

Categorizing Others: The Dynamics of Person Construal

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A fundamental question in social cognition is whether people categorize others on the basis of the social groups to which they belong. Integrating ideas from related work on face processing, the current research explored the emergence and boundary conditions of person categorization. Using speeded responses to facial stimuli as a marker of category activation, the authors showed in 3 experiments that person categorization: (a) occurs only under active-encoding conditions and (b) does not extend to applicable but task-irrelevant categorical dimensions, but (c) is sensitive to overlap in the perceptual features that support multiple categorical construals. The authors consider the implications of these findings for models of social-cognitive functioning and the component processes that support person perception.

Keywords: person perception, category activation, social cognition

Understanding other people is arguably one of the most challenging tasks facing the social perceiver. From the multiple cues available, perceivers must somehow construct coherent internal representations of others, representations that can be used to guide information processing and response generation. Reflecting the pivotal status of this process in social-cognitive functioning, researchers have spent much of the last 50 years attempting to identify the tactics that people use as they strive to make sense of other social agents (Bodenhausen & Macrae, 1998; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). Wide-ranging though the resulting literature may be, most would agree that mental life makes use of an elegant cognitive strategy to streamline the demands of the person perception process: categorical thinking (Allport, 1954; Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kurzban, Tooby, & Cosmides, 2001). Greater debate, however, has centered on the question of when exactly this mode of thought is activated (and implemented) by perceivers in their dealings with others (Bargh, 1999; Blair, 2002; Devine, 1989; Gilbert & Hixon, 1991; Kunda & Spencer, 2003; Macrae, Milne, & Bodenhausen, 1994). We revisit this important issue in the current investigation.

Category Activation: Sometimes or Always?

The contention that categorical thinking may be an inevitable component of social cognition was articulated most forcibly by Allport (1954) in his seminal writings on person perception.

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Guided by the principle of cognitive economy (see also Tajfel, 1969), Allport believed that mere exposure to a stimulus target was sufficient to trigger categorical thinking and the emergence of its associated behavioral products, notably stereotyped reactions. Such was the impact of Allport's writings that for almost four decades the notion that categorical thinking is an inescapable component of social-cognitive functioning went largely unchallenged; indeed, this assumption became the cornerstone of most influential theoretical treatments of person perception (Brewer, 1988; Devine, 1989; Fiske & Neuberg, 1990). However, is this an accurate characterization of the person perception process?

Backed by a revised conception of automaticity (Bargh, 1989, 1994; Logan, 1989), Gilbert and Hixon (1991) were the first researchers to challenge the assumption that category activation is an unavoidable aspect of person construal. Noting that all cognitive operations (including category activation) are dependent on critical triggering conditions (Bargh, 1989; Logan, 1989), Gilbert and Hixon (1991) showed that mere exposure to a stimulus target (e.g., an Asian woman) was not sufficient to prompt category (i.e., stereotype) activation; rather, this outcome was moderated by the availability of attentional resources. Since this important demonstration, a host of other factors have been shown to modulate category activation, including people's processing goals (Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; Pendry & Macrae, 1996), threats to self-esteem (Spencer, Fein, Wolfe, Fong, & Dunn, 1998), hormonal forces (Macrae, Alnwick, Milne, & Schloerscheidt, 2002), gaze direction (Macrae, Hood, Milne, Rowe, & Mason, 2002), visual attention (Macrae, Bodenhausen, Milne, & Calvini, 1999), prejudice level (Lepore & Brown, 1997; Locke, MacLeod, & Walker, 1994; Moskowitz, Gollwitzer, Wasel, & Schaal, 1999), mental imagery (Blair, Ma, & Lenton, 2001), and contextual variables (Wittenbrink, Judd, & Park, 2001).

Notwithstanding the weight of evidence suggesting that categorical thinking can seemingly be avoided, controversy persists regarding the precise cognitive status of this mode of thought. Although some researchers have contended that category activation occurs only under certain triggering conditions (Blair, 2002; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000), others have asserted that categorical thinking is an inescapable facet of

person perception (Bargh, 1999). As consensus has yet to be reached on how categorical thinking should be defined, triggered, and measured, it is perhaps unsurprising that the available empirical evidence can support ostensibly antagonistic viewpoints. Thus, rather than revisiting the issues that have prompted disagreement on this topic (Bargh, 1999; Blair, 2002; Macrae & Bodenhausen, 2000), our intention in the current investigation is to develop understanding of the dynamics of person categorization by considering this cognitive operation from a different (though related) theoretical perspective—that of face processing. The reasoning behind this shift in emphasis is straightforward. By integrating research in person perception with related themes in face processing (Bruce & Young, 1986, 1998), we hope that insights will be gained into the process and boundary conditions of person categorization.

The Face and Person Categorization

As a source of person knowledge, the face is unquestionably the most important stimulus in social perception (see Zebrowitz, 1997). Daily experience attests that even the briefest of glances at a face is sufficient to furnish information about the sex, age, emotional status, and gaze direction of its owner. Moreover, if the person is familiar, one can quickly decode his or her identity and gain access to associated material in semantic memory. The operational characteristics of the system that extracts person knowledge from facial cues has obvious implications for a range of core issues in social cognition (see Bruce & Young, 1986; Haxby, Hoffman, & Gobbini, 2000, 2002; Hoffman & Haxby, 2000), but most notably the question of when exactly perceivers categorize others. As Bruce and Young (1998) have observed:

We can readily categorize individual faces into different types of social group on the basis of their appearance. We are remarkably good at deciding whether faces are female or male, their race, and approximate age. Moreover, such categorizations have consequences for other attributions we make to people. (p. 89)

Notwithstanding this observation, however, work in face processing has rarely addressed the issue of how readily perceivers can categorize others (cf. Santos & Young, in press). Instead, researchers have focused their attention on person identification and the neural operations that subserve the extraction of person knowledge from facial cues (Haxby et al., 2000, 2002).

Guiding much of the aforementioned work has been Bruce and Young's (1986) influential model of face processing. According to this dual-route account of face perception, qualitatively different mental operations are hypothesized to support the processing of familiar and unfamiliar faces. Following the structural encoding of a face, one set of operations is believed to deal with the task of person identification, whereas a quite distinct processing stream abstracts information pertaining to the sex, age, emotional status, and gaze direction of an individual (see also Burton, Bruce, & Johnston, 1990). Operating in parallel, these processing routes furnish perceivers with the myriad products of person construal (i.e., invariant vs. dynamic aspects of person knowledge). To test the underlying tenets of the Bruce and Young (1986) model, researchers have sought to demonstrate the independence of person identification from other components of face processing. For the most part, they have been successful in this regard. Both

patient and neuroimaging studies suggest a dissociation between the operations that abstract generic information from faces and those that support face recognition (e.g., Calder, Young, Perrett, Etcoff, & Rowland, 1996; Haxby et al., 2000, 2002; Hoffman & Haxby, 2000; McCarthy, Puce, Gore, & Allison, 1997; Tranel, Damasio, & Damasio, 1988).

Even in behavioral investigations of face processing, research has been dominated by the question of how perceivers recognize familiar others (e.g., Bruce, Dench, & Burton, 1993; Bruce & Valentine, 1985; A. W. Ellis, Flude, Young, & Burton, 1996; A. W. Ellis, Young, Flude, & Hay, 1987). This problem, however, captures but a single aspect of person construal and its role in social-cognitive functioning. Recognizing familiar individuals is clearly a core problem for the face processing system, but so too is the task of gleanings social knowledge about unfamiliar targets (Blair, Judd, Sadler, & Jenkins, 2002; Livingston & Brewer, 2002; Maddox & Chase, 2004; Maddox & Gray, 2002). Indeed, this may be the most ubiquitous and challenging task confronting social perceivers (Bruce & Young, 1998). In their daily interactions with others, perceivers routinely encounter targets for which they have no prior knowledge or experience. It is in precisely this type of setting that categorical thinking may be most useful. By using readily available visual cues to assign strangers to meaningful social groups (e.g., sex, age), perceivers can accrue the cognitive benefits that derive from the implementation of categorical thinking. So when exactly do perceivers categorize others?

The Present Research

As they are triggered by readily available visual cues, sex, age, and race have been identified by researchers as the dominant categories in person perception (Brewer, 1988; Fiske, 1998; Fiske & Neuberg, 1990). In keeping with this tradition, the studies reported herein explored the conditions under which perceivers categorize others according to their sex. It is well established that men and women can be discriminated on the basis of either superficial textural cues (e.g., stubble) or single features of the face, usually the hairstyle (Brown & Perrett, 1993; Burton, Bruce, & Dench, 1993). What is not yet known, however, is whether mere exposure to a target is sufficient to trigger sex categorization. Although this claim appears with regularity in the literature (Allport, 1954; Bargh, 1999; Devine, 1989; Dovidio, Evans, & Tyler, 1986), supporting evidence is harder to find.

Part of the challenge confronting researchers in social cognition has been to identify methodologies that enable person categorization to be assessed in a viable manner. In an attempt to simplify this problem, investigators have used the term *category* to describe the totality of information (e.g., visual, declarative, behavioral) that is represented in memory about various social groups (e.g., women, dentists, blondes). Once these categorical representations are triggered (Smith, 1998), so too it is assumed are their associated contents, leading to the common use of content accessibility as an index of category activation (see Blair, 2002; Macrae & Bodenhausen, 2000). Adopting such an approach, numerous studies have measured the accessibility of stereotypic traits following the presentation of priming categorical stimuli, usually (though not always) verbal labels (e.g., Devine, 1989; Dovidio et al., 1986; Lepore & Brown, 1997; Macrae, Bodenhausen, & Milne, 1995; Macrae et al., 1997). Yet what of person categorization itself? Is it

possible to establish category activation more directly—that is, independently of the accessibility of stereotype contents?

The face processing literature may be useful not only for providing a cognitive and neural architecture for understanding person perception (Bruce & Young, 1986; Haxby et al., 2000) but also for furnishing experimental techniques through which person categorization (i.e., category activation) can be assessed. In this regard, a favored methodology in investigations of face processing has been to consider the effects of prior exposure to a stimulus on subsequent responses to that same item (e.g., Bruce & Valentine, 1985; for a review, see Bruce & Young, 1998). In a typical experiment, participants judge a set of faces along a particular dimension (e.g., familiarity). Then, in a subsequent test phase, they perform a second task (e.g., naming) on the previously encountered items, together with some new faces. The commonly reported finding is that participants respond with greater rapidity and accuracy to repeated faces than to new stimuli (i.e., repetition priming).

Two aspects of repetition priming are relevant to the current investigation. First, repetition priming demonstrates a degree of generalization that argues against a strictly perceptual basis for the phenomenon, in which facilitated responding is specific to the particular target–judgment combination that is assessed. Instead, repetition priming is known to generalize across different instantiations of the same stimulus (Bruce & Valentine, 1985; Clarke & Morton, 1983; Kempley & Morton, 1982; Murrell & Morton, 1974; Scarborough, Cortese, & Scarborough, 1977; Warren & Morton, 1982). What repetition priming reflects, therefore, is procedural efficiency (see Smith, 1989), such that initial processing of a target leaves a residual memory trace that facilitates responding when the target is reencountered. Second, repetition priming is assumed to reflect the operation of an automatic process. Because participants in these experiments are never asked explicitly to recall stimulus items from earlier processing episodes—indeed, repetition priming effects may even be independent of successful recognition (Mitchell & Brown, 1988)—speeded responding to reencountered items suggests that the earlier representation was reactivated automatically by the processing demands of the current task (see Logan, 1990).

In the face processing literature, repetition priming effects have usually been reported on judgments of familiarity. Participants are presented with photographs of celebrities or acquaintances, and their task is to report (as quickly as possible) whether each target is familiar. A coherent picture is emerging from these investigations. Participants are slower to recognize familiar faces that have not been encountered before than they are to recognize comparable items that have attracted an earlier judgment (Burton, Kelly, & Bruce, 1998; A. W. Ellis et al., 1996; Lewis & Ellis, 1999; Schweinberger, Pickering, Burton, & Kaufman, 2002). Less evident in the existing literature, however, are investigations of the outcomes that accompany the processing of unfamiliar faces (cf. H. D. Ellis, Jones, & Mosdell, 1997; Goshen-Gottstein & Ganel, 2000; Hay, 1999). Yet this is precisely the question that has intrigued social psychologists for half a century. When exposed to facial cues, do perceivers spontaneously categorize others (Allport, 1954)? In this respect, repetition priming may be an ideal marker of person categorization. If, as has been suggested, mere exposure to a target is sufficient to trigger person categorization (Allport, 1954; Bargh, 1999; Devine, 1989), then one would expect savings to emerge if an explicit categorization of the target was required at

a later date (i.e., compared with the categorization of a new target). Note that although asking participants to make explicit categorical judgments may appear to interfere with automatic (i.e., unintentional) categorization processes, it is still possible to assess the operation of automatic processes by their influence on intentional operations (Bargh, 1989). That is, if intentional judgments are faster for one group of participants than another, one can infer the implementation of specific cognitive operations (e.g., person categorization) during a prior processing episode.

Accordingly, using repetition priming as a cognitive marker of category activation, our first two experiments sought to develop contemporary understanding of the process and boundary conditions of person categorization. In so doing, the experiments had two objectives: (a) to investigate the effects of different encoding operations on person categorization and (b) to explore whether person categorization extends to applicable but task-irrelevant categorical dimensions. A third experiment, using a selective attention paradigm, was conducted to explore the perceptual underpinnings of categorical person construal.

Experiment 1: Encoding Operations and Person Categorization

So is mere exposure to a stimulus target sufficient to trigger person categorization? Using repetition priming as a marker of category activation, we considered this question in our first experiment. If, as has been suggested, people extract categorical knowledge (e.g., sex) from faces in an unconditionally automatic manner (Allport, 1954; Bargh, 1999), then one would expect the following effects to emerge. First, participants should be faster to respond to old (i.e., seen before) than new faces in a sex-categorization task (Goshen-Gottstein & Ganel, 2000). Second, this effect should be independent of the initial encoding operation that was undertaken on the faces (i.e., mere exposure should be sufficient to trigger person categorization). In contrast, if, as some have argued, the nature of a prior encoding experience is a critical determinant of person categorization (Blair, 2002; Macrae et al., 1997), then repetition priming (i.e., speeded responses to old faces) should only emerge under certain triggering conditions. To consider these competing possibilities, we used a standard repetition priming paradigm and varied the nature of participants' initial encoding experience (i.e., active vs. passive processing task). The question of interest was whether category activation (i.e., repetition priming) would emerge regardless of the processing context in which the faces were encountered.

Method

Participants and design. Twenty undergraduate students (13 women, 7 men) from Dartmouth College completed the experiment for additional course credit. The experiment had a 2 (encoding operation: active or passive) \times 2 (item status: repeated or new) mixed design with repeated measures on the second factor.

Stimulus materials and procedure. Participants arrived at the laboratory individually, were greeted by a female experimenter, and were seated facing the screen of an Apple Macintosh computer (iMac). At the beginning of the session, participants learned that the goal of the experiment was to assess how readily people can make judgments about faces. Participants were then randomly assigned to either the active- or passive-encoding condition for the initial phase of the experiment. In the active-encoding

condition, participants were informed that their task was to categorize, as quickly and accurately as possible, faces according to their sex. In the passive-encoding condition, participants were told simply to view the faces. During the encoding phase, 40 faces (20 women, 20 men) were presented to participants on a computer running PsyScope software (Cohen, MacWhinney, Flatt, & Provost, 1993). The faces were 40 graphics files depicting grayscale images of faces (full view, neutral pose). The files were standardized to 256×256 pixels and matched subjectively for luminance and contrast. On each trial, a fixation cross appeared for 500 ms, followed by a face for a further 1,000 ms. The intertrial interval was 1,000 ms. Participants in the active-encoding condition reported the sex of each face by means of a key press. Participants in the passive-encoding condition simply viewed the faces. Following the encoding phase, all participants completed a test phase in which they reported the sex of each of 80 faces: 40 women (20 old, 20 new) and 40 men (20 old, 20 new). Each face remained on the screen until participants made a response or 1,000 ms had elapsed. The computer recorded the accuracy and latency of each response. The order of presentation of the items was randomized, and the response key mappings (i.e., female–male or male–female) and the status of the items (i.e., repeated or new) were counterbalanced across participants. On completion of the task, participants were thanked for their assistance and the purpose of the experiment was explained.

Results and Discussion

Mean categorization latencies during the test phase served as the dependent measure of interest. Given the presence of outlying responses in the data set, response times that were more than 2.5 standard deviations from the mean were excluded from the analysis, as were trials on which errors were committed. This resulted in 2.2% of the data being excluded from the statistical analysis. The data were submitted to a 2 (encoding operation: active or passive) \times 2 (item status: repeated or new) mixed-model analysis of variance (ANOVA) with repeated measures on the second factor.

The analysis revealed a main effect of item status on participants' responses, $F(1, 18) = 7.77$, $p = .012$, such that responses were faster for repeated than new faces. This effect was modified, however, by a significant Encoding Operation \times Item Status interaction, $F(1, 18) = 5.85$, $p = .026$ (see Figure 1). Post hoc tests revealed that participants in the active-encoding condition were faster to categorize repeated than new faces ($M = 530$ ms vs. $M = 556$ ms, respectively), $t(18) = 3.68$, $p = .002$. This effect did not emerge, however, for participants in the passive-encoding condi-

tion ($M = 573$ ms vs. $M = 575$ ms, respectively), $t(18) = 0.26$, $p = .80$.

Replicating previous research, categorizing faces according to their sex facilitated subsequent responding to those faces compared with new stimuli (e.g., A. W. Ellis, Young, & Flude, 1990; Goshen-Gottstein & Ganel, 2000; Hay, 1999). Of relevance in the present investigation, however, this repetition priming effect failed to emerge among participants who simply registered the appearance of the faces during the encoding phase of the task. Thus, even when participants had no cognitive constraints or goals that conflicted with or distracted them from sex categorization (Gilbert & Hixon, 1991; Macrae et al., 1995, 1997), they did not appear to categorize the targets according to sex, at least as indexed by a response time measure of category activation. This suggests that person categorization may be contingent on the processing operation that is undertaken when faces are initially encoded (Macrae et al., 1997).

One possible challenge to the current interpretation (i.e., goal-dependent automaticity) may lie in the manner in which the faces were processed by participants in the two experimental conditions. Put simply, perhaps repetition priming failed to emerge under conditions of passive viewing because participants did not attend to the faces during the initial encoding task. To explore this possibility, we carried out a follow-up investigation in which an additional 20 participants completed the study phase of Experiment 1 (i.e., sex categorization vs. passive viewing). Then, rather than performing a sex-categorization task, all participants were given a surprise recognition test in which they had to report whether each of 80 faces (i.e., 40 repeated, 40 new) were old (i.e., seen before) or new (i.e., previously unseen). The results were revealing: Recognition accuracy (i.e., hits–false alarms) was equivalent in the two encoding conditions, $t(9) = 0.60$, $p = .56$. That is, participants in the passive-encoding condition were as likely as their counterparts in the active-encoding condition to recognize the faces from the study phase of the task ($M = .45$ vs. $M = .49$, respectively). This finding is important as it speaks against the possibility that participants in the passive-viewing condition did not attend to the faces.

Another possible interpretation of the current findings is that participants in the passive-viewing condition were attending to dimensions other than sex during the orienting task (hence, the equivalent levels of recognition memory as a function of encoding orientation). We think this unlikely, however, as care was taken to minimize differences between the female and male faces in terms of dimensions that would support alternative categorizations (e.g., age, emotional expression, head posture). Finally, it is also possible that participants in both conditions categorized the faces by sex, but that repetition priming emerged only among participants in the active-encoding condition because these participants had that categorization strengthened by providing explicit sex categorizations in the initial phase of the task. Although we have no specific data in the current experiment that speak to this issue, evidence from the face processing literature argues against such a possibility. Repetition priming has been shown to generalize across some domains (e.g., from judgments of emotional expression to judgments of familiarity; Burton et al., 1998; A. W. Ellis et al., 1990) and to emerge even when no explicit judgment is made during priming (Bruce, Carson, Burton, & Kelly, 1998), suggest-

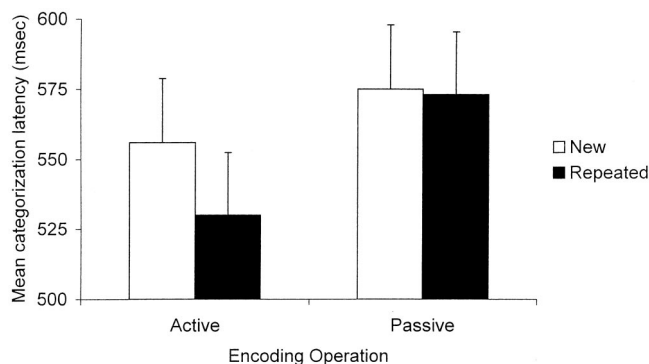


Figure 1. Mean categorization latency (in ms) as a function of encoding operation and item status (Experiment 1).

ing that the effect cannot be attributed to strengthening of a particular (or, indeed, any) explicit response.

Experiment 2: Competing Social Categories

The results of Experiment 1 demonstrate a procedural savings in reconstruing previously encountered individuals, at least insofar as the target judgments across the two phases of the study are identical. However, what about other aspects of person construal? In particular, on first inspection, how much categorical knowledge do perceivers extract from faces? One of the challenging features of person perception is that people can readily be construed on the basis of multiple categorical representations (Bodenhausen & Macrae, 1998; Macrae & Bodenhausen, 2000). For example, a person in the shopping mall can be categorized as an Asian, a woman, or a senior citizen (Fiske, 1998). One of the vexing problems in social cognition has been to determine the cognitive status of a target's applicable but unselected social categories during the person perception process (see Bodenhausen & Macrae, 1998). Are these competing representations also triggered, passively ignored, or actively inhibited by perceivers as they strive to understand others?

In the few studies that have investigated this problem to date, researchers have reported the inhibition of competing categorical knowledge structures during the category selection process (Macrae et al., 1995; Sinclair & Kunda, 1999, 2000). It is worth noting that, in each of these cases, inhibition was established through the impaired accessibility of stereotype contents. If person categorization and stereotyping are potentially dissociable (Brewer, 1988), however, in no sense may stereotype inhibition be indicative of category inhibition. Indeed, the inhibition of stereotype contents surely demands that the relevant social category be activated. Put simply, to inhibit the female stereotype, one must first establish that the target is a woman (Macrae et al., 1995).

With these observations in mind, an interesting question emerges. When perceivers are instructed to construe targets in a particular way (e.g., in terms of their sex), do they also extract information pertaining to an applicable but task-irrelevant categorical dimension (e.g., age)? That is, are multiple construals extracted from available facial cues or do perceivers only compute the categorical judgment of interest (Macrae et al., 1995; Sinclair & Kunda, 1999, 2000)? Work by Stroessner (1996) and Zárate and Smith (1990) suggests that perceivers are attentive to both sex and race, such that men are categorized more quickly by race than by sex, and women are categorized more quickly by sex than by race. However, does this necessarily imply that these targets were categorized initially according to multiple dimensions? We considered this important issue in our second experiment. In a modified repetition priming paradigm, participants were requested to categorize faces either on the basis of their sex or age during the initial study phase of the task. Then, in the subsequent test phase, participants made either sex or age judgments on both repeated and new faces. The value of this design was that it enabled us to establish whether repetition priming extends to applicable but task-irrelevant aspects of a person's identity.

Method

Participants and design. Sixty undergraduate students (43 women, 17 men) from Dartmouth College completed the experiment for additional

course credit. The experiment had a 2 (encoding judgment: sex or age) \times 2 (test judgment: matching or mismatching) \times 2 (item status: repeated or new) mixed design with repeated measures on the third factor.

Stimulus materials and procedure. The experiment was a modified version of Experiment 1. At encoding, all participants were required to report, by means of a key press, either the sex (i.e., female or male) or age (i.e., young or elderly) of each of 40 faces (10 young women, 10 elderly women, 10 young men, 10 elderly men). The faces were 40 graphics files depicting grayscale images of faces (full view, neutral pose). The young faces depicted individuals between the ages of 20 and 30 years; the elderly individuals were all over 60 years of age. The files were standardized to 256 \times 256 pixels and matched for luminance and contrast. At test, participants responded to a total of 80 faces (40 repeated, 40 new; 20 young women, 20 elderly women, 20 young men, 20 elderly men). The judgment required at test either repeated the earlier categorization (i.e., sex–sex, age–age) or called for participants to classify the targets along the other applicable dimension (i.e., sex–age, age–sex). In this way, it was possible to establish whether repetition priming extends to previously nonjudged social categories. The order of presentation of items was randomized, and the response key mappings (i.e., female–male, male–female, elderly–young, or young–elderly) and status of the items (repeated or new) were counterbalanced across participants. On completion of the task, participants were thanked for their assistance and the purpose of the experiment was explained.

Results and Discussion

The data were trimmed using the procedures outlined in Experiment 1. Including trials on which errors were committed, 3.0% of the data were excluded from the statistical analysis. The data were submitted to a 2 (test judgment: sex or age) \times 2 (test-encoding match: matched or mismatched) \times 2 (item status: repeated or new) mixed-model ANOVA with repeated measures on the third factor.

The analysis revealed a significant Test-Encoding Match \times Item Status interaction, $F(1, 56) = 4.84, p < .032$ (see Figure 2). Further inspection of the interaction revealed that participants who made identical judgments at study and test (i.e., sex–sex, age–age) were faster to categorize repeated than new faces, $t(56) = 2.73, p = .009$ ($M = 617$ ms vs. $M = 634$ ms, respectively). In contrast, participants who made different judgments across the two phases of the experiment (i.e., sex–age, age–sex) showed no evidence of repetition priming, $t(56) = 0.32, p = .75$ ($M = 620$ ms vs. $M = 618$ ms, respectively). Consistent with previous research demonstrating that stereotype activation also tends to be confined to one

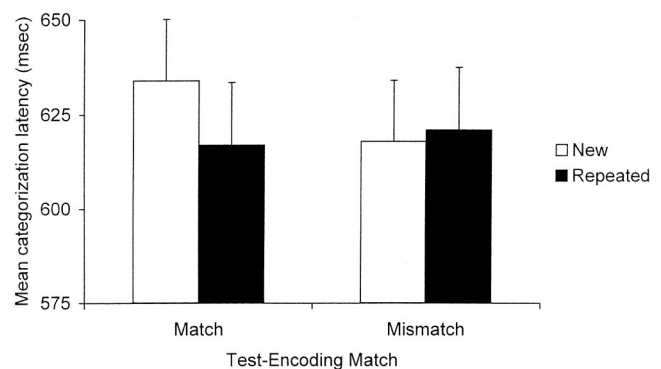


Figure 2. Mean categorization latency (in ms) as a function of test-encoding match and item status (Experiment 2).

aspect of a target's identity (e.g., Macrae et al., 1995; Moskowitz et al., 1999; Sinclair & Kunda, 1999),¹ these results confirm that repetition priming does not extend to applicable but task-irrelevant aspects of a target's identity.

Does this mean that participants are completely insensitive to a target's competing identities during the process of person categorization (Bodenhausen & Macrae, 1998)? Interestingly, the analysis also revealed an unexpected Test Judgment \times Test-Encoding Match interaction, $F(1, 56) = 9.68, p = .003$, such that participants who engaged in sex categorization were faster to respond if, at encoding, they had engaged in age, rather than sex, categorization, $t(56) = 1.88, p = .07$ ($M = 603$ ms vs. $M = 679$ ms, respectively). Thus, although participants did not categorize targets according to both sex and age (i.e., did not demonstrate cross-dimension repetition priming), they did appear—at least when judging target sex—to be sensitive to goal-irrelevant categorical dimensions. Accordingly, we explored this possibility in greater detail in our third experiment.

Experiment 3: Processing Categorical Features

The results of Experiment 2 suggest that, at least at the conceptual level of appraisal, perceivers categorize unfamiliar faces on the basis of a single focal dimension (Macrae et al., 1995; Sinclair & Kunda, 1999). However, does this mean that perceivers do not attend at all to a target's competing identities during the person perception process? For example, when classifying a senior citizen by sex, are perceivers completely insensitive to the age of the person? This seems unlikely given previous work on the perceptual dynamics of face processing (Bruce & Young, 1986, 1998). Indeed, in Experiment 2, ostensibly irrelevant stimulus features did affect the ease with which participants were able to render sex (but not age) categorization decisions. In Experiment 3, we sought to investigate the relationship between perceptual processing and categorical construal—in particular the asymmetry between age and sex categorization—by examining whether perceivers are sensitive to differences in the extent to which perceptual features support categorical judgments.

Taking a lead from extant work on this topic (e.g., Le Gal & Bruce, 2002; Schweinberger, Burton, & Kelly, 1999; Schweinberger & Soukup, 1998), we adapted Garner's (1974, 1976) selective attention paradigm to investigate the perceptual effects of competing categorical memberships (i.e., sex and age) on person construal. The utility of the Garner paradigm is that it examines people's ability to selectively focus on a single relevant dimension of a stimulus (e.g., a person's sex), while ignoring other irrelevant dimensions (e.g., a person's age). Failures of selective attention occur when people cannot avoid noticing changes on the irrelevant dimension while trying to attend to changes on the dimension of interest. Although many studies point to the conceptual independence of processing routes in face recognition (Bruce & Young, 1998), studies using the Garner paradigm have documented evidence of perceptual interdependence among the features that support this processing (Le Gal & Bruce, 2002; Schweinberger et al., 1999; Schweinberger & Soukup, 1998).

In its most basic form, the Garner task has at least two critical conditions: *baseline* and *orthogonal*. In the baseline condition, participants are asked to classify values on the relevant dimension of a stimulus (e.g., target sex), while values on the irrelevant

dimension are held constant (e.g., target age). In the orthogonal (or filtering) condition, participants again classify items on the relevant dimension (i.e., sex), but this time values on the irrelevant dimension of the stimulus also change on a trial by trial basis (i.e., the to-be-categorized targets are randomly intermixed young and elderly persons). The difference in reaction times between orthogonal and baseline trials is termed *Garner interference* and is an index of the efficacy of selective attention. In particular, slower responding in the orthogonal versus baseline condition suggests that participants are unable to ignore judgment-irrelevant aspects of a stimulus (e.g., a target's competing identity).

Applying the logic of the Garner paradigm, in the current study we investigated people's ability to ignore competing categorical information when focusing on a single aspect of a target's identity (e.g., to ignore age while attending to sex or vice versa). In so doing, we sought to establish whether participants could attend selectively to specific categorical dimensions of a person while ignoring other competing identities. We anticipated that perceptual interference (orthogonal > baseline) would emerge in the conditions that demonstrated processing asymmetries in Experiment 2. In particular, whereas age-related information was expected to impede sex categorization, sex-related information was not expected to disrupt age categorization. In other words, we anticipated that participants would be unable to ignore age-related information when judging people's sex, but they would be resistant to sex-related information when judging their age. If observed, such a pattern of effects would underscore the importance of perceptual operations in categorical construal, as perceptual interdependence (vs. independence) among stimulus dimensions implies greater difficulty in attending exclusively to relevant facial features and computing specific categorical judgments.

Method

Participants and design. Thirty-one undergraduate students (16 women, 15 men) from Dartmouth College completed the experiment for additional course credit. The experiment had a 2 (encoding judgment: sex or age) \times 2 (target sex: female or male) \times 2 (target age: young or

¹ These studies (e.g., Macrae et al., 1995; Moskowitz et al., 1999; Sinclair & Kunda, 1999) reveal that focusing on one aspect of a person's identity not only facilitates the activation of stereotypes relevant to that identity, but also inhibits the activation of stereotypes relevant to other dimensions of identity. Macrae et al. (1995), for example, found that participants who were primed to focus on a Chinese woman's sex demonstrated increased accessibility to the female stereotype but decreased accessibility to the Asian stereotype (see also Sinclair & Kunda, 1999). This pattern may seem to be at odds with the current finding that activation of one categorization (e.g., sex) was not accompanied by the inhibition of another applicable construal (i.e., age), suggesting that stereotype inhibition may have proceeded in the absence of category activation. This interpretation of the results is implausible, however. By definition, a category representation must be activated prior to the inhibition of its contents (Bodenhausen & Macrae, 1998). Thus, if Macrae et al. had assessed category activation directly (as in the current research), one suspects that although the contents of the Asian stereotype were inhibited, the target would nonetheless have been categorized as Asian, a plausible outcome given the extended duration of participants' exposure to the target: Because the priming episode lasted several seconds, it is entirely plausible that the target was categorized as both female and Asian, albeit at different points in time (see Kunda, Davies, Adams, & Spencer, 2002).

elderly) \times 2 (block type: baseline or orthogonal) mixed design with encoding judgment as a between-participants factor and repeated measures on the remaining factors.

Stimulus materials and procedure. The experiment was a modified version of Garner's (1974, 1976) selective attention paradigm. All materials were presented and responses collected using SuperLab Pro software for PCs (Haxby, Parasuraman, Lalonde, & Abboud, 1993). As in Experiments 1 and 2, participants learned that the goal of the experiment was to assess how readily people can make judgments about faces. Participants were randomly assigned to report, by means of a key press, either the sex (female or male) or age (young or elderly) of a target. Both the sex and age categorization tasks comprised two conditions, each of which involved two blocks of trials. The first two blocks comprised the baseline condition; the latter two blocks comprised the orthogonal condition. For sex categorization, the baseline condition included one block of young female and young male faces and one block of elderly female and elderly male faces (i.e., age held constant in each block). For age categorization, the baseline condition included one block of young female and elderly female faces and one block of young male and elderly male faces (i.e., sex held constant in each block). For both categorization tasks, the orthogonal condition contained two blocks of young and old, female and male faces.

The faces were graphics files depicting grayscale images of faces (full view, neutral pose). There were a total of 80 faces (20 young women, 20 elderly women, 20 young men, 20 elderly men). The young faces depicted individuals between the ages of 20 and 30 years; the elderly individuals were all over 60 years of age. The files were standardized to 256×256 pixels and matched for luminance and contrast. Each trial started with the presentation of a fixation cross, which was replaced after 1,500 ms by a stimulus face that remained on the screen until a key was pressed, whereupon it was immediately replaced by the next fixation cross. The order of presentation of items within blocks was randomized, and the response key mappings (i.e., female–male or male–female, young–elderly or elderly–young) and blocks of stimuli within condition (i.e., within the baseline and orthogonal blocks) were counterbalanced across participants. On completion of the task, participants were thanked for their assistance and the purpose of the experiment was explained.

Results and Discussion

The data were trimmed using the procedures outlined in Experiment 1. Including trials on which errors were committed, 5.6% of the data were excluded from the statistical analysis. Following previous experiments using the Garner paradigm (e.g., Le Gal & Bruce, 2002), the data were first submitted to a 2 (encoding judgment: sex or age) \times 2 (block type: baseline or orthogonal) mixed-model ANOVA with repeated measures on the second factor.

The analysis yielded a main effect of encoding judgment, $F(1, 29) = 20.90, p < .001$, indicating that participants were faster to judge targets' age than sex ($M = 540$ ms vs. $M = 657$ ms, respectively). The analysis also yielded a main effect of block type, $F(1, 29) = 14.59, p < .001$, indicating that participants responded more quickly during the baseline than orthogonal block ($M = 582$ ms vs. $M = 615$ ms, respectively). These main effects were subsumed however within an Encoding Judgment \times Block Type interaction, $F(1, 29) = 4.16, p = .05$. Interaction means are depicted in Figure 3. The pattern of means demonstrates that the main effect of block type was reliable only for participants who engaged in sex categorization. Whereas participants in the sex-categorization task were slower to respond to targets in the orthogonal than baseline block, $t(29) = 4.07, p = .0003$ ($M = 683$ ms vs. $M = 632$ ms, respectively), participants in the age-categorization

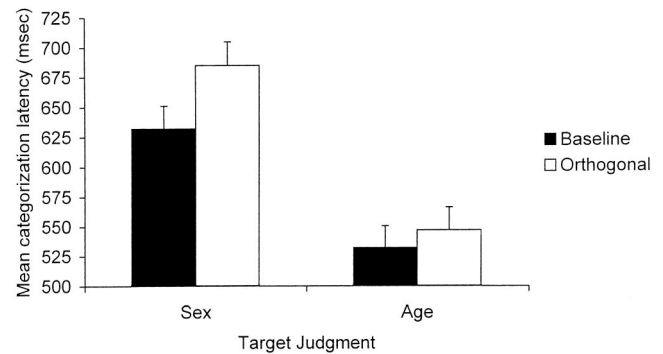


Figure 3. Mean categorization latency (in ms) as a function of target judgment and block type (Experiment 3).

task responded equally quickly to targets in both conditions, $t(29) = 1.24, p = .23$ ($M = 547$ ms vs. $M = 532$ ms, respectively). Thus, whereas sex-related information did not impede age categorization, age-related information impaired participants' ability to categorize faces according to sex.

To examine the findings in greater detail, we submitted the sex categorization data to a 2 (block type: baseline or orthogonal) \times 2 (target sex: female or male) \times 2 (target age: young or elderly) within-participants ANOVA.² Confirming the whole-sample analysis, there was a reliable main effect of block type, $F(1, 14) = 5.69, p = .03$, revealing that participants responded more quickly during the baseline than orthogonal block (respectively M s: 673 ms vs. 725 ms). The analysis also yielded a main effect of target sex, $F(1, 14) = 5.12, p = .04$, indicating that participants were faster to make sex-categorization judgments for female than male faces ($M = 683$ ms vs. $M = 715$ ms, respectively), as well as a main effect of target age, $F(1, 14) = 27.46, p < .001$, such that participants were faster to make sex-categorization judgments for young than elderly faces ($M = 649$ ms vs. $M = 750$ ms, respectively). These main effects were qualified, however, by a reliable Target Sex \times Target Age interaction, $F(1, 14) = 11.50, p = .004$ (see Figure 4). Post hoc tests indicated that participants were faster to categorize the sex of younger than older targets, for both female targets, $t(14) = 6.74, p < .0001$ ($M = 616$ ms vs. $M = 751$ ms, respectively, for younger and older faces) and male targets, $t(15) = 3.35, p = .0048$ ($M = 682$ ms vs. $M = 749$ ms, respectively, for younger and older faces). Interestingly, participants were also faster to categorize the sex of young female faces than young male faces, $t(15) = 3.30, p = .005$ ($M = 616$ ms vs. $M = 682$ ms, respectively).

Thus, participants appeared to be able to process the age of target faces independently of the sex of those faces, but they were unable to process the sex of target faces without attending to the age of the targets. This particular pattern of age dependence during sex categorization may reflect the fact that facial changes during aging tend to minimize apparent sex differences between female and male faces, leading sex categorization to be more difficult for

² Conducting the full factorial analysis (i.e., including the data from the age-categorization task) did not change the interpretation of the data: No main effect for or interaction with block type emerged for the age-categorization analysis.

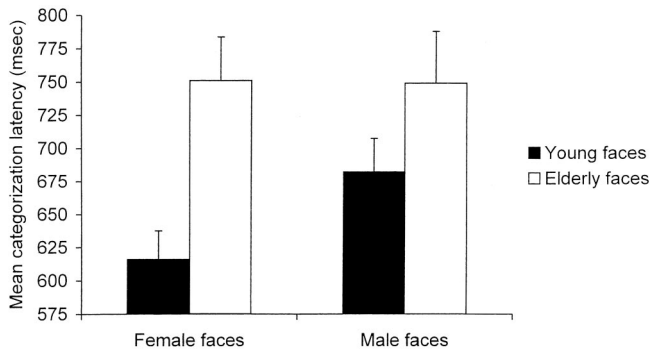


Figure 4. Mean sex categorization latency (in ms) as a function of target sex and target age (Experiment 3).

older targets. Age categorization, in contrast, appears to be insensitive to sex-relevant facial cues (see Berry & McArthur, 1986).

General Discussion

Mere exposure to social targets does not appear to trigger person categorization (Experiment 1). When this processing outcome does occur, however, person categorization is restricted to the categorical dimension of interest (Experiment 2), even when features relevant to alternative categorizations have seemingly been processed (Experiment 3). Taken together, these findings contribute to a picture of person construal as complex but efficient. Perceivers are able to attend to features that support multiple categorizations, yet they show little evidence of having extracted the conceptual meaning of these nonrelevant dimensions.

These findings enrich current understanding of person construal in a number of important ways. To date, much of the available research on person perception has centered on the issue of how and when stereotypical thinking shapes people's interactions with others (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003). This research has yielded a wealth of noteworthy findings regarding the conditions under which category-based beliefs guide people's behavior (see Quinn, Macrae, & Bodenhausen, 2003). Nevertheless, this literature has neglected critical components of the person perception process, components that set the stage for subsequent information processing and response generation. Before the contents of category-based representations can be manipulated in memory (i.e., activated or inhibited), a person must first be assigned to an applicable social category. As a critical precursor of stereotypical thinking, person categorization is therefore worthy of empirical attention. Aside from a handful of studies that have considered the relative ease with which specific categorical judgments can be made (e.g., Brewer, Dull, & Lui, 1981; Stroessner, 1996; Zárate & Smith, 1990), relatively little is known about the actual process of person categorization (e.g., operational characteristics, boundary conditions). Acknowledging this fact, the research reported herein investigated the emergence and boundary conditions of this processing operation.³

Asymmetries in Person Categorization

A provocative finding that emerged in the current investigation was the apparent asymmetry in the processing of different cate-

gorical dimensions of a target. Whereas the efficiency of sex categorization depended on the age of a target, age categorization was not impacted by target sex. This finding speaks to the importance of the relationship between perceptual processing and social categorization. In particular, it suggests that categorical construal is not insensitive to ostensibly irrelevant perceptual features of a target but that sensitivity to these features depends on the extent to which they overlap with judgment-relevant aspects of a target. Consider, for example, the features that are known to denote sex and age. Brown and Perrett (1993) have established that the most important features for sex categorization (excluding hairstyle) are, in order of importance, the jaw line, the eyes and eyebrows, the chin, and the nose. Age is also denoted by a number of features, notably the color and quantity of hair, skin elasticity or texture, the distribution of adipose tissue along the jaw line, the length of the nose and ears, the thickness and texture of eyebrows, and the apparent size of eyes (see Berry & McArthur, 1986). Thus, the facial features that denote sex are also among the features that change with age. As a result, when attending to sex-relevant features, perceivers are also attending inadvertently to age-relevant information, prompting interference in the ease with which they can make sex categorizations (but not prompting age categorization per se).

Why, then, was age categorization not impeded by sex-relevant information? Quite simply, the features that support age categorization may differ little or not at all as a function of a target's sex. Although the craniofacial changes that accompany aging have been documented, little is known about which of these cues are actually used by perceivers when computing the age of a target (with the exception of the role of cranial and facial hair when estimating the age of men, see George & Hole, 1995, 1998). Intuition suggests, however, that skin texture (i.e., the presence or absence of wrinkles) may serve as the primary basis for rudimentary age categorization. Thus, although there is some overlap in the features that differentiate women from men and the elderly from the young, age categorization probably does not rely on any of these features and thus proceeds without disruption from sex-specifying facial information. This observation may have important implications for the course of categorical thinking across the life span. Given the apparent difficulty of determining the sex of elderly targets, age categorization may be the dominant construal in later life.

Category Automaticity—Revisited

Following a number of recent studies in the social-cognitive literature (see Blair, 2002), the present findings challenge the

³ Maddox and colleagues have recently used the category confusion paradigm (Taylor, Fiske, Etcoff, & Ruderman, 1978) to show that skin tone is used as a basis for social categorization (Maddox & Gray, 2002), particularly when race is relevant in the judgment context (Maddox & Chase, 2004). Because participants in these studies were never asked explicitly to render categorical judgments, these results were interpreted as evidence that skin-tone-based racial categorization occurs spontaneously (cf. Kurzban et al., 2001). Nonetheless, the precise locus of categorization remains unspecified in the category confusion paradigm: Because categorization is assessed in this paradigm through explicit memory, it is unclear whether apparent categorization effects emerged at encoding or at retrieval.

widely held assumption that mere exposure to a stimulus target is sufficient to trigger person categorization (Allport, 1954; Bargh, 1999; Devine, 1989; Dovidio et al., 1986). In Experiment 1, passive registration of faces failed to elicit repetition priming (i.e., category activation), although it did appear to support person recognition to the same degree as active categorization. Even more telling, however, goal-irrelevant categorization did not emerge even when attention was directed toward category-relevant perceptual features. Although perceivers who engaged in sex categorization showed attentional sensitivity to age-relevant facial characteristics (Experiment 3), they did not categorize target individuals simultaneously according to both sex and age (Experiment 2). These findings then fail to corroborate the viewpoint that category activation is an unconditionally automatic mental process (see Bargh, 1999).

To be fair, however, this conclusion is based on the results of only a single chronometric measure of category activation. Although response latencies are the favored exploratory tool in social-cognitive investigations of person construal (Blair, 2002; Macrae & Bodenhausen, 2000), these measures are not without their limitations. For example, one might question the sensitivity of response times to the activation of knowledge structures in memory. It is possible that even passive viewing of faces was sufficient to trigger person categorization; response times may simply have been too insensitive to detect the resulting activation. Acknowledging this possibility, researchers have recently turned to electrophysiological measures of brain activity, such as event-related potentials (ERP) and magnetoencephalography to investigate the neural components of person construal.

These neurophysiological investigations have suggested that early visual processing is attentive to differences in the sex, age, and race of social targets. Mouchetant-Rostaing and colleagues (Mouchetant-Rostaing & Giard, 2003; Mouchetant-Rostaing, Giard, Bentin, Aguera, & Pernier, 2000), for example, have demonstrated that sex and age are processed independently of participants' encoding goal, with evidence of processing pertaining to these dimensions emerging approximately 145–185 ms poststimulus onset. Similarly, Ito and Urland (2003) have provided evidence for the early visual processing of task-irrelevant categorical information. Across two experiments, they showed that the N100 component of the ERP response was sensitive to race differences even when participants' task was to categorize faces according to sex and that the N200 and P200 components were sensitive to both sex and race differences regardless of the categorical judgment that was required. On the basis of these findings, Ito and Urland (2003) have suggested that early attentional effects (albeit in the context of an active-processing task) provide evidence for the automaticity of person categorization by race.

Nevertheless, do these neural events really index person categorization? Or might they simply reflect the perceptual extraction of featural information from faces? That is, do they reflect the assignment of target faces to meaningful social categories or simply perceptual differentiation among the target faces? In support of the former viewpoint, Liu, Harris, and Kanwisher (2002) have reported a face-selective cortical response (M100) occurring 100 ms poststimulus onset that correlates with later successful categorization of an item (i.e., face vs. house). Importantly, however, Liu et al. also found that the M100 showed a stronger response to stimuli depicting face parts than entire facial config-

urations, thereby suggesting that this neural event indexes feature extraction rather than classification of the target face into some semantically meaningful category. A similar conclusion was offered by Mouchetant-Rostaing and Giard (2003) following their demonstration that neither sex nor age processing influence the N170 ERP component associated with the global structural encoding of faces (e.g., Bentin, Allison, Puce, Perez, & McCarthy, 1996; Eimer, 2000). Together, this body of evidence suggests that early, task-independent visual processes extract featural information from faces, information that undoubtedly serves as the basis for—but should not be seen as interchangeable with—subsequent target categorization (VanRullen & Thorpe, 2001).

So what insights, if any, can be gleaned from work of this kind? Our viewpoint is that a complete understanding of person construal can only be achieved if neuroscience research is integrated with social-cognitive investigations into this topic. Although brain imaging techniques provide valuable information about the temporal characteristics (i.e., ERP research) and neural substrates (functional magnetic resonance imaging research) of person categorization (Mason & Macrae, 2004), they say little about the information that people routinely use to compute category membership, the extent to which social categorization is modulated by processing goals and individual differences, and the degree to which category-based construal guides people's impressions and memories. Social cognition research, however, speaks directly to these fundamentally important questions. Only by using a range of complementary techniques and approaches, we suspect, will it be possible to understand the complexities of person categorization. In this respect, social-cognitive research is likely to play a pivotal and influential role in future work on this topic.

Models of Person Construal

In attempting to delineate the cognitive dynamics of person construal, one can glean interesting insights by integrating findings from the relevant literatures on face processing and person perception. At first blush, it is perhaps surprising that researchers have not yet considered issues that lie at the intersection of these seemingly related domains of inquiry. On closer inspection, however, it becomes apparent why these literatures have developed quite independently. Although ostensibly dealing with the same psychological problem (i.e., how people construe others), face processors and social cognition researchers have directed their attention to different aspects of the person perception process. Whereas the dominant pursuit in face processing has been to establish how people recognize familiar others (see Bruce & Young, 1986), social-cognitive research has focused instead on the issues of when, why, and for whom categorical thinking guides the construal of unknown targets (Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000).

Reflecting the unique aspects of the problems confronting perceivers as they strive to make sense of others, distinct theoretical models have emerged to account for the effects arising at different stages of the person perception process. In the face processing literature, emphasis has fallen on the cognitive and neural operations that support the extraction of person knowledge (e.g., sex, emotion, gaze direction, identity) from available facial cues (Bruce & Young, 1986; Farah, Wilson, Drain, & Tanaka, 1998; Haxby et al., 2000, 2002; Kanwisher, 2000; Tarr & Gauthier, 2000). A rich

variety of measuring instruments and subject populations has been used to inform current understanding of this issue. From brain imaging explorations to investigations of neuropsychological patients, an impressive literature has charted the structural and functional components of person recognition (see Bruce & Young, 1998). In person perception research, in contrast, theoretical models have tended to delineate the memorial operations (i.e., category-based processing vs. individuation) that support people's evaluations of others. This work, too, has yielded an expansive literature (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003).

Of course, to fully understand the vagaries of person construal, it is necessary to consider how both early perceptual processes and downstream memorial operations shape people's understanding of others. One way in which this can be achieved is through an integration of the theoretical and empirical issues that lie at the intersection of social cognition and face processing (Brewer, 1988; Bruce & Young, 1986; Fiske & Neuberg, 1990). Prior to the activation of knowledge structures in long-term memory, perceivers must first extract applicable person knowledge from available stimulus cues. For the most part, this social information is conveyed by the face, such that even the briefest of glances at a face is sufficient to furnish a wealth of knowledge about its owner. Although categorical information (e.g., sex, age) is clearly one class of information that is extracted from the face during the early stages of perceptual processing (Bruce & Young, 1986, 1998; Haxby et al., 2002), so too are other aspects of person knowledge (e.g., emotion, gaze direction, identity). Given that the products of perceptual operations set the stage for subsequent target-related processing (e.g., memory retrieval, response generation), investigations of person perception would do well to consider the multiple aspects of person knowledge that can be gleaned from facial cues (Bruce & Young, 1986, 1998; Haxby et al., 2000, 2002) in addition to the other forms of information that may become activated and applied during the person construal process.

Indeed, examining differences between face processing and more traditional social-cognitive phenomena can be instructive with regard to the dynamics of person construal. The current results, for example, suggest a relatively high degree of specificity in the procedural efficiency associated with social categorization. This is at odds with previous work. In a series of studies designed to examine the generality of social (trait) inference processes, Smith and colleagues examined repetition priming in terms of process (trait inference vs. semantic categorization; Smith & Branscombe, 1987), target judgment (particular traits; Smith, Branscombe, & Bormann, 1988), and stimulus content (particular behaviors; Smith, 1989; Smith & Branscombe, 1987, 1988; Smith et al., 1988). On the basis of evidence that repeating the target judgment and repeating the stimulus content led to equivalent speedups in responding, Smith et al. (1988) argued that the procedural efficiency associated with social inference was driven by general processing demands. In the current investigation, however, categorization did not generalize to nonfocal dimensions.

It is worth noting, however, that whereas Smith and colleagues examined higher order inferences and relied on verbal stimulus materials, we examined simple categorical judgments and used facial stimuli. Considering the stimuli and tasks in combination, we suggest that the current investigation differs from the work of Smith and colleagues in terms of the underlying component pro-

cesses necessary to render the desired judgments. More specifically, categorical judgments can be made solely on the basis of facial features (i.e., perceptual information), whereas drawing trait inferences from verbal materials demands extensive semantic processing. This elaborative semantic processing may underlie the greater generality observed in the trait inference research than in the present inquiry. In support of this reasoning, evidence from the face recognition literature also suggests generality when more complex construals are required. That is, cross-domain repetition priming effects do emerge—but only when the judgment undertaken at test is related to the target's identity and cannot be derived from specific facial features (e.g., Burton et al., 1998; A. W. Ellis et al., 1990). What this suggests is that it is only by examining the similarities and differences between various social-cognitive processes and their outcomes that a complete understanding of social cognition can be achieved.

Conclusions

To negotiate the intricacies of everyday interaction, perceivers require information-processing routines that simplify the complexities of the person perception process. The mind's evolved solution to this problem would appear to be to assign individuals to meaningful (and distinct) social groups through a process of person categorization (Kurzban et al., 2001). In the current inquiry, we have attempted to inform current understanding of person categorization by charting the emergence and boundary conditions of this effect. Clearly additional research is required on this pivotal social-cognitive topic. For example, what is the relationship between person categorization and stereotyping (i.e., are these processes functionally dissociable)? Are categorization and stereotyping supported by distinct neural operations (i.e., are these processes anatomically dissociable)? How early in the visual-processing stream does person categorization occur? Answers to these questions will not only illuminate otherwise puzzling aspects of person perception, but they will also integrate work in social psychology with broader intellectual themes in the cognitive neurosciences.

References

- Allport, G. W. (1954). *The nature of prejudice*. Cambridge, MA: Addison Wesley.
- Bargh, J. A. (1989). Conditional automaticity: Varieties of automatic influence in social perception and cognition. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 3–51). New York: Guilford Press.
- Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition: Basic processes* (2nd ed., Vol. 1, pp. 1–40). New York: Erlbaum.
- Bargh, J. A. (1999). The cognitive monster: The case against the controllability of automatic stereotype effects. In S. Chaiken & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 361–382). New York: Guilford Press.
- Bentin, S., Allison, T., Puce, A., Perez, A., & McCarthy, G. (1996). Electrophysiological studies of face perception in humans. *Journal of Cognitive Neuroscience*, 8, 551–565.
- Berry, D. S., & McArthur, L. Z. (1986). Perceiving character in faces: The impact of age-related craniofacial changes on social perception. *Psychological Bulletin*, 100, 3–18.

- Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality and Social Psychology Review*, 6, 242–261.
- Blair, I. V., Judd, C. M., Sadler, M. S., & Jenkins, C. (2002). The role of Afrocentric features in person perception: Judging by features and categories. *Journal of Personality and Social Psychology*, 83, 5–25.
- Blair, I. V., Ma, J. E., & Lenton, A. P. (2001). Imagining stereotypes away: The moderation of implicit stereotypes through mental imagery. *Journal of Personality and Social Psychology*, 81, 828–841.
- Bodenhausen, G. V., & Macrae, C. N. (1998). Stereotype activation and inhibition. In R. S. Wyer Jr. (Ed.), *Advances in social cognition* (Vol. 11, pp. 1–52). Mahwah, NJ: Erlbaum.
- Brewer, M. B. (1988). A dual-process model of impression formation. In R. S. Wyer Jr., & T. K. Srull (Eds.), *Advances in social cognition* (Vol. 1, pp. 1–36). Hillsdale, NJ: Erlbaum.
- Brewer, M. B., Dull, V., & Lui, L. (1981). Perceptions of the elderly: Stereotypes as prototypes. *Journal of Personality and Social Psychology*, 41, 656–670.
- Brown, E., & Perrett, D. I. (1993). What gives a face its gender? *Perception*, 22, 829–840.
- Bruce, V., Carson, D., Burton, A. M., & Kelly, S. (1998). Prime time advertisements: Repetition priming from faces seen on subject recruitment posters. *Memory & Cognition*, 26, 502–515.
- Bruce, V., Dench, N., & Burton, M. (1993). Effects of distinctiveness, repetition and semantic priming on the recognition of face familiarity. *Canadian Journal of Experimental Psychology*, 47, 38–60.
- Bruce, V., & Valentine, T. (1985). Identity priming in the recognition of familiar faces. *British Journal of Psychology*, 76, 373–383.
- Bruce, V., & Young, A. (1986). Understanding face recognition. *British Journal of Psychology*, 77, 305–327.
- Bruce, V., & Young, A. (1998). *In the eye of the beholder: The science of face perception*. New York: Oxford University Press.
- Burton, A. M., Bruce, V., & Dench, N. (1993). What's the difference between men and women? Evidence from facial measurement. *Perception*, 22, 153–176.
- Burton, A. M., Bruce, V., & Johnston, R. A. (1990). Understanding face recognition with an interactive activation model. *British Journal of Psychology*, 81, 361–380.
- Burton, A. M., Kelly, S. W., & Bruce, V. (1998). Cross-domain repetition priming in person recognition. *Quarterly Journal of Experimental Psychology*, 51A, 515–529.
- Calder, A. J., Young, A. W., Perrett, D. I., Etcoff, N. L., & Rowland, D. (1996). Categorical perception of morphed facial expressions. *Visual Cognition*, 3, 81–117.
- Clarke, A., & Morton, J. (1983). Cross modality facilitation in tachistoscopic word recognition. *Quarterly Journal of Experimental Psychology*, 35A, 79–96.
- Cohen, J. D., MacWhinney, B., Flatt, M., & Provost, J. (1993). PsyScope: A new graphic interactive environment for designing psychology experiments. *Behavioral Research Methods, Instruments, and Computers*, 25, 257–271.
- Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, 56, 5–18.
- Dovidio, J. F., Evans, N., & Tyler, R. B. (1986). Racial stereotypes: The contents of their cognitive representations. *Journal of Experimental Social Psychology*, 22, 22–37.
- Eimer, M. (2000). The face-specific N170 component reflects late stages in the structural encoding of faces. *Neuroreport*, 11, 2319–2324.
- Ellis, A. W., Flude, B. M., Young, A. W., & Burton, A. M. (1996). Two loci of repetition priming in the recognition of familiar faces. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22, 295–308.
- Ellis, A. W., Young, A. W., & Flude, B. M. (1990). Repetition priming and face processing: Priming occurs within the system that responds to the identity of a face. *Quarterly Journal of Experimental Psychology*, 42A, 495–512.
- Ellis, A. W., Young, A. W., Flude, B. M., & Hay, D. C. (1987). Repetition priming of face recognition. *Quarterly Journal of Experimental Psychology*, 39A, 193–210.
- Ellis, H. D., Jones, D. M., & Mosdell, N. (1997). Intra- and inter-modal repetition priming of familiar faces and voices. *British Journal of Psychology*, 88, 143–156.
- Farah, M. J., Wilson, K. D., Drain, M., & Tanaka, J. N. (1998). What is “special” about face recognition? *Psychological Review*, 105, 482–498.
- Fiske, S. T. (1998). Stereotyping, prejudice, and discrimination. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed.; Vol. 2, pp. 357–411). New York: McGraw-Hill.
- Fiske, S. T., & Neuberg, S. L. (1990). A continuum model of impression formation from category-based to individuated processes: Influences of information and motivation on attention and interpretation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 3, pp. 1–74). New York: Academic Press.
- Garner, W. R. (1974). *The processing of information and structure*. Potomac, MD: Erlbaum.
- Garner, W. R. (1976). Interaction of stimulus dimensions in concept and choice processes. *Cognitive Psychology*, 8, 98–123.
- George, P. A., & Hole, G. J. (1995). Factors influencing the accuracy of age estimates of unfamiliar faces. *Perception*, 24, 1059–1073.
- George, P. A., & Hole, G. J. (1998). Recognising the ageing face: The role of age in face processing. *Perception*, 27, 1123–1134.
- Gilbert, D. T., & Hixon, J. G. (1991). The trouble of thinking: Activation and application of stereotypic beliefs. *Journal of Personality and Social Psychology*, 60, 509–517.
- Goshen-Gottstein, Y., & Ganel, T. (2000). Repetition priming for familiar and unfamiliar faces in a sex-judgment task: Evidence for a common route for the processing of sex and identity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 26, 1198–1214.
- Haxby, J. V., Hoffman, E. A., & Gobbini, M. I. (2000). The distributed neural system for face perception. *Trends in Cognitive Sciences*, 4, 223–233.
- Haxby, J. V., Hoffman, E. A., & Gobbini, M. I. (2002). Human neural systems for face recognition and social communication. *Biological Psychiatry*, 51, 59–67.
- Haxby, J. V., Parasuraman, R., Lalonde, F., & Abboud, H. (1993). SuperLab: General-purpose Macintosh software for human experimental psychology and psychological testing. *Behavior Research Methods, Instruments, & Computers*, 25, 400–405.
- Hay, D. C. (1999). Repetition priming of face gender judgments: An instance based explanation. *Current Psychology*, 18, 140–149.
- Hoffman, E. A., & Haxby, J. V. (2000). Distinct representations of eye gaze and identity in the distributed human neural system for face perception. *Nature Neuroscience*, 3, 80–84.
- Ito, T. A., & Urland, G. R. (2003). Race and gender on the brain: Electroocutaneous measures of attention to the race and gender of multiply categorizable individuals. *Journal of Personality and Social Psychology*, 85, 616–626.
- Kanwisher, N. (2000). Domain specificity in face perception. *Nature Neuroscience*, 3, 759–763.
- Kempey, S. T., & Morton, J. (1982). The effect of priming with regularly and irregularly related words in auditory word recognition. *British Journal of Psychology*, 73, 441–454.
- Kunda, Z., Davies, P. G., Adams, B. D., & Spencer, S. J. (2002). The dynamic course of stereotype activation: Activation, dissipation, and resurrection. *Journal of Personality and Social Psychology*, 82, 283–299.
- Kunda, Z., & Spencer, S. J. (2003). When do stereotypes come to mind and when do they color judgment? A goal-based theoretical framework for

- stereotype activation and application. *Psychological Bulletin*, 129, 522–544.
- Kurzban, R., Tooby, J., & Cosmides, L. (2001). Can race be erased? Coalitional computation and social categorization. *Proceedings of the National Academy of Sciences, USA*, 98, 15387–15392.
- Le Gal, P. M., & Bruce, V. (2002). Evaluating the independence of sex and expression in judgments of faces. *Perception and Psychophysics*, 64, 230–243.
- Lepore, L., & Brown, R. (1997). Category and stereotype activation: Is prejudice inevitable? *Journal of Personality and Social Psychology*, 72, 275–287.
- Lewis, M. B., & Ellis, H. D. (1999). Repeated repetition priming in face recognition. *Quarterly Journal of Experimental Psychology*, 52A, 927–955.
- Liu, J., Harris, A., & Kanwisher, N. (2002). Stages of processing in face perception: An MEG study. *Nature Neuroscience*, 5, 910–916.
- Livingston, R. W., & Brewer, M. B. (2002). What are we really priming?: Cue-based versus category-based processing of facial stimuli. *Journal of Personality and Social Psychology*, 82, 5–18.
- Locke, V., MacLeod, C., & Walker, I. (1994). Automatic and controlled activation of stereotypes: Individual differences associated with prejudice. *British Journal of Social Psychology*, 33, 29–46.
- Logan, G. D. (1989). Automaticity and cognitive control. In J. S. Uleman & J. A. Bargh (Eds.), *Unintended thought* (pp. 52–74). New York: Guilford Press.
- Logan, G. D. (1990). Repetition priming and automaticity: Common underlying mechanisms? *Cognitive Psychology*, 22, 1–35.
- Macrae, C. N., Alnwick, K. A., Milne, A. B., & Schloerscheidt, A. M. (2002). Person perception across the menstrual cycle: Hormonal influences on social cognitive functioning. *Psychological Science*, 13, 532–536.
- Macrae, C. N., & Bodenhausen, G. V. (2000). Social cognition: Thinking categorically about others. *Annual Review of Psychology*, 51, 93–120.
- Macrae, C. N., Bodenhausen, G. V., & Milne, A. B. (1995). The dissection of selection in person perception: Inhibitory processes in social stereotyping. *Journal of Personality and Social Psychology*, 69, 397–407.
- Macrae, C. N., Bodenhausen, G. V., Milne, A. B., & Calvini, G. (1999). Seeing more than we can know: Visual attention and category activation. *Journal of Experimental Social Psychology*, 35, 590–602.
- Macrae, C. N., Bodenhausen, G. V., Milne, A. B., Thorn, T. M. J., & Castelli, L. (1997). On the activation of social stereotypes: The moderating role of processing objectives. *Journal of Experimental Social Psychology*, 33, 471–489.
- Macrae, C. N., Hood, B. M., Milne, A. B., Rowe, A. C., & Mason, M. F. (2002). Are you looking at me? Eye gaze and person perception. *Psychological Science*, 13, 460–464.
- Macrae, C. N., Milne, A. B., & Bodenhausen, G. V. (1994). Stereotypes as energy-saving devices: A peek inside the cognitive toolbox. *Journal of Personality and Social Psychology*, 66, 37–47.
- Maddox, K. B., & Chase, S. G. (2004). Manipulating subcategory salience: Exploring the link between skin tone and social perception of Blacks. *European Journal of Social Psychology*, 34, 533–546.
- Maddox, K. B., & Gray, S. A. (2002). Cognitive representations of Black Americans: Reexploring the role of skin tone. *Personality and Social Psychology Bulletin*, 28, 250–259.
- Mason, M. F., & Macrae, C. N. (2004). Categorizing and individuating others: The neural substrates of person perception. *Journal of Cognitive Neuroscience*, 16, 1785–1795.
- McCarthy, G., Puce, A., Gore, J. C., & Allison, T. (1997). Face-specific processing in the human fusiform gyrus. *Journal of Cognitive Neuroscience*, 9, 605–610.
- Mitchell, D. B., & Brown, A. S. (1988). Persistent repetition priming in picture naming and its dissociation from recognition memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14, 213–222.
- Moskowitz, G. B., Gollwitzer, P. M., Wasel, W., & Schaal, B. (1999). Preconscious control of stereotype activation through chronic egalitarian goals. *Journal of Personality and Social Psychology*, 77, 167–184.
- Mouchetant-Rostaing, Y., & Giard, M. H. (2003). Electrophysiological correlates of age and gender perception on human faces. *Journal of Cognitive Neuroscience*, 15, 900–910.
- Mouchetant-Rostaing, Y., Giard, M. H., Bentin, S., Aguera, P. E., & Pernier, J. (2000). Neurophysiological correlates of face gender processing in humans. *European Journal of Neuroscience*, 12, 303–310.
- Murrell, G., & Morton, J. (1974). Word recognition and morphemic structure. *Journal of Experimental Psychology*, 102, 963–968.
- Pendry, L. F., & Macrae, C. N. (1996). What the disinterested perceiver overlooks: Goal-directed social categorization. *Personality and Social Psychology Bulletin*, 3, 250–257.
- Quinn, K. A., Macrae, C. N., & Bodenhausen, G. V. (2003). Stereotyping and impression formation: How categorical thinking shapes person perception. In M. A. Hogg & J. Cooper (Eds.), *Sage handbook of social psychology* (pp. 87–109). Thousand Oaks, CA: Sage.
- Santos, I. M., & Young, A. W. (in press). Exploring the perception of social characteristics in faces using the isolation effect. *Visual Cognition*.
- Scarborough, D. L., Cortese, C., & Scarborough, H. S. (1977). Frequency and repetition effects in lexical memory. *Journal of Experimental Psychology: Human Perception and Performance*, 3, 1–17.
- Schweinberger, S. R., Burton, A. M., & Kelly, S. W. (1999). Asymmetric dependencies in perceiving identity and emotion: Experiments with morphed faces. *Perception and Psychophysics*, 61, 1102–1115.
- Schweinberger, S. R., Pickering, E. C., Burton, A. M., & Kaufman, J. M. (2002). Human brain potential correlates of repetition priming in face and name recognition. *Neuropsychologia*, 40, 2057–2073.
- Schweinberger, S. R., & Soukup, G. R. (1998). Asymmetric relationships among perceptions of facial identity, emotion, and facial speech. *Journal of Experimental Psychology: Human Perception and Performance*, 24, 1748–1765.
- Sinclair, L., & Kunda, Z. (1999). Reactions to a Black professional: Motivated inhibition and activation of conflicting stereotypes. *Journal of Personality and Social Psychology*, 77, 885–904.
- Sinclair, L., & Kunda, Z. (2000). Motivated stereotyping of women: She's fine if she praised me but incompetent if she criticized me. *Personality and Social Psychology Bulletin*, 26, 1329–1342.
- Smith, E. R. (1989). Procedural efficiency: General and specific components and effects on social judgment. *Journal of Experimental Social Psychology*, 25, 500–523.
- Smith, E. R. (1998). Mental representation and memory. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed.; Vol. 1, pp. 391–445). New York: McGraw-Hill.
- Smith, E. R., & Branscombe, N. R. (1987). Procedurally mediated social inferences: The case of category accessibility effects. *Journal of Experimental Social Psychology*, 23, 361–382.
- Smith, E. R., & Branscombe, N. R. (1988). Category accessibility as implicit memory. *Journal of Experimental Social Psychology*, 24, 490–504.
- Smith, E. R., Branscombe, N. R., & Bormann, C. (1988). Generality of the effects of practice in social judgment tasks. *Journal of Personality and Social Psychology*, 54, 385–395.
- Spencer, S. J., Fein, S., Wolfe, C. T., Fong, C., & Dunn, M. (1998). Automatic activation of stereotypes: The role of self-image threat. *Personality and Social Psychology Bulletin*, 24, 1139–1152.
- Stroessner, S. J. (1996). Social categorization by race or sex: Effects of perceived non-normalcy on response times. *Social Cognition*, 14, 247–276.

- Tajfel, H. (1969). Cognitive aspects of prejudice. *Journal of Social Issues*, 25, 79-97.
- Tarr, M. J., & Gauthier, I. (2000). FFA: A flexible fusiform area for subordinate-level visual processing automatized by expertise. *Nature Neuroscience*, 3, 764-769.
- Taylor, S. E., Fiske, S. T., Etcoff, N. L., & Ruderman, A. J. (1978). Categorical and contextual bases of person memory and stereotyping. *Journal of Personality and Social Psychology*, 36, 778-793.
- Tranel, D., Damasio, A. R., & Damasio, H. (1988). Intact recognition of facial expression, gender, and age in patients with impaired recognition of face identity. *Neurology*, 38, 690-696.
- VanRullen, R., & Thorpe, S. J. (2001). The time course of visual processing: From early perception to decision-making. *Journal of Cognitive Neuroscience*, 13, 454-461.
- Warren, C., & Morton, J. (1982). The effects of priming on picture recognition. *British Journal of Psychology*, 73, 117-129.
- Wittenbrink, B., Judd, C. M., & Park, B. (2001). Spontaneous prejudice in context: Variability in automatically activated attitudes. *Journal of Personality and Social Psychology*, 81, 815-827.
- Zárate, M. A., & Smith, E. R. (1990). Person categorization and stereotyping. *Social Cognition*, 8, 161-185.
- Zebrowitz, L. A. (1997). *Reading faces: Windows to the soul?* Boulder, CO: Westview Press.

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