categorization. These experiments also aimed to contrast activation of the Black-fear stereotype against other emotions and stereotypes that may become activated when perceiving a Black face. Finally, this research examined potential links between early psychophysiological activation during racial categorization and an implicit behavioral measure of racial bias. A modified flanker task was used in both experiments to test the effects of context information on racial categorization, and both also utilized an established index of racial bias (i.e., weapons task; Payne, 2001) with the purpose of correlating stereotype activation and attention in the flanker task with automatic and controlled estimates of bias in the weapons task.

Taken together, the results from these experiments suggest mixed support for the primary hypotheses laid out in the introduction. Hypothesis 1 stated that context information was expected to affect the processing of target stimuli in the flanker task at all stages of processing. This hypothesis was tested by varying flanker stimuli in both experiments by emotion (Experiment 1) and stereotype (Experiment 2). Support for Hypothesis 1 would have been indicated by both behavioral and psychophysiological data demonstrating interactions between flanker words and target pictures, indicating that participants were attending to both target and distracter information. The results of both experiments instead illustrated that contextual information does not affect categorization until later stages of processing. That is, in the flanker tasks, only target race main effects were seen in most early ERP components (i.e., P200, N200), and these main effects were not qualified by interactions with context information (i.e., flanker words). These data suggest that participants did not process the flanker information until later in processing. At later processing stages, significant interactions emerged in the RT data indicating that participants were attending to the flanker words and that these words affected their overt categorization speed. Regardless of whether these words were related to emotions or stereotypes, they did not affect racial categorization until at least 400 ms after stimulus onset. These results are consistent with previous research that has demonstrated that when the flanker stimuli are not mapped on to an experimentally defined response, differences emerge on response-related measures, but may not occur on stimulus-related ERP components like those measured here (Smid, Lamain, Hogeboom, Mulder, & Mulder, 1991).

This finding provides information about the influence of contextual information on the social categorization process above and beyond what is available in the literature. No published studies have shown that information presented simultaneously with a target influences the categorization of that target only at later stages of processing (but see Dickter & Bartholow, 2006). Although previous studies have established that categorization takes place very quickly after stimulus presentation (e.g., Ito & Urland, 2003), the present research provides insight as to the timeline over which distracter information may play a role in this process. Additionally, this finding may be important to the theoretical nature of context information in terms of social categorization models. For example, the continuum model

(Fiske & Neuberg, 1990) suggests that social perceivers make judgments about individuals along a continuum that ranges from category-based beliefs to attribute-based beliefs (i.e., individuating information). Similarly, Brewer (1988) proposed a model in which perceivers make either category- or person-based judgments about members of social categories. Both models suggest that motivation and attention determine whether targets are judged as individuals or group members. The findings of the present research suggest that because perceivers are first attending to race only and not to context information, they may start out by using only category-based information, but then shift to more attribute-based judgments later, if certain conditions are met, such as high motivation. Fiske and Neuberg (1990) proposed this idea in their model and the results of this paper offer electrocortical support for this tenet of the model. This finding may have real-world implications as well. For example, when encountering a member of a certain race, our initial categorization of that person into a social group may be unaffected by other information at early processing stages, which may lead to the activation of race-related stereotypes. External information may then be attended to at later processing stages and affect our behavioral reactions to that person once we process that information.

Hypothesis 2 stated that participants would allocate more attention to Black targets than to White targets early in processing, and that attention would then shift to White targets. Previous studies have found that White participants attend differently to Black and White targets, as indicated by early ERP components (e.g., Dickter & Bartholow, 2006; Ito & Urland, 2003, 2005; Ito et al., 2004). Consistent with those studies and Hypothesis 2, the present research found that White participants' attention was initially biased toward Black targets (seen in P200 target race main effects). Some researchers have suggested that this difference may be caused by negative stereotypes about Blacks that are activated upon perceiving a Black face (e.g., Ito & Urland, 2003). However, other research has demonstrated that Black participants show a reversal of this pattern in P200 (Dickter & Bartholow, 2006). That is, Black participants show larger P200 to White faces, indicating that perhaps the threat may not be the stereotype elicited by Black targets but rather the perception of an outgroup member.

Although the P200 reveals greater early attention to Black targets for White participants, attention then shifts to White targets later in processing, as indexed by the N200. As is the case with the P200, Dickter and Bartholow (2006) found the opposite pattern of results with Black participants, that is, larger N200 amplitudes to Black compared to White targets. Taken together, the current results and those of our prior work suggest that the pattern of these main effects in early ERP components may be dependent upon the participants' race in addition to the race of the target. Thus, these results indicate that attentional effects may not necessarily depend upon negative stereotype activation. Consistent with this interpretation, the present studies found that participants gave greater attention to the outgroup early in processing, and then shortly after attention was directed toward the ingroup. Additionally, these findings suggest that contextual information did not affect participants' attention to race at this stage in processing. The fact that target race main effects at this early stage were not qualified by interactions with flanker words suggests that the stereotypes and emotions presented peripherally did not affect attention at this stage.

At later stages of processing, however, contextual information did affect the social categorization process and it was at this stage of processing that Hypothesis 3 was tested. This hypothesis proposed that the stereotype most linked with Blacks would be a fear-related stereotype and was tested by examining interactions between context words and targets in the flanker tasks. Hypothesis 3 was partially supported by the behavioral results in Experiment 1, in that emotion words presented as flanker information significantly interacted with target race. Thus, these results provide evidence that at this later stage of processing, participants were paying attention to the flanker information (even though told to ignore it) and that this information was affecting their categorization of target faces, depending on the race of the faces and the word presented. Recall that in Experiment 1, the flanker task involved the presentation of emotion-related words that fit into the following categories: anxiety, anger, fear, happiness, sadness, and disgust. However, the behavioral results were unclear as to whether these emotions facilitated or impeded the categorization of Black versus White faces because there was no clear pattern of results in the behavioral data. That is, although there was a significant interaction between target race and the emotion-related words, there were no simple effects differences between White and Black targets for any emotion condition.

Although the behavioral results in this first experiment did not fully support Hypothesis 3, more support comes from the physiological data. That is, the P300 latency data indicated that participants were quickest to respond to trials in which Black faces were surrounded by fear-related words. Because psychophysiological data is not reliant upon physical processes like pressing a response button, P300 latency may be a more pure measure of processing speed during social categorization. Thus, these results provide some support that the link between Black and fear may be stronger than other emotions.

The second experiment involved a modified flanker task that utilized the same Black and White targets but used flanker words related to the following stereotypes: fear-related, White-positive, White-negative, Black-positive, Black-negative. Experiment 2 revealed an interaction that was perhaps more supportive of Hypothesis 3 than the interaction found in Experiment 1. That is, collapsing across stereotype condition revealed that participants were the slowest to categorize a White target when surrounded by fear-related information (e.g., aggressive, dangerous, threatening, violent) and slowest to categorize a Black target when surrounded by positive stereotype-related information (e.g., athletic, funny, ambitious, educated). Reaction times were fastest when Black faces were matched with fear-related flankers and when White faces were matched with positive-related flankers. Thus, it appears that the content of the flankers influenced social categorization in the following way: fear-related words facilitated processing of Black faces while impeding the processing of White faces while positive words facilitated processing of White faces while impeding the processing of Black faces.

Although previous studies have demonstrated that the Black-negative pair often yields faster RTs than the White-positive pair, most studies usually include fear-related stereotypes in the negative condition rather than separating them into their own category. However, as Experiment 2 shows, there were no differences between the categorization of Black and White targets when presented with negative stereotypes when these negative stereotypes did not include fear-related stereotypes. Differences did emerge in conditions with positive stereotypes and fear-related stereotypes, suggesting that the Black stereotype may be more linked to something fear-related than simply negative. More support for Hypothesis 3 was found in the weapons tasks, in which Black primes facilitated the categorization of guns while White primes slowed the categorization of guns, again suggesting a connection between the Black category and a fear-related response. Because most studies group fear-related stereotypes into the negative condition, it has been impossible to sort out which, if any, negative stereotype is more linked to the Black category. This research shows preliminary evidence that a fear-related stereotype may be more strongly paired with the Black category than other negative, non-fear-related stereotypes. Thus, the findings presented here may have implications for studies that examine negative versus positive stereotypes of Blacks, and may also suggest that the fear-related stereotypes may have been driving the robust finding that Black is equated with "negative". More research should examine potential differences among Black stereotypes within the broader category of negative, as well as for other racial groups.

The explanation that the Blacks may be more strongly linked to a fear-related stereotype compared to general negative stereotypes is consistent with the hypotheses of this research, which stemmed from a literature that has demonstrated a behavioral and a psychophysiological connection between Black and fear. That is, behavioral thought-listing tasks have demonstrated that participants are aware that fear-related stereotypes such as violent, criminal, and dangerous exist (Devine, 1989; Dovidio et al., 1997; Lepore & Brown, 1997) and studies have found that traits such as hostility, aggression, and criminality are the most prevalent stereotypes about Blacks (Devine & Elliot, 1995; Payne, 2001). Additionally, reaction time experiments have demonstrated that participants are quicker to "shoot" Black targets than White targets (Correll et al., 2002) and have greater amygdala activated to unfamiliar Black versus unfamiliar White faces (Phelps et al., 2000), which has been linked to fear responses. Theoretically, the pairing of Black targets with a fear-related stereotype may have to do with the link between darkness and threat (Schaller et al., 2003), which suggests that a fear reaction to the social group of Blacks may be adaptive (Hurwitz & Peffley, 1997). The results of the second experiment presented in this paper support this theory and demonstrate that identifying the activation of stereotypes upon perception of a Black target as "negative" may not be as accurate as defining them as "fear-related."

Hypothesis 4 stated that, due to preliminary evidence in previous studies suggesting the P200 may be an index of threatening stimuli (Schaller et al., 2003), the P200 in the current studies would be larger for trials that involved threatening stimuli, especially Blacks and fear-related words. Results from both experiments indicated that Black targets yielded larger P200s than did White targets. This may suggest a link between the category of Black and a fear response. Recall, however, that a previous study (Dickter & Bartholow, 2006) found that Black participants showed a reversal in P200 amplitude, such that White targets yielded larger P200s than Black targets. Thus, it may be that the "threat" indexed by the P200 is a fear of the outgroup and may not necessarily be related to a specific stereotype linked with Blacks. That is, both Black and White participants are aware of the fear-related stereotypes that exist about Blacks and arguably are both activating these stereotypes upon seeing a Black target (Devine, 1989). In fact, several studies have shown evidence that Black participants automatically activate negative stereotypes about their ingroup in measures of implicit bias (e.g., Correll et al., 2002). These findings, coupled with the data from Dickter and Bartholow (2006) indicating that Black participants have larger P200 to outgroup targets, thus indicates that the P200 is larger to groups that differ from the perceiver and are most likely not due to the specific stereotypes about social groups.

Additional support for Hypothesis 4 came from the physiological data in Experiment 1. In this case, targets surrounded by negative words produced larger amplitude P200s than positive words. There was also larger P200 amplitudes associated with trials that contained anger-related words relative to trials with happiness-related words. Again, this provides support for the hypothesis that the P200 is an index of threatening stimuli.

Hypothesis 5 posited that there would be a link between the flanker task and the weapons task. This hypothesis was tested by examining possible connections between physiological responses and measures of racial bias, as indicated by the behavioral results in the weapons task. As previously stated, it was expected that participants would direct early implicit attention to Black targets, as indexed by early ERP components (specifically, the P200). If this early attention to Blacks was due to a fear-related stereotype being accessed about the social group "Black," it would be expected that attention to Black faces may predict behavior on a racial bias task. That is, to the extent that a participant gives more attention to a Black target and thus has a stronger activation of negative Black stereotypes, this participant would score high on a racial bias task (in this case, the weapons task). The alternative, however, is that White participants are attending more to Black targets because of their outgroup status, leading to no correlations between attentional ERP components and racial bias. Since no clear relationship emerged between the attentional ERP components and any of the indices of racial bias in either of the experiments, the alternative explanation seems more plausible. Thus, it does not seem that early attention to Blacks should be used as an index of racial bias – that is, ERPs may not have a functional significance for racial bias due to the lack of correspondence between the ERP components and a behavioral measure of bias. Taken together with the findings from the P200, it seems that participants are allocating greater attention to Black targets based upon the fact that these targets are outgroup members, and at this early stage in processing, stereotypes are not influencing attention.

Finally, a measure of familiarity with Blacks was administered to participants to assess potential effects of the individual differences on the behavioral or physiological measures, but familiarity was not a significant moderator on any analyses.

Limitations and Future Directions

Although the data from Experiments 1 and 2 partially supported several of the proposed hypotheses, there were also some unexpected findings and some contradictory findings across experiments. Therefore, it is important to realize the limitations of this research. First, Experiment 1 failed to reveal any differences between conditions in which Black targets were involved. It was predicted that RTs would be shorter in trials in which a fear-related emotional word was presented as distracter information for Black targets versus White targets. Therefore, it is difficult to make conclusions about Hypothesis 3 based upon the results from Experiment 1. However, the P300 latency results in Experiment 1 did support the predicted pattern and showed potential support for Hypothesis 3, indicating that perhaps the behavioral data were not as sensitive as the ERP data in showing context effects. Another possibility may be that emotion-related words such as those used in Experiment 1 do not affect the categorization process in the same way that stereotypes like those in Experiment 2 did. That is, RT results from Experiment 2 were in the predicted direction and supported Hypothesis 3 and it may be the case that emotion-related words are processed differently or attended to in a different manner than the stereotype-related words. More research should be conducted to explore these possibilities.

Secondly, although there was a significant Prime x Target interaction in the RT data for the weapons task in the first experiment, replicating other studies (Payne, 2001; Amodio et al., 2004), this effect did not emerge in the second study. Additionally, it was predicted that there would be correlations across the flanker tasks and the weapons tasks, but there were only some significant correlations in the first study and interpreting these findings was difficult. However, the accuracy data for the weapons tasks in both experiment did replicate previous findings. As previously mentioned, there were differences between the current weapons task used and the original task that had to do with timing of stimuli presentation. Although these changes in the paradigm were necessary in order to collect physiological data, they may have been responsible for the some of the seemingly contradictory results found. The lack of consistency across Experiments 1 and 2 regarding the weapons task may have led to the fact that Hypothesis 5 was not supported. That is, because the behavioral effects found in the current studies were different from those previously found, the lack of support for Hypothesis 5 may be unique to this paradigm and not all behavioral data. Thus, it is necessary in future research to further explore possible links between early ERP components and behavioral racial bias.

Another limitation was the lack of predicted ERP effects in the weapons tasks. It was predicted that participants would show larger N200s to incompatible trials as this component has been linked with response conflict. Specifically, the N200 was predicted to be larger on trials in which guns were preceded by White faces and tools by Black faces. However, this predicted pattern was not seen; indeed, the opposite pattern of effects emerged in Experiment 2. Taken together, it is difficult to make any strong conclusions about either of the weapons tasks because of the lack of compatibility across experiments (in which participants were performing the exact same task) as well as the lack of supported predictions. Since there has been a limited amount of research on the ERP components activated during the weapons task, more research should examine the neural processes that occur during this task.

Additionally, although the current research sought to examine the social categorization process in White participants, the lack of Black participants in this experiment is another weakness of this line of research. Previous research (Dickter & Bartholow, 2006) has demonstrated that Black participants show evidence of different neural processing of the same stimuli during a categorization task. Although some of the present findings may be generalized to participants of other races, it is likely that Black participants would experience the tasks differently and therefore it is not possible to generalize the present findings to other racial groups. Future research will help examine potential differences between perceivers based on race.

Conclusions

This research provides some preliminary evidence that White participants are quicker to associate Black targets with fear-related stimuli, which suggests that the Black-fear pairing might be more strongly linked in memory than connections between Black and other stereotypes or emotions, both negative and positive. Although previous studies have established a link between the Black category and negative stereotypes or emotions, the research presented here suggests that there may be more specific associations within the negative category. That is, a fear-related response or fear-related stereotypes may be more strongly associated with Blacks than other negative responses or stereotypes.

Additionally, the physiological data presented here support previous research indicating that White participants direct greater attention first to Black targets, and then shift their attention to White targets. Although some researchers have suggested that greater attention to Blacks may be due to the automatic activation of negative traits, this study coupled with previous studies support the idea that these attentional differences may have to do more with ingroup-outgroup distinctions than the specific stereotypes activated.

Finally, the behavioral data indicate support for dual-processing models of stereotype activation in that participants first attended to categorical information, but context information only affected responding at later stages of processing. Although previous studies have suggested that categorization takes place very quickly after stimulus presentation, this is the first study to indicate the specific timeline over which distracter or context information plays a role in information processing. Therefore, the findings presented in this document provide a unique contribution to the social psychological literature in that this is the first series of studies to present both behavioral and electrocortical support for the dual-processing model of stereotype activation.

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Table 1:

Experiment 1 Flanker Task RT Means

	Target Race	
	Black	White
Flanker Word	*M*	*M*
Anxiety	442.94	444.55
Anger	437.63	444.80
Fear	442.67	441.82
Happiness	441.70	450.01
Sadness	444.29	449.99
Disgust	441.55	444.91

Table 2:

Experiment 1 Weapons Task RT Means

	Prime Race	
	Black	White
Target Word	*M*	*M*
Gun	362.20	365.33
Tool	366.85	356.52

Table 3:

Experiment 1 Weapons Task Automatic and Controlled Estimates

	Prime Race	
	Black	White
Estimate	*M*	*M*
Automatic	.64	.91
Controlled	.15	.19

Table 4:

Correlations between Flanker Task ERPs and Weapons Task Performance: Experiment 1

	N2_black	N2_white	P2_black	P2_white	P3_black	P3_white	Black control	Black auto
N2_black	1.00							
N2_white	*0.94	1.00						
P2_black	0.15	0.11	1.00					
P2_white	0.18	0.21	*0.96	1.00				
P3_black	*0.40	*0.34	*0.54	*0.54	1.00			
P3_white	*0.47	*0.47	*0.49	*0.54	*0.93	1.00		
Black cont	-0.09	-0.08	0.20	0.24	0.04	0.12	1.00	
Black auto	-0.14	-0.15	0.13	0.12	0.00	-0.04	0.09	1.00
White cont	-0.16	-0.15	0.27	0.30	0.13	0.19	*0.78	0.17
White auto	-0.21	-0.18	0.16	0.23	0.08	0.13	*0.56	0.10
Black gun	-0.30	-0.29	-0.07	-0.06	*-0.42	-0.33	0.30	0.10
Black tool	-0.33	-0.33	-0.08	-0.09	*-0.49	*-0.41	0.32	0.20
White gun	-0.28	-0.29	-0.11	-0.11	*-0.38	-0.29	*0.37	0.18
White tool	*-0.44	*-0.48	-0.07	-0.13	*-0.45	*-0.41	0.28	0.16

	White control	White automatic	Black gun	Black tool	White gun	White tool
White cont	1.00					
White auto	*0.83	1.00				
Black gun	*0.34	0.22	1.00			
Black tool	*0.38	0.24	*0.89	1.00		
White gun	*0.45	0.30	*0.94	*0.92	1.00	
White tool	*0.37	0.21	*0.80	*0.89	*0.83	1.00

Note. * = $p < .05$

Table 5:

Experiment 2 Flanker Task RT Means

	Target Race	
	Black	White
Flanker Word	*M*	*M*
Fear	442.93	445.51
Negative	446.14	444.07
Positive	448.94	442.43

Table 6:

Experiment 2 Weapons Task RT Means

	Prime Race	
	Black	White
Target Word	*M*	*M*
Gun	339.45	337.69
Tool	358.07	349.45

Table 7:

Experiment 2 Weapons Task Automatic and Controlled Estimates

	Prime Race	
	Black	White
Estimate	*M*	*M*
Automatic	.64	.67
Controlled	.12	.23

Table 8:

Experiment 2 Correlations between Flanker Task ERPs and Weapons Task Performance

	N2_black	N2_white	P2_black	P2_white	P3_black	P3_white	Black control	Black auto
N2_black	1.00							
N2_white	*0.95	1.00						
P2_black	0.26	0.24	1.00					
P2_white	0.26	0.29	*0.95	1.00				
P3_black	0.16	0.14	*0.46	*0.43	1.00			
P3_white	0.11	0.16	*0.39	*0.44	*0.94	1.00		
Black control	0.03	0.01	0.22	0.26	0.24	0.22	1.00	
Black auto	-0.18	-0.22	0.04	0.02	-0.04	0.03	0.23	1.00
White control	0.04	0.05	0.22	0.26	0.27	0.27	*0.46	*0.34
White auto	-0.01	-0.05	-0.11	-0.09	-0.16	-0.11	0.05	*0.38
Black gun	0.10	0.08	0.06	0.17	-0.09	-0.03	*0.43	0.06
Black tool	0.04	0.00	-0.05	0.02	-0.08	-0.03	*0.43	*0.37
White gun	0.07	0.07	0.03	0.14	-0.10	-0.02	*0.48	0.13
White tool	0.10	0.08	-0.04	0.03	-0.14	-0.07	*0.39	0.30

	White control	White automatic	Black gun	Black tool	White gun	White tool
White cont	-0.21					
White auto	*0.34	1.00				
Black gun	*0.43	0.16	1.00			
Black tool	*0.36	0.07	*0.82	1.00		
White gun	*0.36	0.10	*0.97	*0.86	1.00	
White tool	-0.21	0.12	*0.81	*0.94	*0.85	1.00

Note. * = $p < .05$

Figure 1:

Experiment 1 Flanker Task: RT as a Function of Emotion and Target Race

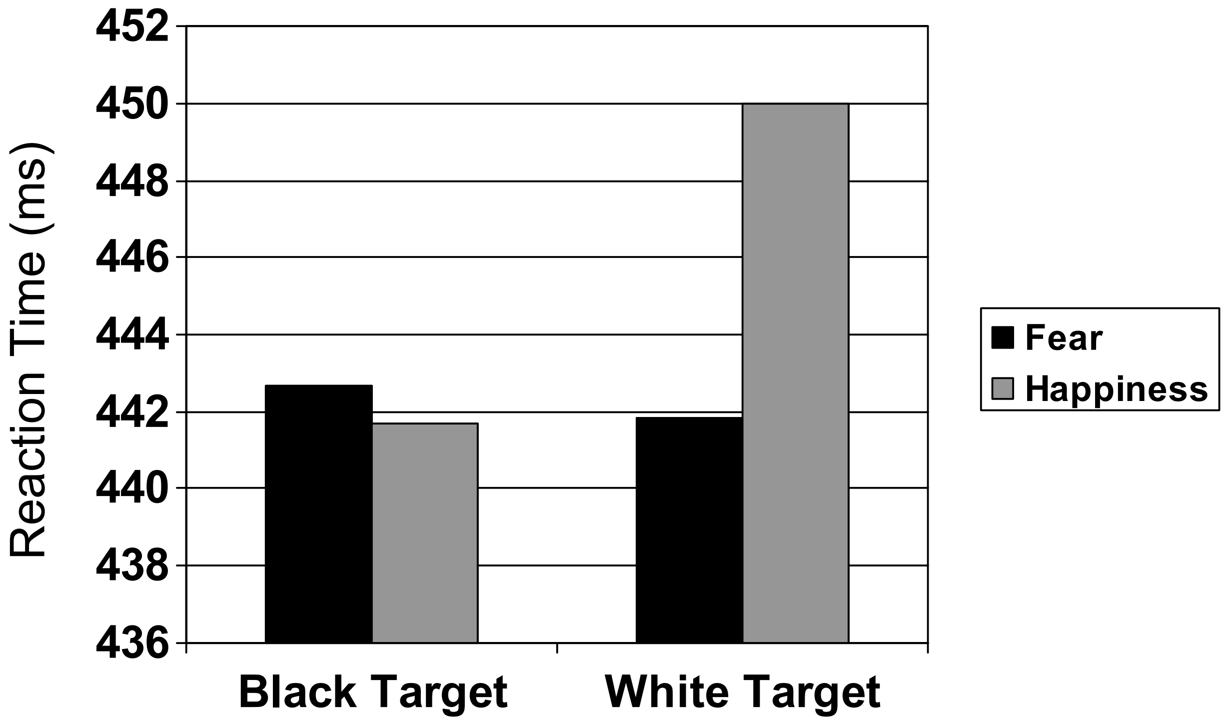


Figure 2:

Experiment 1 ERP Amplitude as a Function of Target Race

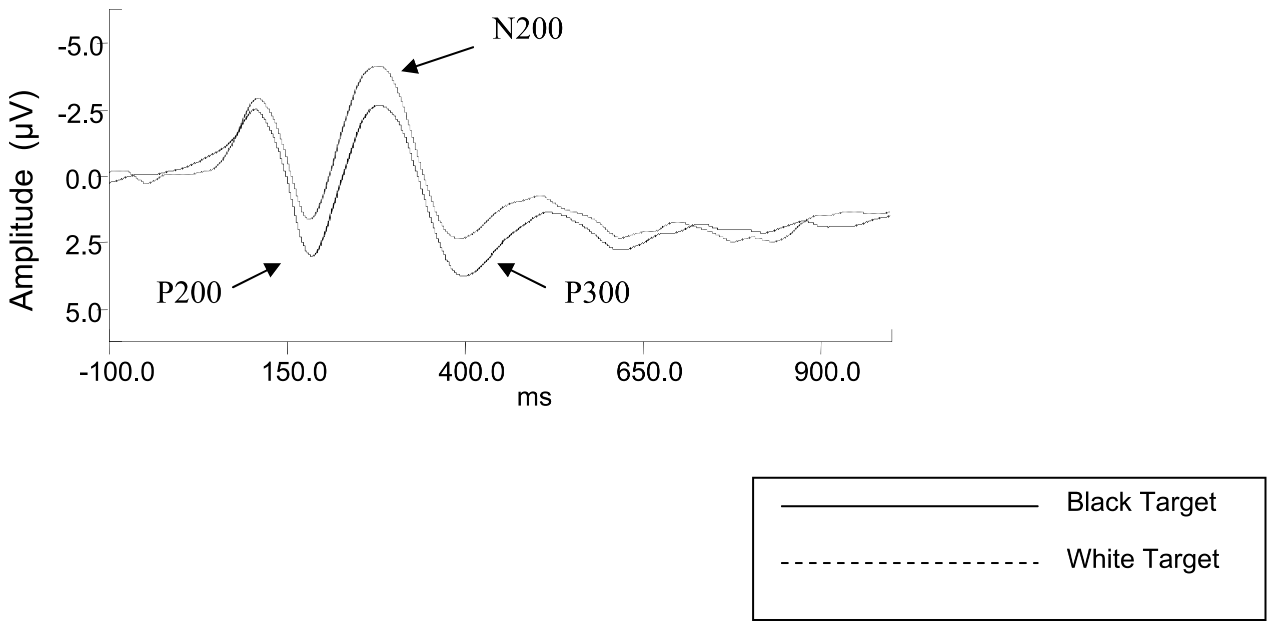


Figure 3:

Experiment 1 Flanker Task: P300 amplitude as a Function of Emotion and Target Race

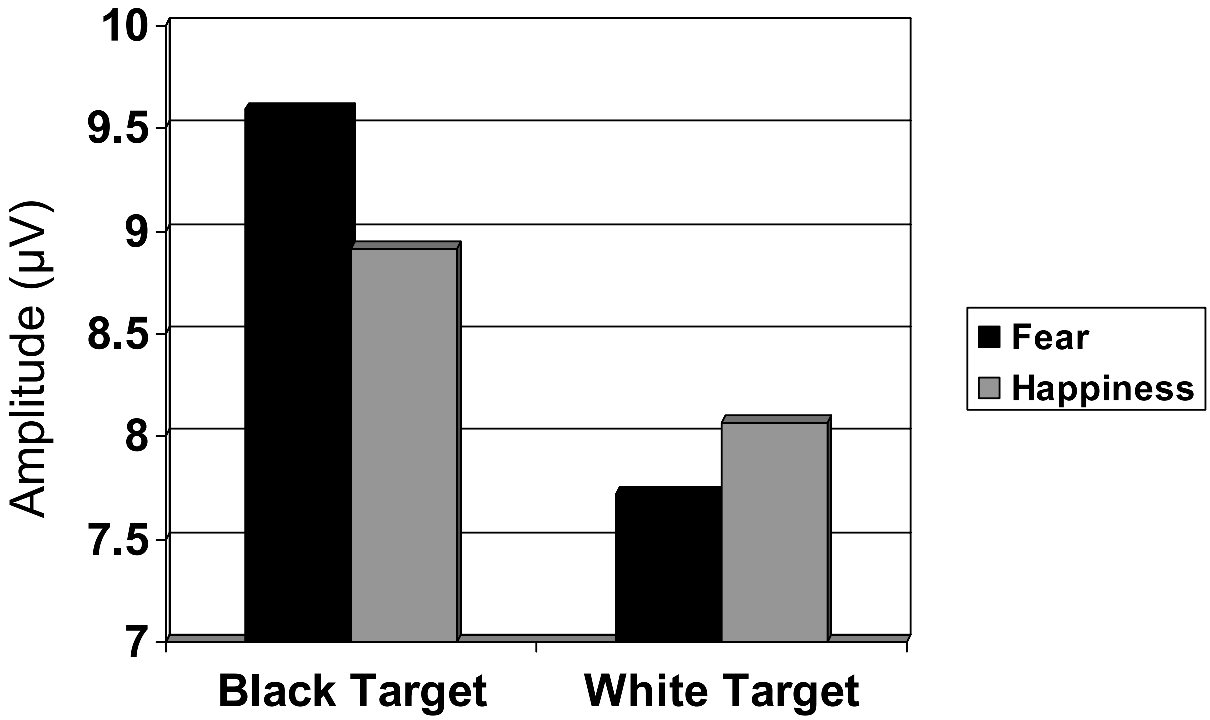


Figure 4:

Experiment 1 Weapons Task: RT as a Function of Prime and Target

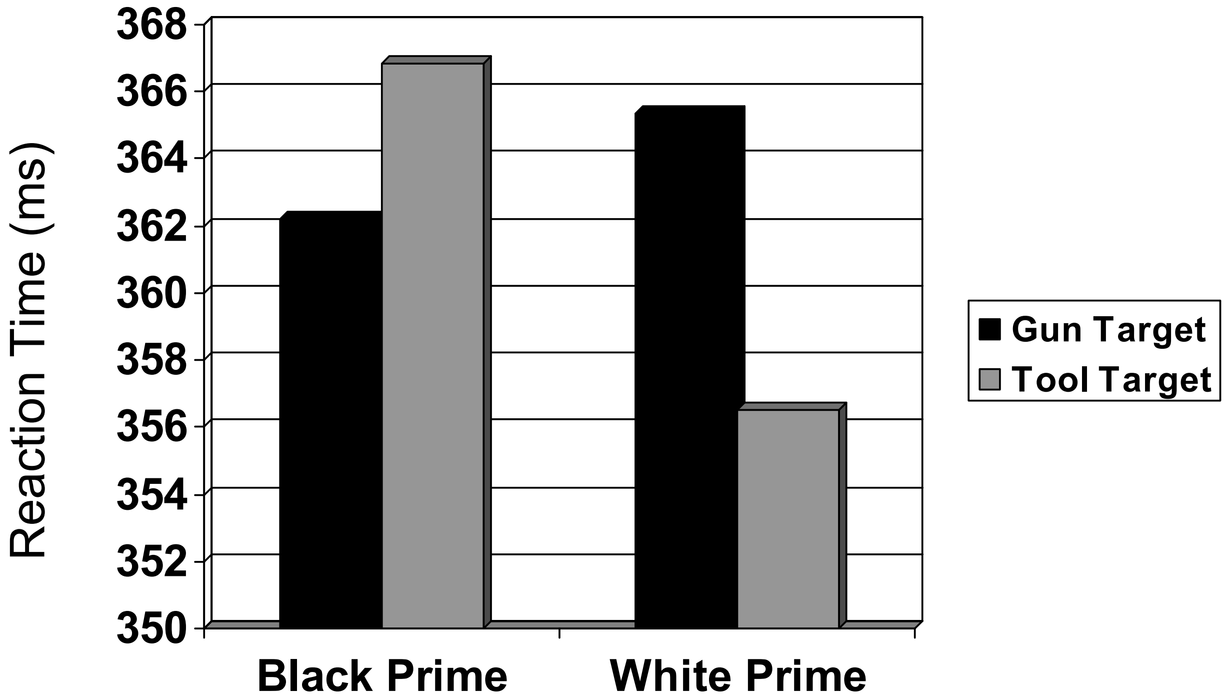


Figure 5:

Experiment 2 Flanker Task: RT as a Function of Stereotype and Target Race

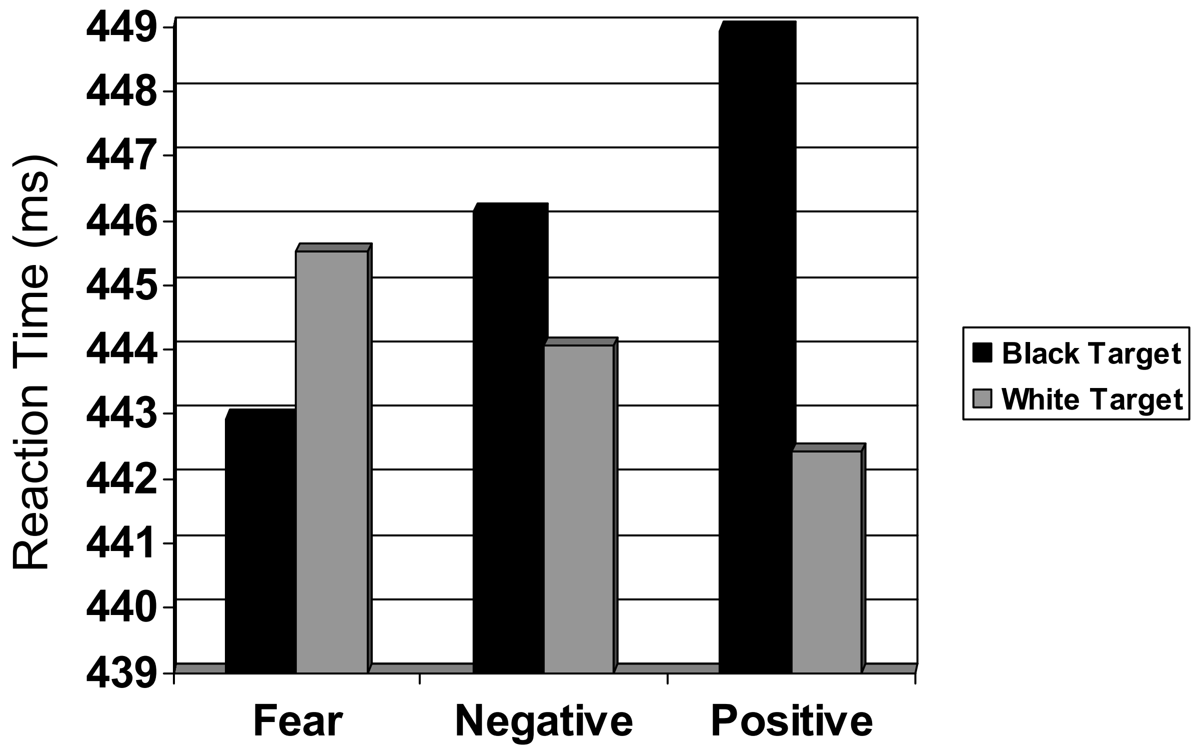
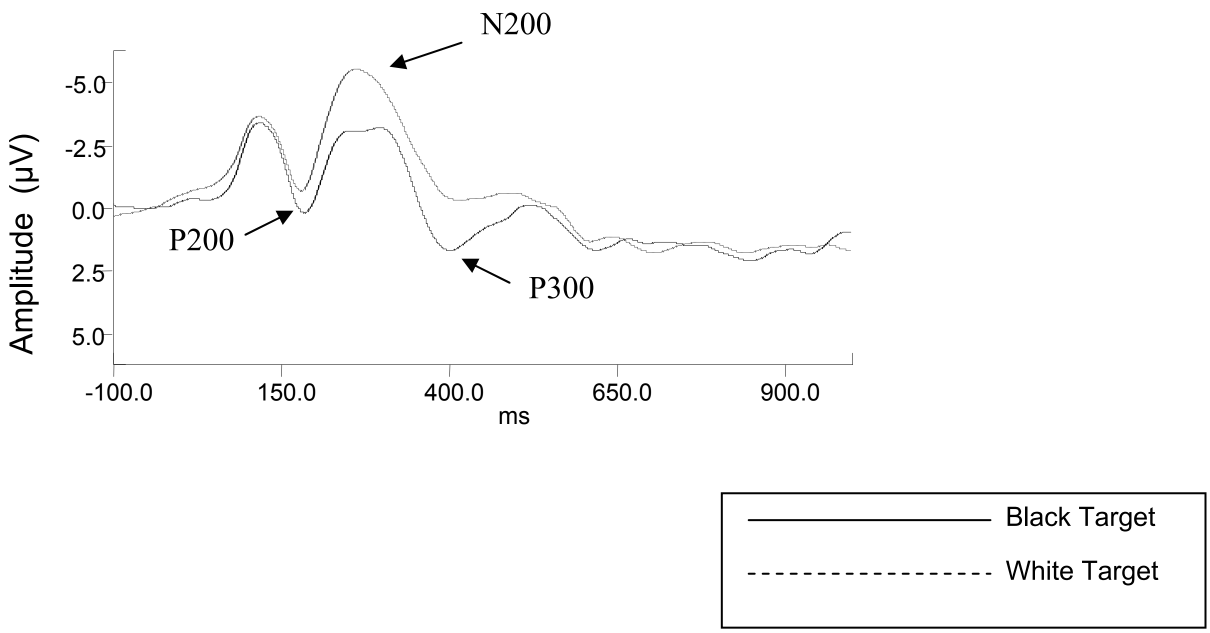


Figure 6:

Experiment 2 ERP Amplitude as a Function of Target Race



Appendix I:

Experiment 1 Informed Consent

College of Arts and Science

University of Missouri-Columbia

Department of Psychological Sciences
Social Cognitive Neuroscience Lab
200 South 7th Street
Columbia, MO 65211
PHONE (573) 882-1944
FAX (573) 884-5588

Statement of Informed Consent for the research project entitled:
"Recognition of words and faces"

Introduction to the Study:

- You are being asked to participate in this study in order to attain credit for experimental participation in your Introductory Psychology (PSYC 1000) class.
- Cheryl Dickter of the University of Missouri is conducting this study, under the supervision of Dr. Bruce Bartholow.

Purpose:

- This study is designed to examine the control of attention during recognition of faces.

What Will Happen During the Study:

- First, several harmless electrodes will be placed on your scalp and face. These electrodes will record the tiny electrical activity in your brain as you view and respond to the stimuli presented in this study; the electrodes ***will not*** be used to harm you in any way. Electrode gel will be inserted into each electrode prior to recording, and will need to be washed out of your hair and off of your face following the session. This gel easily washes out with water. Shampoo and a private restroom with shower stall are available if you would like to use them.
- On a computer screen, you will see a series of trials in which a face is presented in the center of the screen, with words presented on either side. The words used are associated with emotions.
- Your task will be to press one of two keys on the response pad depending upon whether the person in the middle of your screen is White or Black.
- Then, you will complete a short computer task in which you will be asked to classify pictures of tools and weapons by pressing a button on a response pad.
- Upon completion, you will receive two hours of experimental credit or 4 credits.
- There will be approximately 50 participants in this study. All will be female and male undergraduate students at the University of Missouri.

Your Privacy is Important:

- We will make every effort to protect your privacy.
- An arbitrary code number has been assigned to you for this study. The link between this code number and information that could be used to personally

identify you will be kept in a locked file cabinet in a locked location in the Psychology Building.
- The results of this experiment will not be linked to any specific individual; we are only interested in group averages.
- No identifying information will ever be made public.

Your Rights:
- You decide on your own whether or not you want to be in this study.
- You will not be treated any differently if you decide not to be in this study.
- If you decide to be in the study, you will receive 4 experimental credits, and you will have the right to leave at any time. If you withdraw from participation once the study has begun, you will still receive the amount of experimental credit for PSYC 1000 commensurate with the time you spend here.
- If at any time you have any questions or concerns about being in this study, you should contact Dr. Bruce Bartholow (Room 10 McAlester Hall) at (573) 882-1805, or via email: BartholowB@missouri.edu.

Institutional Review Board Approval:
- The MU Campus Institutional Review Board (IRB) of the University of Missouri has approved this study.
- If you have any concerns about your rights in this study you may contact the IRB office, 483 McReynolds Hall, (573) 882-9585.

Summary:
- I understand that this is a research study examining attention and recognition of faces.
- If I agree to be in this study, the following things will happen:
    - Several harmless electrodes will be placed on my scalp and face for recording of brain and muscle activity.
    - I will view a series of trials in which faces will be presented in the center of the screen, with words presented on either side. My task will be to press one of two keys depending upon the race of the target picture.
    - On a later task, I will view a series of trials in which pictures of guns and tools will be presented in the center of the screen. My task will be to press one of two keys depending on whether the target is a gun or a tool.
    - I will receive four experimental credits for my Introductory Psychology class.

I have had the chance to ask questions about this study if I have any, and they have been answered for me. I understand that I may ask questions at any time during or following the study. I have read the information in this consent form, and I agree to be in the study.

____ ____________
(Signature of participant) (Date)

____
(Printed name of participant)

Appendix II:

Experiment 1 Flanker Words

Anxiety:
1. anxiety
2. worry
3. concern
4. unease
5. nervous
6. tense

Anger:
1. anger
2. fury
3. rage
4. irritated
5. annoyed
6. fuming

Fear:
1. fear
2. terror
3. dread
4. panic
5. scary
6. threaten

Happiness:
1. happiness
2. content
3. pleasure
4. joy
5. bliss
6. delight

Sadness:
1. sadness
2. grief
3. sorrow
4. unhappy
5. misery
6. gloom

Disgust:
1. disgust
2. revolting
3. hatred
4. aversion
5. sicken
6. nausea

Appendix III:

Experiment 1 Debriefing

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Experiment Debriefing
"Recognition of words and faces"

Thank you for participating in this study today. In this project, we are interested in examining how peripheral information influences one's ability to accurately and quickly categorize a target stimulus. In this study, you were shown a series of trials in which a face was presented as a target stimulus, flanked on either side by words (the "flankers"). Your task was to indicate as quickly as possible whether the target was Black or White. As you may have noticed, the flanker words we used are commonly associated with emotions in our culture.

In this study, we are interested in how people associate race with emotional words. We will be able to identify from your brain waves which emotions people most associate with Blacks and Whites. We predicted that you will be more easily able to categorize Black targets when they are surrounded with emotions commonly associated with negativity, especially fear-related emotions, and that you would be more easily able to categorize White targets when they are surrounded by positive words, such as happiness-related emotions. Furthermore, we hypothesized that your brain activity would show evidence of response competition (basically, indecision as to which response to make) on trials in which the race of the target is surrounded by words that are inconsistent with the stereotypic emotion associated with the racial group.

For your second task, you completed a paradigm in which you saw a face followed by a gun or a tool. Your job was to categorize the item as either a gun or a tool. For this part of the study, we predicted that you would be quicker to categorize the guns after seeing a Black target, because Blacks are stereotypically associated with violence and Whites are not. Additionally, we predicted that your brain activity would show more response competition on trials in which a Black face is followed by a tool.

Another aspect of this study involves determining whether racial attitudes influence the responses participants make. Earlier this semester, you completed a short online questionnaire on racial attitudes during the mass testing session for your Introductory Psychology class. We hypothesized that individuals with more extreme racial attitudes will show more evidence of response competition, compared to individuals whose racial attitudes are less extreme.

Be assured that the data you provided today will never be linked to you personally and cannot be used to identify you. An arbitrary code number has been assigned to your data, and this code is not linked to your name or any other personally identifiable information. This number merely represents the responses that you made during the experiment. Furthermore, the researcher cannot identify you personally based on your code number. Also, your racial attitude data will not be linked to you personally and will only be used in aggregate with the responses of other individuals.

Thank you again for participating in this research. We would like to ask that you please not discuss any aspect of this study with any student who might participate in this experiment. This is to ensure that future participants will have the same experience that you had. It is very important for the integrity of this research that participants not be aware of the full scope of this study prior to participating. At this time, please ask the researcher if you have any questions concerning this study or your involvement in it.

Should you at any time have questions concerning this study, please feel free to contact Dr. Bruce Bartholow (10 McAlester Hall; 882-1805; email: bartholowb@missouri.edu). Again, we ask that you not discuss any aspect of this experiment with anyone. It is important to the research that each participant have the same experience, and that participants all begin without full knowledge of all aspects of the study.

Appendix IV:

Familiarity Questionnaire Items

Instructions: For each of the next three items, please estimate the approximate percentage of people who are or were represented by each of the racial groups listed. For example, on the first item, if you went to a high school in which half of the students were White and the other half were Black, you would respond 50% for White, 50% for Black/African-American, and 0% for each of the other 3 categories.

What percentage (approximately) of the **students in your high school** were represented by each of the following racial groups? (Note that the percentages should add up to 100.)

1. White
2. Black/African-American
3. Hispanic
4. Asian
5. Other

What percentage (approximately) of the **people in your neighborhood where you grew up** were represented by each of the following racial groups? (Note that the percentages should add up to 100.)

1. White
2. Black/African-American
3. Hispanic
4. Asian
5. Other

What percentage (approximately) of **your friends and acquaintances** are represented by each of the following racial groups? (Note that the percentages should add up to 100.)

1. White
2. Black/African-American
3. Hispanic
4. Asian
5. Other

Appendix V:

Experiment 2 Flanker Words

Black Fear:

1. aggressive
2. dangerous
3. threatening
4. violent

Black Negative:

1. ignorant
2. stupid
3. dirty
4. dishonest

Black Positive:

1. athletic
2. funny
3. entertaining
4. expressive

White Negative:

1. weak
2. greedy
3. selfish
4. conceited

White Positive:

1. ambitious
2. educated
3. polite
4. intelligent