

# Multiple cues in social perception: The time course of processing race and facial expression

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## Abstract

The purpose of the present study was to examine the time course of race and expression processing to determine how these cues influence early perceptual as well as explicit categorization judgments. Despite their importance in social perception, little research has examined how social category information and emotional expression are processed over time. Moreover, although models of face processing suggest that the two cues should be processed independently, this has rarely been directly examined. Event-related brain potentials were recorded as participants made race and emotion categorization judgments of Black and White men posing either happy, angry, or neutral expressions. Our findings support that processing of race and emotion cues occur independently and in parallel, relatively early in processing.

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## Introduction

Faces convey important social information that is useful for a variety of inferences. For instance, information about racial group membership and emotional expression can be informative about an individual's likely traits, attributes, and behavioral intentions (Bodenhausen & Macrae, 1998; Brewer, 1988; Devine, 1989; Fiske, Lin, & Neuberg, 1999), and perhaps not surprisingly, extensive research has documented our ability to quickly and efficiently extract both types of information from faces (Eimer & Holmes, 2002; Eimer, Holmes, & McGlone, 2003; Felmingham, Bryant, & Gordon, 2003; Holmes, Vuillemeir, & Eimer, 2003; Ito, Thompson, & Cacioppo, 2004; Ito & Urland, 2003, 2005; James, Johnstone, & Hayward, 2001; Schupp, Junghöfer, Weike, & Hamm, 2003; Schupp et al., 2004; Vanderploeg, Brown, & Marsh, 1987). While it is possible to consider how individual sources of information affect social inferences, such as how race affects evaluations, it is also impor-

tant to consider the more naturalistic question of how multiple sources of social information are processed from faces. That is, we can consider how both race and emotion information are processed from the same face.

Models of face processing suggest that information about social identity and emotional expression are processed separately and in parallel (Bruce & Young, 1986; Haxby, Hoffman, & Gobbini, 2000). According to Bruce and Young (1986), social category information such as age and gender and information regarding emotional expression are processed by functionally separate components of the face perception system. Moreover, these separable components are assumed to operate in parallel (see also Mouchetant-Rostang & Giard, 2003), suggesting little interaction between the two types of information, at least in initial stages of perception. Haxby et al. (2000) have similarly argued that the perception of invariant, relatively unchangeable aspects of a face, which would presumably include social category information, are theoretically and neurally dissociable from the perception of changeable aspects of a face such as facial expressions. However, despite the theoretical importance of this issue, little research has simultaneously examined the perception of race and expression. Instead, the majority of

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previous research has examined these cues in isolation, independent of one another; research on race perception typically examines responses to faces with emotionally neutral expressions (e.g., Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Greenwald & Banaji, 1995; Levin, 2000), and research on emotional expression often examines responses to faces depicting only one race (typically Caucasian) (e.g., Eimer et al., 2003; Hansen & Hansen, 1988). While it is necessary to investigate the independent effects of these cues, they are typically perceived simultaneously, making it important to understand how the cues are perceived in combination throughout processing.

Our purpose in the present study was therefore to examine how both race and expression information are processed from the same face. In addition, we wished to examine the time course of race and emotion processing. The development of increasingly sophisticated social cognition and neuroscience methods has allowed social psychologists to obtain more precise information about the timing and ordering of social perception processes. This research tells us that what may be considered a single outcome (“face perception”) is likely composed of numerous, theoretically separate processes (Haxby et al., 2000). Using measures with sensitive time course information allows us to examine not only how race and expression information are processed, but also how this unfolds over time, starting with early perceptual processes and ending with explicit race and expression categorization judgments.

The importance of examining time course information is highlighted by recent research demonstrating interactive effects between race and emotion information in explicit categorization judgments. Hugenberg and Bodenhausen (2003, 2004) have found both that facial expressions influence racial categorization of racially-ambiguous faces and that race influences emotion perception of emotionally-ambiguous faces. Specifically, consistent with cultural stereotypes linking Blacks with more negative attributes, especially with aspects related to hostility and threat, White participants higher in implicit prejudice were more likely to categorize racially-ambiguous faces as African American when the face displayed an angry expression as opposed to a happy expression (Hugenberg & Bodenhausen, 2003). Similarly, White individuals high in implicit prejudice more readily perceived anger than happiness in the faces of unambiguous Black but not White faces (Hugenberg & Bodenhausen, 2004). Moreover, when categorizing by facial expression, participants respond more quickly to angry and sad facial expressions than happy expressions for Black targets, both of which are affectively-congruent with negative evaluations, but respond more quickly for happy facial expressions for White targets (Hugenberg, 2005). These effects differ from those predicted by face processing models. This may be accounted for by the type of response considered. Face processing models treating race and expression processing as independent are generally interpreted as referring to relatively early stages of perception whereas Hugenberg and Bodenhausen measured explicit,

self-reported response. The difference in the pattern of results and type of responses considered suggests the importance of examining a wider time course of responding in order to determine if the likelihood of interactions among race and expression information differs as a function of type of response assessed.

In addition, it is worth noting that the interactive effects just discussed were obtained in situations where one of the cues was ambiguous, and/or with somewhat atypical-looking faces generated from animation software. This raises the question of whether interactive effects among types of facial information are more likely when cues are ambiguous and/or novel, or whether they occur more broadly and should therefore also be expected when perceiving actual faces with unambiguous race and facial expressions. We will examine this in the present study by investigating the simultaneous perception of race and expression information when both are relatively easy to perceive.

#### *Investigating the time course of social perception*

Investigating the time course of social perception requires a measure that has both high temporal resolution and is known to be sensitive to different psychological processes that may occur during the perception of race and expression. Event-related brain potentials (ERPs) are particularly well suited for this. ERPs utilize high sampling rates to record electrical brain activity that can index early attentional and perceptual processing across time. ERP waveforms are comprised of distinguishable components, some negative going and some positive going, that occur at a particular latency and over particular scalp sites. Individual components are thought to reflect different psychological processes, and multiple components are typically elicited by the same stimulus, allowing for the measurement of multiple responses that unfold over time to the same stimulus. In particular, component amplitude is thought to reflect the degree to which the psychological process associated with the individual component has been engaged and component latency is thought to reflect the point in time by which the psychological operation has been completed.

#### *ERP components relevant to race and expression perception*

We focus on four particular ERP components of relevance to the perception of race and expression. These components provide a basis for examining sensitivity to race and expression information from faces across time. Past research suggests that some of the earliest components sensitive to race and expression information—including the N100, a negative deflection occurring around 100 ms after stimulus onset, and the P200, a positive deflection occurring around 200 ms—may reflect orienting to threatening and/or distinctive stimuli. At the N100, threatening primes elicit more attention (i.e. larger amplitudes) than positive primes (Weinstein, 1995); in a passive viewing task, angry faces elicit larger amplitudes than neutral faces (Felmingham et al., 2003), and Black faces elicit larger amplitudes than

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