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Neurocognitive Underpinnings of Face Perception: Further Evidence of Distinct Person and Group Perception Processes

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A model of social perception is presented and tested. The model is based on cognitive neuroscience models and proposes that the right cerebral hemisphere is more efficient at processing combinations of features whereas the left hemisphere is superior at identifying single features. These processes are hypothesized to produce person and group-based representations, respectively. Individuating or personalizing experience with an outgroup member was expected to facilitate the perception of the individuating features and inhibit the perception of the group features. In the presented study, participants were asked to learn about various ingroup and outgroup targets. Later, participants demonstrated that categorization response speeds to old targets were slower in the left hemisphere than in the right, particularly for outgroup members, as predicted. These findings are discussed for their relevance to models of social perception and stereotyping.

Keywords: social perception, stereotyping, social neuroscience, face perception

How is it that experience with outgroup members often fails to influence judgments regarding the actual outgroup? One can identify numerous studies showing how people are categorized by race and gender (Ito & Urland, 2003, 2005; Lepore & Brown, 1997; Stroessner, 1996; Zárate & Smith, 1990), but few, if any, studies investigate face perception processes regarding familiar others. Because people can be categorized any number of ways, it seems that even minimal interactions with others can influence how they are perceived later. Just as important, recent work showing dissociations between person and group perceptions (Zárate, Sanders, & Garza, 2000) suggest that familiarity with a person should impact later group categorizations as a function of the prior experience. The dissociations between attitudes toward a person and attitudes toward the associated group also suggest that person and group perceptions are distinct processes. Presented below is a recently developed model of social perception. It is based on multiple findings within the neuroscience literature and contends that social perception is driven by two distinct systems. Finally, new predictions are developed to test how familiarity with a person impacts interhemispheric communication for ingroup and outgroup members.

Research shows that person and group perception processes are distinct (Hamilton & Sherman, 1996; Hamilton, Sherman, & Mad-

dox, 1999), and those distinctions point to some long-standing issues within social psychology. Is social perception a single continuum from group to person perception, or are there dual processes that produce distinct outputs? The distinctions between serial and parallel processes for person and group perceptions have been at the center of a long debate, but the mechanisms through which they operate have been somewhat ignored. Although dual-process models are not without criticism (Kruglanski et al., 2003), we argue that the competing demands of social categorization and person perception support the need for dual-process models in social perception. We further argue that cerebral hemispheric asymmetries in perception match well with the basic distinctions in social perception.

A Neurocognitive Model of Social Perception

The basis for this model lies in the recognition that person perception and group categorization require attending to different properties of the person and appear to occur at different stages (Lui, Harris, & Kanwisher, 2002). Individual person perception requires that an individual's face be processed and recognized. For face recognition, combinations of features and the ways in which those features relate to each other are particularly important. Almost all models of face recognition entail a feature integration process consistent with the visual processing that normally occurs in the right hemisphere (Farah, Wilson, Drain, & Tanaka, 1998). Recognition requires attending to the overall spatial configuration of internal facial features (i.e., eyes, nose, and mouth) and how those features relate to each other. Specific features, such as when a close friend starts wearing eyeglasses or shaves off or grows a beard, have little impact on recognition processes. In fact, perceivers often cannot identify when a major facial feature has changed.

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A person can start wearing eyeglasses or shave a beard and close friends are often able to say he or she looks different but are unable to identify how the person changed.

Group categorization, in contrast, requires attending to specific or single features within the face. For example, race perception often requires attending to one feature: skin color (Levin, 1996). A simple mask like that worn by the fictional Zorro can inhibit face recognition but does little to inhibit gender categorization. Thus, although individuating information is lost, group category information is still available. The attention to similar features across an array of items produces the abstraction or semantic representation of the features. The feature integration process necessary for person identification can be independent of the feature identification process necessary for group categorization. If one finds distinct mechanisms in each hemisphere that produce different representations, it would further support the distinctions between person and group perceptions.

Our model accounts for person versus group distinctions by hypothesizing that social perception entails two parallel processes (Zárate et al., 2000). One process more efficiently identifies the individuating characteristics of others, whereas the other process is better at identifying social category membership features. These processes work together to produce various person and group dissociations. The mediating mechanisms entail how the cerebral hemispheres process visual information. The right cerebral hemisphere is more adept at identifying combinations of features and using those features to distinguish one exemplar from another. The left cerebral hemisphere is particularly adept at identifying salient features to identify commonalities and differences across a number of different exemplars (Marsolek, 1999; Navon, 1977; Weissman & Banich, 1999). In essence, the processing conducted by the right hemisphere is an interactive-cue process, and the processing conducted by the left hemisphere is an additive-cue process (Medin & Smith, 1981). Interactive-cue processes produce exemplar representations, whereas additive-cue processes produce prototype representations. The feature integration encoding mechanisms favored by the right hemisphere more often bias the system to retrieve exemplar-like social representations. The abstract representations produced by the left hemisphere more often prime or lead to schematic or group-based memory retrieval representations of social stimuli (Cabeza & Nyberg, 2000). These encoding asymmetries bias the system to produce more concrete person-based representations or more abstract group-level representations, respectively.

Prior Support

In three sets of studies, Zárate, Sanders, and colleagues (Sanders, McClure, & Zárate, 2004; Zárate et al., 2000; Zárate & Sanders, 2004) found preliminary support for these cerebral asymmetries in social perception. Consistently, the right and left hemispheres demonstrated qualitatively different responses to the same stimuli. In Zárate et al. (2000), the right hemisphere demonstrated memory for specific faces via a mere exposure effect (Zajonc, 1968) in Experiment 1 and exemplar-driven categorization patterns in Experiment 3. In contrast, the left hemisphere demonstrated evaluative priming for outgroup members in Experiment 2 (Dovidio, Evans, & Tyler, 1986; Zárate & Smith, 1990) and prototype-like processing within a gender categorization task in

Experiment 3 (Zárate & Sanders, 1999). The studies demonstrated that the right hemisphere was superior at processing person- or instance-based information and the left hemisphere was superior at processing group-level information.

Sanders et al. (2004) further demonstrated differential learning patterns across the hemispheres. After participants were classically conditioned to respond to pictures of one particular bearded man presented with numerous pictures of other nonbearded men, participants were presented with a series of new photos. New photos included new bearded men, new nonbearded men, and the targets presented earlier. Galvanic skin responses (GSR) were used to measure participants' responses. When targets were presented to the right hemisphere, participants responded with a heightened GSR to only the specific bearded man. When items were presented to the left hemisphere, however, participants responded with a heightened GSR to all of the bearded men. Thus, the right hemisphere responded to the person, whereas the left hemisphere responded to the group category *bearded men*.

These general effects support other research by Golby, Gabrieli, Chiao, and Eberhardt (2001). Golby et al., using functional magnetic resonance imaging (fMRI), demonstrated that participants had differential response patterns to same-race and other-race targets. From that, they argued that "left-hemisphere pathways may mediate categorical visual processes that maximize similarities among examples in a category, whereas right-hemisphere pathways may mediate coordinate visual processes that maximize individuation between examples in a category" (Golby et al., 2001, p. 847). The reported research builds on this past research to further disentangle how person and group perceptions work together to produce a coherent mental representation of the social world.

In this model, cerebral asymmetries mean that the system has processing biases. It does not mean that the left hemisphere houses group processing abilities and that the right hemisphere houses person-based processes. In fact, either encoding process can produce either type of outcome. Ito and Urland (2005), for instance, using event-related potential (ERP) methodologies, showed that categorical processing appears to be independent of structural (person) processing. They also contend that person and categorical processing can be accomplished through a myriad of processes. Consistent with that, we argue that these differential processing systems are only biased to process information differently and that those processing asymmetries produce distinct social perception outcomes. Thus, the systems are biased to produce differential outputs but are capable of producing and do produce multiple outputs (Cabeza & Kato, 2000).

Is Social Perception Special?

It is difficult to directly extend the neurological literature to social psychology. The neurological substrates of face perception processes are well studied and highly debated. Some researchers contend that face perception is special and dominated by the right cerebral hemisphere (Hillger & Koenig, 1991; Parr, Dove, & Hopkins, 1998; for reviews, see Bruce & Humphreys, 1994, or De Renzi, Perani, Cartesimo, Silveri, & Fazio, 1994) and, in particular, associated with the fusiform gyrus of the right hemisphere (McCarthy, Puce, Gore, & Allison, 1997; Moscovitch, Winocur, & Behrmann, 1997). The associated research on this issue subsumes

neurological imaging studies that question if faces are processed by a specific fusiform face area or whether the processes are distributed across a range of neurological substrates (Cohen & Tong, 2001; Haxby et al., 2001). The debate also covers experimental manipulations that show, for instance, that inversion disrupts the accurate perception of faces more than the perception of other stimuli (Valentine, 1988). The fact that face perception is more disrupted than other stimuli by that manipulation suggests that face perception is special.

Others contend, however, that face perception is simply very well practiced and that any effects unique to faces represent expertise more than some particular perceptual mechanism (Diamond & Carey, 1986). Indeed, comprehensive reviews specific to the modular versus distributed approach to face perception are inconclusive (e.g., Cohen & Tong, 2001). Nevertheless, at the very least, research shows that face perception is differentiated from nonsocial perception very early in the visual process, at least at 170 ms, showing distinct processing at a relatively early stage (Ito, Thompson, & Cacioppo, 2004). The fact that race perception appears to occur even before structural face processing, at about 120 ms, (Ito & Urland, 2003) indicates that basic group membership processes are particularly important in the perception stream.

Extensions of the neurological literature to the social psychological realm are made more difficult because most studies equate social perception with person recognition. Social categorization tasks are rarely used in neuroimaging studies, yet categorization processes have multiple important social psychological ramifications. With the emergence of social neuropsychological research, however, some group categorization studies have emerged. Ito and Urland (2003), for instance, showed that race processing appears to start at about 122 ms and that the early effects are larger for other-race targets than for same-race targets. Their later research (Ito & Urland, 2005) included an individuation task, but they did not investigate how that task impacted later group processing, which is central to this research. Wheeler and Fiske (2005) also used an individuation task in which people are asked to make inferences about the vegetable preferences of the presented targets. Their research also supports the basic distinctions presented in this model. In particular, during the social categorization task, participants demonstrated an enhanced amygdala response in the left hemisphere only. In the individuation task, however, activity in the right amygdala differed across the White and Black targets. Thus, at multiple levels, one can find support for the general hypothesis that the left hemisphere appears to process group-level information, whereas the right hemisphere appears to process individual-level information.

Social Categorization Moderators

Finally, any social extension of a neurocognitive model must account for the degree to which race or gender is differentially salient as a function of both perceiver and target characteristics (Zárate & Smith, 1990). Target race is more salient when one is perceiving other-race targets (Stroessner, 1996). This is evident in social categorization studies and in face recognition studies. For example, Stroessner showed that White participants appear to automatically attend to race for Black targets but not White targets. Black targets are perceived by race faster than are White targets, and White participants are relatively unable to avoid attending to

race for Black targets. Similarly, Wheeler and Fiske (2005) found with White participants that during an individuation task, White participants show that right cerebral amygdala activation is reduced for Black targets. Because race is generally more important for other-race targets than for same-race targets, one can assume that race perception is a default process for other-race targets more so than for same-race targets. Outgroup homogeneity studies show that individuals attend more to the individuating features of targets of their gender than of targets of another gender (Park & Rothbart, 1982). These results also suggest that under normal circumstances, targets of the same race and same gender as observers are normally perceived as individuals more so than as group members. Thus, personalizing experiences, for instance, would likely interfere more with individuals' perceptions of other-race and other-gender targets than for same-race and same-gender targets.

Given the possibility that face perception is special and that the neurocognitive literature uses a small subset of social perception tasks, it is incumbent on social psychologists to test fully any particular hypotheses rather than to merely transport neurocognitive constructs to social psychology. To do that, in the research here, we use a divided visual field task. Stimuli are presented briefly to either the right visual field or the left visual field, referred to as a *hemifield*. Information is then processed first by the contralateral hemisphere. Items presented to the right visual field are processed first by the left hemisphere. Items presented to the left visual field are processed first by the right hemisphere. The primary advantage to this methodology is that the methods are similar to those of many social psychological experiments and allows many researchers to test social factors with relative ease to build a theoretical and empirical base on which to develop further neuroimaging studies.

Regarding hemifield studies, research often shows gender differences across lateralization patterns. For example, Kilgore and Yurgelun-Todd (2001) showed that during the perception of happy and fearful faces, men demonstrated greater hemispheric asymmetries than did women. Similarly, studies using a local–global visual task (Roalf, Lowery, & Turetsky, 2006) often find greater male cerebral asymmetries than female asymmetries. In a typical local-global task, small stimuli (local), often letters, are embedded in a larger array (global) that are often arranged to make a different letter. The left hemisphere is generally more adept at identifying the smaller or local stimuli, whereas the right hemisphere is generally more adept at identifying the larger array. Not all studies produce gender differences, however, and sometimes those effects are relatively weak (Hiscock, Perachio, & Inch, 2001). Because gender represents a fundamental social category, we examine gender differences in the present research.

Person Versus Group Judgments: Inhibitory Phenomena

In the current research, we advance prior work by considering how the cerebral hemispheres work together to produce basic social psychological phenomena. There are a number of potential models for how the hemispheres cooperate. Many nonsocial models find support for the inhibitory-interaction hypothesis, which maintains that activating the dominant hemisphere will inhibit the same processes in the nondominant hemisphere. Theoretically, once an output is produced, it works to inhibit alternative outputs (Rutherford & Lutz, 2004). Rutherford and Lutz (2004) found this

effect with the use of word conditions when the left hemisphere was first activated and then deactivated but not with the right hemisphere. Interhemispheric competition is also affected by the bilateral effect where information presented to the nondominant hemisphere will transfer efficiently to the dominant hemisphere. Thus, information processing consistent with the normal processing mode is processed easily and quickly transferred to the other hemisphere. Interference occurs when the information being transferred from the nondominant hemisphere competes with the information presented directly to the dominant hemisphere for processing capability. The information presented to the nondominant hemisphere will eventually just give way and inhibit that information (Jordan & Patching, 2003; Olk & Hartje, 2001).

Because people can be categorized any number of ways, social perception models must include some response inhibition mechanism. Without an inhibition process, the social perceiver would be left with a near endless array of conscious categorizations of their social world. The multiple perceptions would overwhelm the perceiver. To account for this, our hypothesis is that the two hemispheres work in parallel. On encountering a social stimulus, both processes are initiated. Depending on how the social stimuli match stored memory (Smith & Zárate, 1992), recently primed events (Bargh & Ferguson, 2000), perceiver goals (Wheeler & Fiske, 2005), the targets' characteristics, and other factors, either hemisphere can produce the first conscious representation. Once an output is produced, it works to inhibit alternative outputs. This inhibitory mechanism accounts for a number of person and group distinctions. For example, outgroup members are categorized faster by ethnicity (Stroessner, 1996) but are also more poorly recognized than ingroup members (Malpass, 1974). In this instance, efficient group identification processes inhibit individuation. Similarly, new hypotheses are drawn below regarding how familiarity should influence group and person encoding mechanisms. Thus, given the complexity of social perception, it is proposed that the various mechanisms work to inhibit alternative outputs to reduce perceptual overload.

Experimental Overview and Predictions

The preceding analyses provide predictions regarding how developing person-based representations can influence subsequent group-based perceptions. In the present study, participants first learned about eight persons: four same-race targets and four other-race targets. All targets were men; participants were men and women. To promote person-based memories of the targets, participants learned individuating nonstereotypic information about the targets. This training included school major, interests, and the like. This training reflects the types of social acquaintance learning one is often confronted with in real-world interactions. After the training, participants were given a group categorization task. During the categorization task, participants were asked to make race and gender categorizations of new targets and of the targets used in the previous training (trained targets). It was predicted that the recent and therefore very salient person-based training would interfere with making group-based categorizations, particularly if making person-based representations is not the default process.

The individuating experiences at learning were expected to produce different effects across the cerebral hemispheres in the social categorization task. The model predicts that the temporally

salient person-based representations would work to inhibit the categorization processes normally favored by the left hemisphere (Zárate et al., 2000). That is, the person-based training was hypothesized to produce relatively strong individuated representations that should interfere with the left hemisphere processes. This will be reflected in slower response times (RTs) to categorize the trained targets by race or gender when presented to the left hemisphere compared with the right. Thus, the model predicts that for the trained targets, RTs will be slower in the left hemisphere than in the right despite the fact that the left hemisphere is generally responsible for categorization processes. This should be especially true for responses to targets whose race and gender are not those of the participant (compared with when targets are of the same race and gender of participants) when race and gender are more salient. The right hemisphere is biased toward producing person-based representations. Because the training task is consistent with default person-based processing of the right hemisphere, the training should influence subsequent categorization tendencies. This is particularly true in this situation, where the stimuli were specifically designed to be nonstereotypic. Thus, it was further hypothesized that the person-based training should not interfere with the person-based processing normally favored by the right hemisphere.

In summary, the model predicts that the person-based training would produce different effects as a function of group membership and cerebral hemisphere. Person-based information about others was expected to inhibit group categorizations in the left hemisphere relative to the right hemisphere for targets of another race or gender than the participant and more so for other race and gender targets. Person-based information was not expected to greatly influence perceptions when the targets are of the same race and gender as participants (e.g., Latino men). The person-based representation is posited to compete with the group-based representations, thereby slowing down responses to targets of a different race or gender than the participant. The person-based training was also hypothesized to have little effect for same-race, same-gender targets because people normally process information about ingroup members in an individuated way (Park & Rothbart, 1982). Thus, although experience generally improves performance, in this instance, it was predicted to inhibit performance because it does not match the default processing style favored by the left hemisphere.

Method

Participants

Sixty-seven Latinos participated for partial course credit in an introduction to psychology course. Four participants were removed from analyses because they reported being left handed. Of the remaining participants, 36 were women and 27 were men.

Stimuli

This study consisted of a training phase and an experimental phase. The training phase involved participants learning about four African American males (an outgroup for the participants) and four Latino male targets (an ingroup for the participants). Targets were presented individually as a frontal head-and-shoulder, color

photo. Photos were 7 cm high and 6 cm wide. Each photo was presented with individuating information. The information included names, pictures, and a short, nonstereotypic profile (e.g., "David is the youngest of four. He is currently enrolled at the university. He enjoys going to the movies"). Each target was presented twice during the training phase. In the first presentation, the participants viewed each target and his information for 1.5 min. In the second presentation, participants viewed each target for 30 s. Participants were instructed to form impressions of the targets; become familiar with the pictures, names, and personal information; and review this information as many times as possible in the time given. Stimuli were presented using PowerPoint to control the speed of presentation.

In the test phase, participants were presented with a series of photos for a categorization task. Each trial consisted of a fixation point, a photo, and a group label, in that order. Participants were first presented with an *X* in 24-point font for 500 ms. The *X* was followed by a photo of an individual presented to either the left or the right visual field for 180 ms. The 180-ms presentation rate was used so that the items were gone before the participants could move their eyes to see the items directly. The photo was immediately followed by one of four possible group labels presented centrally in 24-point font. The group labels were *Latino*, *Black*, *man*, and *woman*. Words were presented for 1,500 ms or until the participant responded through a keypress. The longest a trial could last was 2,180 ms, but the length of each trial was dependent on the speed of the participant on the task. Participants were instructed to hit the *N* key if the word and picture matched and to hit the *C* key if the picture and the word did not match. Keys were covered with labels to represent *yes* and *no*, respectively.

Test phase photos were the same size and type as in the training phase. Target photographs were presented so that the center of each photo was 6.5 cm to the left or right of a central fixation point. Included in the photoset were 48 faces: 12 Latino women, 12 Latino men (including the 4 trained), 12 African American women, and 12 African American men (including the 4 trained). Each picture was displayed eight times, twice with each word and in each visual field, for a total of 384 trials. Of these 384 trials, 192 trials presenting female targets were filler trials. Two experimental sets were produced with each target face used as a trained face and as a new face. Four other African American male targets and 4 Latino male targets were always new faces across all participants. Analyses are reported only if they replicated across stimulus sets. Further, as a control, all comparisons revolved around the same

new 4 targets for each group. Participants were given a short break after 192 trials, creating two blocks. Equal numbers of trained and new targets and African American and Latino targets were presented within each block, counterbalanced for hemifield and question.

Procedure

Participants were placed 60 cm from the computer screen and on a chin rest to ensure equal distance from the computer screen and floor for all participants and throughout all trials. We instructed participants to stare at the *X* to ensure participants' focus was on the central fixation point at the beginning of each trial. Participants completed a practice set of 10 trials before the test phase. Participants were instructed to be as accurate and as fast as possible. RTs were recorded from the point the word appeared to the time a participant hit a key on the keyboard. Stimuli presentation and data recording were conducted via SuperLab (Cedrus Corporation, 2002).

Results

RTs below 200 ms were deleted from analyses. Consistent with previous studies (Zárate et al., 2000), only correct RTs between 200 ms and 1,500 ms were analyzed. Incorrect responses totaled 12% of the total responses. The aggregate means were evaluated for normality, and all response means fell within acceptable limits, so no transformations were needed (Ratcliff, 1993).

The data were first analyzed within a 2 (question type: race or gender) \times 2 (target race: Latino or African American) \times 2 (visual field: left visual field–right hemisphere or right visual field–left hemisphere) \times 2 (target type: trained or new) \times 2 (participant gender) analysis of variance. Target type, target race, question type, and visual field were treated as within-subject factors. The question type factor did not influence the results; thus, means were aggregated across that factor for further analyses. The ensuing analysis produced a Target Race \times Visual Field \times Target Type \times Participant Gender four-way interaction, $F(1, 61) = 6.41, p = .014$. See Table 1 for the means for each condition. Because the primary interest was in hemispheric asymmetries for outgroup and ingroup targets, that four-way interaction was decomposed by analyzing trained and new targets separately to identify differences across the hemispheres. This also eliminates any possible main

Table 1
Mean Response Times (in Milliseconds) to African American and Latino Targets Separately for Trained and New Targets

Target type	Trained				New			
	Left hemisphere		Right hemisphere		Left hemisphere		Right hemisphere	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
African American targets	838	128	815	117	828	123	815	118
Female participants	872	113	856	115	870	103	830	107
Male participants	792	134	761	96	771	127	793	130
Latino targets	860	130	838	117	857	126	846	108
Female participants	903	127	867	107	888	102	875	95
Male participants	800	111	800	121	815	144	807	114

effects due to experience that produce an overall facilitation or inhibition independent of any hemispheric asymmetry.

This test included trained Latino and African American targets as repeated measures in the same analysis and produced only a significant visual field effect, $F(1, 61) = 4.18, p = .045$, without any gender effect. As predicted, responses were significantly slower to trained items when they were presented to the left hemisphere than when they were presented to the right hemisphere. Although the analysis for trained items did not produce a significant Target Race \times Visual Field \times Participant Gender interaction, $F(1, 61) = 2.37, p = .13$, further analyses explored for potential moderators across same-race targets versus other-race targets and for gender differences across those comparisons. Specifically, we conducted planned comparisons that examined the visual field effect for African American and Latino targets separately. As predicted, for trained African American targets, responses were slower in the left hemisphere condition than in the right hemisphere condition (see Table 1), $F(1, 61) = 4.34, p = .0413$. Participant gender did not influence that interaction, $F(1, 61) = .44, ns$. That same analyses for the Latino targets, however, produced only a participant gender main effect, $F(1, 61) = 10.96, p = .0016$, without any differences across hemispheres, $F(1, 61) = 1.54, p = .22$. Further comparisons conducted separately for women and men, however, revealed that although women responded marginally faster to the targets first processed in the right hemisphere, $F(1, 35) = 3.03, p = .09$, responses for the male participants did not differ across conditions $F(1, 26) = 0, ns$. This pattern of findings supports our hypotheses.

A similar analysis of the new targets produced a three-way interaction that included target race, visual field, and participant gender, $F(1, 61) = 4.12, p = .04$. Further analyses for each race analyzed separately revealed a significant Gender \times Hemifield interaction for the African American targets, $F(1, 61) = 11.24, p = .001$, and no effect for the Latino targets (all $ps > .3$). For the African American targets, female participants responded faster to targets first processed in the right hemisphere versus the left hemisphere, $F(1, 35) = 12.72, p = .001$. Male participants, however, responded similarly to targets across the hemispheres, $F(1, 26) = 2.08, p = .16$. Those means are also reported in Table 1. The overall pattern was different for new targets than for trained targets and further supports the general hypotheses.

Discussion

These data show that group judgments about known individuals are slower in the left cerebral hemisphere than in the right cerebral hemisphere for targets that differ in group membership on at least one fundamental social category of race or gender. Personalizing experiences, even minimal experiences, inhibit group perception processes for outgroup members. These results show that social perception processes differ across the hemispheres as a function of prior learning experiences. Learning about Joe inhibits participants from categorizing Joe as "Black." It is important to note that the inhibition occurs in the left hemisphere, as predicted. The left hemisphere is the hemisphere more responsible for stereotyping (Zárate et al., 2000). This supports the hypothesis that personalizing information works to interfere with the activation or completion of social categorization processes, particularly when the targets differ from the perceiver on important social dimensions. A

basic tenet of modern social cognitive theory is that social categorization mediates the application of the associated stereotypes (Dovidio et al., 1986; Fazio & Dunton, 1997; Zárate & Smith, 1990). With inhibited social categorization speeds, one can infer inhibited stereotyping. These results show why intergroup contact often fails to reduce the stereotypes associated with those outgroup members: The stereotype is simply not activated.

Here, the inhibition occurred with a minimum of familiarity. This is both conceptually and methodologically important. Conceptually, intergroup contact is far more involved than the simple manipulations used here. Presumably, more extensive contact might produce either stronger effects or qualitatively different effects. Extended contact might drive two distinct effects. On the one hand, more contact will provide more personalizing experiences, thereby strengthening the manipulations. This would facilitate right hemisphere perceptual processes and further inhibit social categorization processes. Extended contact also generally occurs over multiple days and often years, allowing time for memory consolidation processes to further strengthen the original encoding processes (Abel et al., 1995; Chavez, 2006). A more conscious awareness of the individual may dramatically alter the associated processes. Thus, learning counterstereotypic or irrelevant information about a person can interfere with accessing the associated stereotypes and, over time, that interference should get stronger.

The fact that the effects are evident for African American targets but show perceiver gender differences, albeit marginal ones, for the Latino targets suggests important social psychological moderators to any neurological model. A social feature is not perceived in a vacuum. In this instance, race receives added attention for other race targets. Similarly, the fact that Latino male participants made no distinctions between new and trained Latino male targets suggests that when targets are the same on all of the relevant dimensions, people generally make individuating inferences about others. Because the stimuli were male faces, however, one must interpret any participant gender effects with caution.

Methodologically, these results suggest that many reported findings of automatic stereotyping might be limited to those situations in which the perceiver has no prior knowledge of the targets. In related research, Kawakami, Dovidio, Moll, Hermsen, and Russin (2000) showed that practice in negating the use of stereotypes reduced later stereotype activation. In our study, participants were asked to make more personal inferences about the targets, which also produced reduced group categorization effects. Thus, although it is well accepted that people automatically stereotype others, our results suggest that those effects might be due to the fact most researchers use entirely new person targets. If all participants know about a target is his or her race, maybe it is only logical that they stereotype the targets.

One can easily extend this model to test how actual contact and prolonged contact influence social perception. For instance, in the current experiments, the personalizing information was nonstereotypic. What does the research on the contact hypothesis suggest if the contact partially supports the stereotype? If the learning experience provides constant cues of the group membership to make the targets appear representative of the group, the person should be encoded as a group member. With that encoding, one should find facilitated rather than inhibited categorical processing. Category-consistent processing should be evident in the left hemisphere and

for centrally presented targets. Similarly, one can identify other moderators of the contact hypothesis to test the underlying neurocognitive components. Through a broader investigation of the contact hypothesis, one can identify the underlying components to understand better the associated processes.

The presented research also addresses the primacy of person and group perception processes. Traditionally, some of the dominant models of social perception have posited a serial process. Features such as race, gender, and possibly age are perceived first (Fiske & Neuberg, 1990). If the perceiver is properly motivated or if the initial perception is inadequate, the perceiver proceeds to attend to and encode individuating features. Thus, "category-based processes have priority over attribute-oriented processes" (Fiske & Neuberg, 1990, p. 2). Within that model, attribute-oriented responses entail individuating responses. Despite the intuitive appeal of the model, multiple lines of research suggest that person perception may occur before group perception or, at the very least, occur at the same time. Indeed, Brewer (1988) suggested that person perception consists of dual processes, including category and person-based processing. The model presented here supports that type of distinction.

Further evidence against the hypothesis that social perception starts with categorizations and moves to person-based inferences comes from a study completed by Sanders (1999, Study 2). In Sanders's study, participants were presented with a series of paired prime-target photos. The prime was always presented centrally, and the target photo was presented to either hemifield. Two different judgment tasks were used. At times, participants were asked to make same-person judgments. Was the target the same person as the prime? At other times, participants were asked to make same-gender judgments. Was the target person the same gender as the prime? The main finding of interest was a Task \times Hemisphere interaction. Participants were faster to respond to the same-person task when the targets were presented directly to the right hemisphere. In contrast, same gender judgments were faster in the left hemisphere than in the right (when the target was the same person). In addition, overall, same-person judgments were made marginally faster than were same-gender judgments. Those data provide further evidence that the person-based judgments are not only independent of group categorization processes but may also be faster.

These data further support our model that social perception entails two distinct neurologically based perceptual systems. One system, which identifies combinations of features, works to develop exemplar-based memories of individuals. The other system, which identifies specific features, works to develop group-based representations. Through those representations, the associated information becomes accessible. Consistent with models that posit dual memory systems (cf. Brewer, 1988; Knowlton & Squire, 1993), experience with a target had dissociated effects on later categorical processing.

The original goal of the model was to address social perception issues, although these findings are relevant for a number of research topics. How do the hemispheres respond to well-practiced but orthogonal judgments? Social perception is very well practiced, which provides a unique opportunity to investigate how various orthogonal automatic processes compete for consciousness. One can also contrast less practiced but more salient judgments (per experimental manipulations) with more automatic judg-

ments to test how explicit and implicit processes work. If the hemispheres are biased toward processing particular types of information, one can further distinguish person from group perception. We hope that these approaches can shed light on intergroup perceptions and other basic social psychological processes.

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