

Research Article

Controlling Racial Prejudice

Social-Cognitive Goals Affect Amygdala and Stereotype Activation

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ABSTRACT—*The malleability of stereotyping matters in social psychology and in society. Previous work indicates rapid amygdala and cognitive responses to racial out-groups, leading some researchers to view these responses as inevitable. In this study, the methods of social-cognitive neuroscience were used to investigate how social goals control prejudiced responses. Participants viewed photographs of unfamiliar Black and White faces, under each of three social goals: social categorization (by age), social individuation (vegetable preference), and simple visual inspection (detecting a dot). One study recorded brain activity in the amygdala using functional magnetic resonance imaging, and another measured cognitive activation of stereotypes by lexical priming. Neither response to photos of the racial out-group was inevitable; instead, both responses depended on perceivers' current social-cognitive goal.*

People instantly categorize other people on the basis of social distinctions such as race, gender, and age (Fiske, 1998). Such rapid and even automatic responses direct much of human cognition and behavior (Bargh & Chartrand, 1999; Jacoby, Lindsey, & Toth, 1992; Schacter, 1992). The sensory and social world bombards people with information, so such adaptive shortcuts efficiently use their limited mental resources. Social cognition is no exception to this rapid, convenient type of response (Fiske, 2004, chap. 4).

Category-based responses, often known collectively as prejudice,¹ omit the effortful process of getting to know an individual

in detail and quickly provide a basic framework on which to base social interaction. Social categorization saves time and mental energy (Macrae, Milne, & Bodenhausen, 1994). However, quick heuristics to assess a person can harm both the perceiver and the target person. Therefore, controversy surrounds the inevitability or controllability of these rapid category-based responses. Individual differences, stimulus context, and social goals all influence relatively automatic biases, measured by reaction time methods (Fiske, 1998 and 2004, chap. 11).

In the present experiments, we applied techniques from brain imaging and cognitive-social psychology to this question. Specifically, we asked whether a person's conscious social goals can influence the process of person perception even at early stages indexed by activity patterns in the amygdala. Such results would demonstrate that goals control prejudice even earlier than often implied.

Although a complex network of multiple neural systems is surely involved, substantial evidence suggests that amygdala activity reflects arousal triggered by fast unconscious assessment of potential threat signified by sensory, social, and emotional stimuli (e.g., Adolphs, Tranel, Damasio, & Damasio, 1994; see meta-analyses by Murphy, Nimmo-Smith, & Lawrence, 2003; Phan, Wager, Taylor, & Liberzon, 2002). Patients with damage to the amygdala give abnormally positive judgments of the approachability and trustworthiness of unfamiliar faces (Adolphs et al., 1994). Human brain-imaging and patient studies show that the amygdala is involved in sensing, relaying, and learning about potential danger represented by stimuli, whether via previous direct experience with an aversive stimulus, as in fear conditioning, or via indirect experience through social signals communicated by fear or anger in other individuals' facial expressions (Adolphs et al., 1994; Breiter et al., 1996; Morris, Öhman, & Dolan, 1998). The amygdala responds to imagined or anticipated aversive events learned even through verbal communication (Phelps et al., 2001). The amygdala also helps modulate the strength of conscious emotional memories (Cahill et al., 1996; Hamann, Ely, Grafton, & Kilts, 1999) and

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¹The social cognition literature differentiates category-based responses as stereotyping (cognitive activation of knowledge about common social categories), prejudiced emotions (emotional response to members of a social out-group), and overt discrimination (behavior; Fiske, 1998; Greenwald et al., 2002). The three types of responses are often but not always correlated.

filters affective information reaching consciousness (Anderson & Phelps, 2001). Processing in the amygdala occurs quickly and even without awareness of the evoking stimulus (Bechara et al., 1995; Cunningham et al., 2004; Morris et al., 1998; Whalen et al., 1998).

That the amygdala has a role in complex high-level social contexts is supported by recent functional magnetic resonance imaging (fMRI) experiments showing that activation of the amygdala during presentation of pictures of unfamiliar faces differs according to whether the faces are from a racial out-group or the observers' own group (Hart et al., 2000). This differential amygdala response correlates with implicit evaluations of racial groups (Phelps et al., 2000). Amygdala activity apparently indexes early, unconscious neural assessment of potential threat associated with unfamiliar members of a racial out-group. Thus, it indicates relatively automatic social evaluation, without intent (Cunningham, Johnson, Gatenby, Gore, & Banaji, 2003) and even for briefly presented stimuli (Cunningham et al., 2004). Patterns of brain activity in the amygdala can inform answers to an important question about social interaction: Can perceivers' social goals moderate early indicators of potential prejudice? Other imaging studies of race perception have not manipulated social goals.

Early research indicated that knowledge about characteristics of a stereotyped group is inevitably activated in the presence of a member of that group and, further, that once this framework for interacting with the individual is activated, prejudice follows (Fiske, 1998). This move from activation to application of stereotyped knowledge is only conditionally automatic. Intentional, controlled efforts to inhibit expression of automatically activated stereotyped thoughts differentiate observers who display prejudice and discrimination from those who do not (Blair & Banaji, 1996; Devine, 1989; Fiske & Neuberg, 1990). Further, other research indicates that even the initial activation of stereotyped knowledge is not fully automatic, but rather depends on factors such as cognitive load, attentional capacity, and processing objectives. If the observer is attentionally overloaded or not motivated to process the target as a human, he or she may fail to activate relevant stereotype knowledge in the first place (Bargh, 1989; Gilbert & Hixon, 1991; Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997). Even amygdala activation to cross-race faces can be moderated by familiarity and fame, as well as by individual differences in prejudice (Hart et al., 2000; Phelps et al., 2000).

Explicit expression of racial prejudice has been declining in the United States (Fiske, 1998). However, more subtle implicit prejudice toward social out-groups still is evident on indirect measures (Devine, 1989; Dovidio, Evans, & Tyler, 1986; Greenwald et al., 2002). These implicit prejudices occur even in individuals who explicitly reject a stereotype and would find knowledge of their own tendency to be aversive.

The tendency to apply stereotype knowledge and to feel prejudice is not inevitable. It varies not only between individ-

uals, but also within the same individual, depending on factors such as a person's current processing goals with respect to the target (Blair & Banaji, 1996; Fiske & Neuberg, 1990; Macrae et al., 1997). Several processing goals promote category-based responses (Fiske, 1998). For example, time pressure, need for closure, moderate cognitive load, and general-impression goals all encourage prejudice. Category-based responses focus primarily on readily apparent features, such as age, race, and gender, and many theories view category-based responses as the default.

In contrast, several processing goals promote controlled processing and individuated responses. For example, direct instructions to individuate, instructions merely to be accurate, accountability to a third party, and outcome dependency on the other person all encourage perceivers to focus on the other person's individual attributes that go beyond or contradict group stereotypes. The two contrasting types of impression formation—category based and individuated—are echoed in other dual-process theories from the social psychology of attitudes and social cognition more generally (Chaiken & Trope, 1999).

In the present experiments, we manipulated participants' social goals while measuring amygdala activity and stereotype activation. We sought to determine whether a simple conscious shift in social-cognitive set might interrupt default category-based responses to a target from a racial out-group. Using fMRI, we compared White participants' brain activity in the amygdala during presentation of unfamiliar Black faces and White faces while the participants performed each of three tasks: socially neutral visual search, social categorization, and social individuation. A second experiment used lexical priming to measure stereotype activation during presentation of the same Black versus White faces while participants operated under the same three goals. This two-pronged approach, measuring responses in the brain and in reaction times, allowed for dual levels of analysis, connecting brain activity patterns with cognitive processes.

METHOD

Overview

In both experiments, participants completed three blocks each of the three main tasks (nonsocial visual search, social categorization, and social individuation). In each of the nine blocks, participants completed 12 trials. Each trial presented a word for 1 s, then a university-yearbook photo of an unfamiliar male face for 2 s (Fig. 1). Half the faces in each block were African American (Black), and half were European American (White).

In the socially neutral visual search task (Treisman, 1988), observers determined whether a dot was present somewhere on each face. This task was designed to encourage participants to process the photos as simple, nonsocial visual stimuli (Macrae et al., 1997). In the social categorization task, participants determined whether the person in each photo was over 21 years

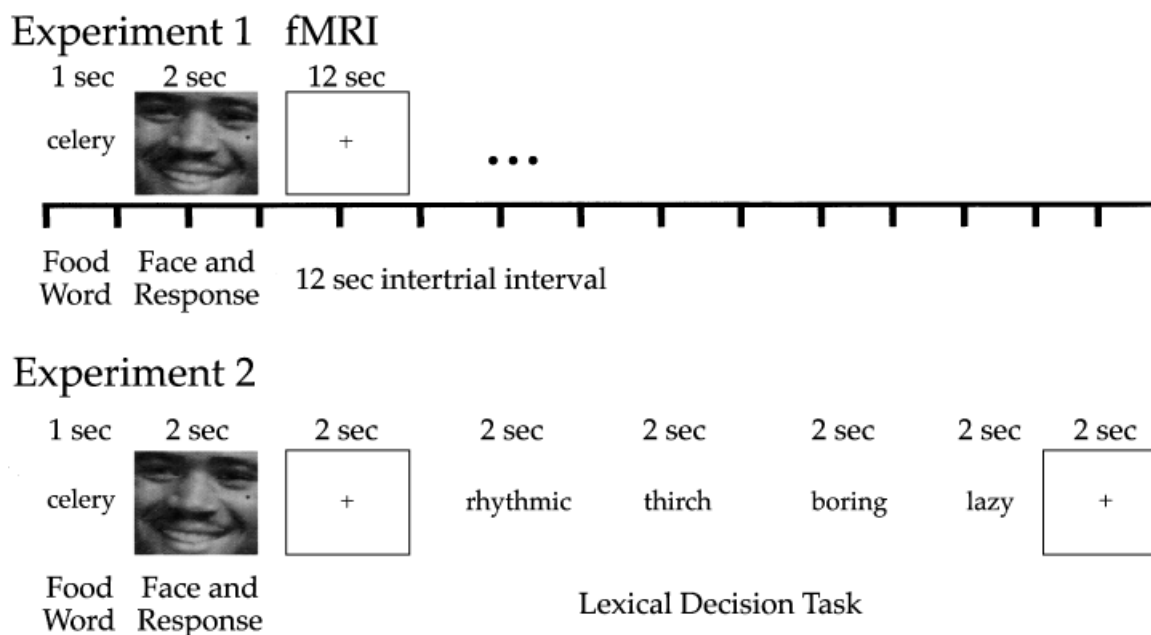


Fig. 1. Time course of one trial in Experiment 1 (functional magnetic resonance imaging, fMRI) and Experiment 2 (lexical decision reaction time).

of age. This task was designed to encourage social categorization of the faces. The processing in this task resembles the superficial processing required by the basic memory and gender categorization tasks used previously to obtain race effects for unfamiliar faces (Hart et al., 2000; Phelps et al., 2000). In the social individuation task, participants were asked to think about the individual in the photo and decide whether he would like a particular vegetable (indicated by the word presented immediately before the photo). This task was designed to encourage participants to think about each face as a unique individual by elaborating personal traits. The two social tasks (categorization and individuation) were equated for difficulty, and reaction time was limited to the 2-s display period for all tasks.

Participants in Experiment 1 performed these tasks inside an fMRI scanner so that brain activity in the amygdala complex could be monitored on a trial-by-trial basis. Participants in Experiment 2 performed these tasks at a computer monitor, making lexical decisions about nonwords, stereotype-relevant words, and stereotype-irrelevant words after being primed by a Black or White face.

Subjects and Stimuli

Participants in Experiment 1 (fMRI) were 7 European American undergraduate and graduate students (4 females). Participants in Experiment 2 (lexical decision) were 42 undergraduates (17 females; 36 European Americans, 6 Asian Americans); 4 were excluded from analyses because of either suspicion or failure to follow instructions.

On each block, participants first saw for 2 s an instruction screen with one of three centered words—“dot?” “over 21?” or

“vegetable?”—respectively instructing the participant to complete the visual search, social categorization, or social individuation task for all faces during that block. After the instruction screen, the visual presentation of stimuli was exactly the same across all tasks. On each trial, a vegetable word appeared for 1 s, followed by a face for 2 s. The face for each trial was selected randomly (with the constraint that 6 Black and 6 White faces were presented in each block of 12 faces with no repeat presentations) from a set of black-and-white yearbook photos of 40 Black and 40 White males. Each photo was cropped to show only the face without hair. Half of the faces (50% of the Whites, 50% of the Blacks) had a dark gray dot subtending approximately 0.5° of visual angle present somewhere on the face. The vegetable word presented before every face was randomly chosen from a set of 12 vegetables with similar frequency of use in English: asparagus, broccoli, carrot, cauliflower, celery, cucumber, eggplant, lettuce, radish, spinach, squash, and tomato. The chosen vegetables have few associations with common racial stereotypes and a neutral emotional valence.

In Experiment 1 (fMRI), each face was followed by a 12-s intertrial interval during which a fixation cross was presented. In Experiment 2 (lexical decision), the face was followed by a 2-s fixation screen, followed by four lowercase words or letter strings presented for 2 s each, and then by another 2-s fixation screen.

For Experiment 2, lexical decision words and letter strings were randomly selected from a set of 16 words and 16 nonwords: 8 stereotype-relevant words commonly associated with African American stereotypes (4 positive: *musical*, *athletic*, *rhythmic*, *loyal*; 4 negative: *loud*, *aggressive*, *lazy*, *hostile*), 8 stereotype-irrelevant words (4 positive: *calm*, *observant*, *romantic*, *candid*;

4 negative: *boring, lonely, obsessive, hesitant*), and 16 nonwords. Lexical decision words and nonwords appeared on screen until the participant responded or until 1.5 s passed. All trials with responses slower than 1.5 s or faster than 300 ms, as well as all trials with incorrect responses, were discarded from statistical analysis. After each word or nonword disappeared, a blank screen appeared; its duration was equal to 2,000 ms minus response time (or 500 ms if there was no response), to allow a constant presentation rate of one decision string every 2 s.

Two of the three main tasks were equated on difficulty. Participants subjectively rated the vegetable-individuation task and the age-categorization task as similarly difficult (difficulty ratings of 5.1 and 4.8, respectively, on a scale from 1, *very easy*, to 10, *very difficult*); the visual search task was rated as easier (1.6).

General Procedure

The experiment was initially described to participants as a study about memory for faces. Before the actual experiment, participants saw a demonstration and practiced each main task (and in Experiment 2, the lexical decision task) using a set of practice faces and words not used in the actual experiment. Participants were instructed to answer “yes” or “no” as quickly and accurately as possible on the main task and on the lexical decision task. In the fMRI experiment, participants pressed a red button in one hand to indicate “no” or a green button in the opposite hand to indicate “yes” (the hand used for each button was counterbalanced across subjects), during the 2 s before each face disappeared from the screen. In Experiment 2, participants indicated their responses by pressing one of two keys on a computer keyboard. Each participant completed three blocks (12 trials each) of each of the three main tasks in a random counterbalanced order (e.g., ABCBCACAB).

All participants provided written informed consent and were debriefed afterward. Participants in the fMRI study were screened for scanning (e.g., not pregnant, no metal implants). At the conclusion of the experiment, to assess the level of familiarity with members of various races, we asked all participants in both experiments to list the first 20 acquaintances that came to mind and then to indicate the race of these listed acquaintances. Participants then completed two questionnaires: the Internal and External Motivation to Avoid Prejudice Scale (Plant & Devine, 1998) and the Modern Racism Scale (McConahay, 1986), both designed to measure individuals’ propensity for prejudice. None of these measures correlated with brain activity or reaction time.

EXPERIMENT 1: fMRI SCANNING AND ANALYSIS

The fMRI scanning used a 1.5-T G.E. Signa whole-body and radio-frequency head-coil scanner located at Princeton Radiology Associates in Princeton, NJ. Synchronized with the

scanner, a Macintosh G3 laptop running a MATLAB 5.2.1 program presented the visual stimuli, which were projected onto a screen located at the participant’s feet, visible indirectly through mirrors. Responses were recorded using a bimanual fiber-optic response pad (Current Designs Inc., <http://www.curdes.com/response>). Forty-three contiguous structural T1-weighted spin-echo oblique axial slices aligned in the functional plane were acquired (5-mm slice thickness, 256 × 224 matrix in a 240-cm field of view; repetition time/echo time = 500 ms/minimum). Seven contiguous oblique axial functional slices (5-mm slice thickness, in-plane resolution 3.75 mm × 3.75 mm) aligned parallel to the anterior commissure–posterior commissure (AC-PC) plane were acquired, covering the area approximately from the AC-PC line to 35 mm ventrally. A gradient echo one-shot spiral trapezoidal pulse sequence was used (repetition time = 1,000 ms; echo time = 35 ms; flip = 65°, 64 × 64 matrix). Participants completed nine 190-s blocks, each acquiring 190 volumes (total of 1,620 usable volumes). Each block consisted of twelve 15-s trials. Fifteen seven-slice brain scans were taken on each trial, 1 scan during the vegetable word display, 2 scans during the face display and response, and 12 scans during the intertrial interval that allowed activity to return to baseline levels. Ten acquisitions were discarded at the beginning of each block to allow the scanner to reach a steady state while the task-instruction screen was presented.

Before statistical analysis, image preprocessing was carried out using AIR (Woods, Cherry, & Mazziotta, 1992) for motion correction; in addition, all participants’ images were co-registered to a common reference brain using a 12-parameter algorithm for group analysis. Images were detrended and smoothed using an 8-mm full-width/half-maximum three-dimensional Gaussian filter. Images taken during each of the three main tasks (categorization, individuation, visual search) were analyzed separately in three two-tailed paired *t* tests comparing trials with Black faces and trials with White faces. For each comparison, regions of interest were identified (Forman et al., 1995). A voxel-wise mixed-effects analysis of variance (ANOVA) with participants as a random effect and race of face and task as fixed effects was also performed to identify areas showing significant main effects of task and race of face, and their interaction ($p < .05$, cluster size of 8). Finally, the results of these analyses were overlaid onto the reference structural images and transformed to standard stereotactic Talairach space (Talairach & Tournoux, 1988) using AFNI software (Cox, 1996) on a Macintosh computer.

The omnibus ANOVA isolated a race-of-face main effect in the right amygdala and hippocampus and an interaction of race of face by task in the right amygdala; these areas overlapped. No main effect of task emerged in areas around the amygdala even when the statistical threshold standard was relaxed to $p < .10$. This result supports the assumption that the three main tasks do not differ significantly in their effect on amygdala activity.

Given the significant Race \times Task interaction, the main comparison of interest tested for significant differences in amygdala activity during trials with Black faces, relative to trials with White faces. This allowed us to measure whether the between-race difference in amygdala response varied across tasks, depending on participants' social goal in viewing the photographs. Planned contrasts of trials presenting Black faces versus White faces were completed separately for each of the three main tasks.

During the social categorization task, the contrast showed a significant difference in left amygdala activity and a sub-threshold difference in right amygdala activity during presentation of White faces versus Black faces (Fig. 2a; left amygdala maximum z score = 2.75 at Talairach coordinates $x = -20$, $y = -10$, $z = -14$; 15 voxels). These results replicate previous findings (Hart et al., 2000; Phelps et al., 2000) showing differential amygdala activity to racial out-groups when people categorize a target face for gender or use it for a simple memory task.

In contrast, the nonsocial visual search task showed no difference in amygdala activity during presentation of White faces versus Black faces (Fig. 2c). When participants processed the photos as simple visual stimuli, the response of the amygdala was the same for the two races.

Finally, during social individuation, activity in the right amygdala differed between Black faces and White faces, but the relative direction was reversed (Fig. 2b; right amygdala maximum z score = 2.05 at $x = 21$, $y = -9$, $z = -14$; 8 voxels). Activity in the right amygdala was suppressed during presentation of Black faces compared with White faces. According to social psychological theory, individuation encourages observers

to focus on traits that go beyond stereotypes. One possible explanation of these results is that participants' individuation of the preferences of people in the photographs inhibited category-based emotional responses observable at the level of the amygdala.

Across the three tasks, the amygdala complex showed a clear difference in relative response to in-group versus out-group faces. This amygdala response depended on participants' social processing goal, showing that such goals influence even low-level, fast emotional responses to out-group race members.

EXPERIMENT 2: LEXICAL DECISION TASK

The lexical decision task, based on principles of implicit priming, uses the idea that information is associated so that activation of one concept spreads as in a web and activates related concepts. Stereotypes, as an efficiency of thought, are one way of organizing the social world into categories (Fiske, 1998). Presenting a representation of a stereotyped group (e.g., a category-relevant word such as *black*) activates stereotype-relevant knowledge so that immediately subsequent processing of stereotype-relevant information is faster than processing of non-stereotype-relevant information (e.g., Dovidio et al., 1986). Experiment 2 used photographs of members of a stereotyped group to activate stereotyped knowledge; response times to stereotype-relevant and -irrelevant words were measured.

A within-subjects Task \times Race \times Trait Relevance ANOVA showed a main effect for task, $F(2, 36) = 5.37$, $p < .009$, consistent with participants' estimates of the relative ease of the visual search task ($M = 615.51$ ms), compared with the other two (individuation: $M = 622.14$ ms; categorization: $M = 631.23$

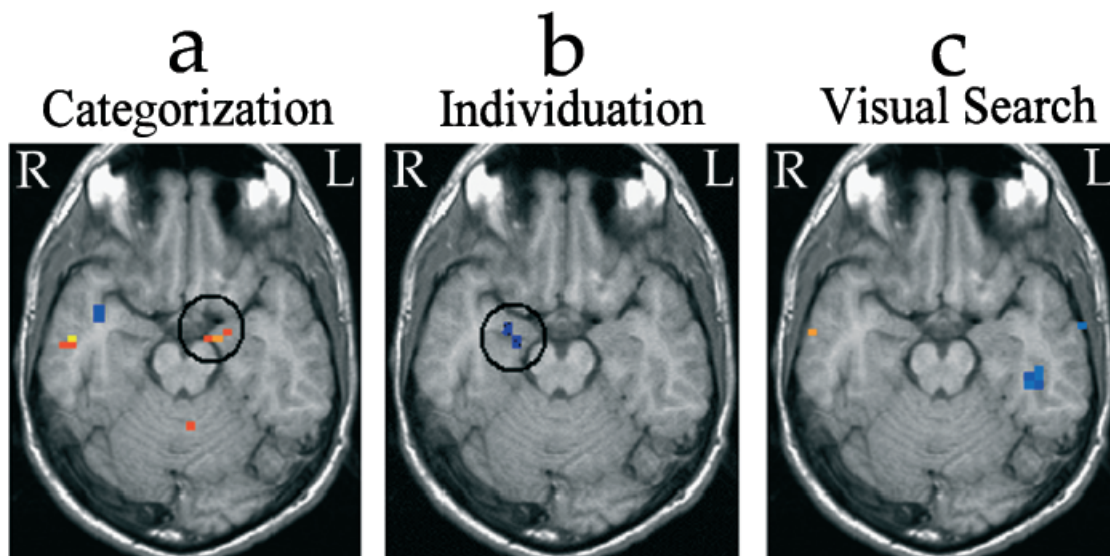


Fig. 2. Results of three planned contrasts from Experiment 1. Red and yellow indicate areas where activity was greater for Black faces than for White faces. Blue indicates areas where activity was greater for White face trials than for Black face trials. An axial image from a common reference brain is shown for each task: (a) categorization, (b) individuation, and (c) visual search. Circled areas indicate the region of interest, namely, the amygdala.

TABLE 1
Mean Lexical Decision Times as a Function of Race, Task, and Stereotypic Relevance

| Race of face | Task | | |
|--------------|---------------------|-----------------------------|----------------------------------|
| | Visual search (dot) | Social categorization (age) | Social individuation (vegetable) |
| | Relevant words | | |
| Black face | 609.26 | 618.23 | 615.45 |
| White face | 614.21 | 641.21 | 621.79 |
| Difference | -4.95 | -22.98* | -6.34 |
| Mean | 611.74 | 629.72 | 619.12 |
| | Irrelevant words | | |
| Black face | 626.53 | 631.82 | 618.84 |
| White face | 612.03 | 633.66 | 631.45 |
| Difference | 14.50 | -1.84 | -12.61 |
| Mean | 619.28 | 632.74 | 625.15 |

* $p < .05$.

ms). The difficulty of the categorization task was doubtless increased by the narrow age range of the yearbook-style photographs. The marginal Task \times Race interaction, $F(2, 36) = 2.81, p < .07$, suggests task variability by race. And as Table 1 indicates, the task reaction times did vary by race.

Our hypotheses predicted a very specific pattern—that the Black-White speed difference would appear only for stereotype-relevant words during the social categorization task, one condition out of six. The three-way interaction, with two degrees of freedom, constituted a weak and unfocused test of this effect, and the effect itself was diffused across three main effects, a two-way interaction, and the three-way interaction. A more focused test examined the six separate difference scores. As predicted, only the difference score for stereotype-relevant words during the categorization task was significant. Paired t tests were performed separately for each of the three main processing tasks. Results showed that the Black-White difference in lexical decision time reached significance only in the categorization task, and only for stereotype-relevant words, $t(37) = 2.22, p < .05$. Reaction time was significantly faster for stereotype-relevant words after presentation of out-group Black faces only when participants were thinking about the age of the person in the photo (during the categorization task).

The presentation of Black faces primed stereotype knowledge about Blacks only when participants were processing the faces categorically. When participants processed the faces as individuals or as simple visual stimuli (during the individuation task and during the visual search task), the presentation of Black faces did not significantly speed the response time to identify stereotype-relevant words.

GENERAL DISCUSSION

An easily controlled change in social-cognitive goals differentiated amygdala activity patterns in Experiment 1, and we have

recently replicated these results on a 3-T magnet, using whole-brain imaging with different faces but the same social-goal manipulations (Harris & Fiske, 2003). Experiment 2 shows that goals also influence cognitive stereotype activation, measured by lexical priming. The cognitive and neural responses, respectively, show stereotyping and primitive emotional prejudice responses. And both show that a process often viewed as inevitable is instead malleable by social goals. Together the experiments show that a stereotyped or prejudiced response to an out-group member requires, at minimum, that the stimulus (a photo in this case) be processed deeply enough that it represents a social target. Simple visual inspection, as in the visual search task, was not enough to trigger a differential response to an out-group member either in amygdala activity or in stereotype-knowledge activation (Gilbert & Hixon, 1991; Macrae et al., 1997). Other catalysts for categorization and individuation should have similar effects. For example, instructions, individual differences, stimulus context, and various social goals all determine category-based and individuating processes (Fiske, 2004, chap. 11).

Most important, the results show that perceivers can change the social context in which they view a target person and thereby affect out-group perception measurable in both the brain and reaction time behavior. Categorical processing of social targets, which social psychology nominates as the default processing mode, generated differential responses to in-group versus out-group members both in the amygdala and in stereotype activation. However, this default differential response can evaporate, given a conscious effort to individuate. Changes in social cognitive set occurred within the same individuals; that is, regardless of an individual's long-term tendencies toward prejudice, responses to the target person varied with controllable processing goals. Moreover, these changes in social-cognitive set occurred rapidly. The main tasks were completed during the 2 s of each trial when a face was present, and switching between the individuating and categorizing mind-set

occurred quickly across 3-min blocks, so the tasks were not practically difficult to implement. Other imaging studies of race perception do not show main effects for race on amygdala activity, suggesting some variability in the social goals elicited across and perhaps randomly within studies (Golby, Gabrieli, Chiao, & Eberhardt, 2001; Hart et al., 2000; Phelps et al., 2000; Richeson et al., 2003). For example (Phelps et al., 2000), although a majority of participants in a memory task showed amygdala activation to early presentations of unfamiliar Black faces, not all did so, and individual differences in implicit prejudice predicted amygdala activation. Thus, the effects of race on amygdala activity depend on goals, initial exposure, and individual differences. Our study capitalized on superficial, category-based goals and initial exposures to unfamiliar faces.

Although the current experiments focused on racial stereotyping by White American participants, other research shows that both Blacks and Whites tend to categorize their respective out-group (Fiske, 1998; Hart et al., 2000) and that prejudices extend to other categories, including other ethnic, gender, and age groups. Further investigation can reveal whether the amygdala is involved generally in out-group perception or only in certain types of out-group dynamics.

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