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The Perceptual Determinants of Person Construal: Reopening the Social–Cognitive Toolbox

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Guided by a heuristic account of social–cognitive functioning, researchers have attempted to identify the cognitive benefits that derive from a categorical approach to person construal. While revealing, this work has overlooked the fact that, prior to the application of categorical thinking as an economizing mental tool, perceivers must first extract category-triggering information from available stimulus cues. It is possible, therefore, that basic perceptual processes may also contribute to people's propensity to view others in a category-based manner. This possibility was explored in 3 experiments in which the authors investigated the ease with which perceivers can extract categorical and identity-based knowledge from faces under both optimal and suboptimal (i.e., inverted faces, blurred faces, rapidly presented faces) processing conditions. The results confirmed that categorical knowledge is extracted from faces more efficiently than identity-related knowledge, a finding that underscores the importance of perceptual operations in the generation of categorical thinking.

Keywords: person perception, categorical thinking, social–cognitive toolbox, mental economy

> The mind tends to categorize environmental events in the grossest manner compatible with the need for action. (Allport, 1954, p. 21)

An acknowledged facet of the person-perception process is that people frequently construe others on the basis of the social groups to which they belong. For example, rather than viewing a fun-loving, stamp-collecting vegetarian as a unique entity, perceivers may prefer instead to classify the person as a woman, an Asian, or perhaps a young adult (Brewer, 1988; Fiske & Neuberg, 1990). The consequences of this processing tactic are straightforward and well documented: (a) perceivers tacitly assume that the target possesses attributes that are associated with membership in these groups, and (b) category-based expectancies are used to guide their interactions with (and recollections of) the individual (Allport, 1954; Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). According to conventional wisdom, perceivers adopt this processing strategy because of its cognitive efficiency (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000). As Allport (1954) famously remarked,

> We like to solve problems easily. We can do so best if we can fit them rapidly into a satisfactory category and use this category as a means of prejudging the solution. . . . So long as we can get away with course overgeneralizations we tend to do so. Why? Well, it takes less effort, and effort, except in the area of our most intense interests, is disagreeable. (pp. 20–21)

Guided by Allport's (1954) account of social–cognitive functioning, researchers have expended considerable efforts cataloging the cognitive benefits that accrue from a categorical approach to person construal (Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). For the most part, this work has delineated the manner in which category activation (and application) economizes aspects of information processing, such as item encoding, resource allocation, and response generation (see Bodenhausen & Lichtenstein, 1987; Bodenhausen & Wyer, 1985; Macrae et al., 1999; Macrae, Hewstone, & Griffiths, 1993; Macrae, Milne, & Bodenhausen, 1994; Macrae, Stangor, & Milne, 1994; Pendry & Macrae, 1994). But is cognitive economy, at least as indexed by standard memorial and attentional measures, the only determinant of category-based responding? There may be reason to question this assumption. After all, prior to the application of categorical thinking as an economizing mental tool, perceivers must first extract category-triggering information from available stimulus cues. In particular, they must locate and activate relevant knowledge structures in memory (Gilbert & Hixon, 1991). It is possible, therefore, that early perceptual processes (and their associated products) may also contribute to perceivers' tendency to think about others in a category-based manner (see Blair, Judd, &

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Fallman, 2004; Livingston & Brewer, 2002; Maddox & Gray, 2002). We explored this possibility in the current investigation.

Person Construal: Who or What Are You?

Despite the priority given to perceptual processes in contemporary accounts of face recognition (e.g., Bruce & Young, 1986; Haxby, Hoffman, & Gobbini, 2000, 2002), work in social cognition has tended to overlook the importance of these operations (but see Zebrowitz, 1997), focusing instead on the cognitive and behavioral aspects of person construal (Macrae & Bodenhausen, 2000). This oversight can be traced to a couple of factors. First, the dominant empirical pursuit in social–cognitive research has been to investigate person construal at the stages of stereotype activation and application (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000), stages that take place after a target has been detected and categorized. Second, a favored technique for eliciting categorical thinking has been to present participants with verbal stimuli (e.g., category labels, forenames), a methodology that necessarily obscures the role played by perceptual operations in the registration, classification and recognition of social targets (but see Blair et al., 2004; Gilbert & Hixon, 1991; Livingston & Brewer, 2002; Macrae, Bodenhausen, & Milne, 1995; Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; Maddox & Gray, 2002; Quinn & Macrae, 2005). Yet these operations patently exert a significant influence on the course and products of the person-perception process (Bruce & Young, 1998).

Underlying people's understanding of others are perceptual operations that abstract both variant (e.g., emotional expression, gaze direction) and invariant (e.g., sex, identity) aspects of person knowledge from available facial cues (Bruce & Young, 1986; Burton, Bruce, & Johnston, 1990; Haxby et al., 2000, 2002; Kanwisher, 2000; Tarr & Gauthier, 2000). In this respect, it is interesting to note that contemporary models of face processing confront the same challenge as social–cognitive approaches to person perception—namely, to establish how and when perceivers construe targets (e.g., Madonna, Tony Blair, Uncle Pete) as unique entities (i.e., person individuation) rather than instances of generic social groupings (i.e., person categorization)? It is interesting that the solutions reached by the respective fields are quite distinct, with each emphasizing the importance of different operations in the information-processing stream (e.g., Bruce & Young, 1986; Fiske & Neuberg, 1990). Whereas social–cognitive research underscores the importance of memorial operations (e.g., category-based vs. person-based retrieval) in the person-perception process (Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000), work in face processing emphasizes the perceptual operations through which people abstract categorical and identity-related information about others (Bruce & Young, 1986; Farah, Wilson, Drain, & Tanaka, 1998; Haxby et al., 2000, 2002). Motivating the current investigation is the assumption that a consideration of the functional characteristics of these perceptual operations may provide a useful clue as to why category-based responding plays such a prominent role in person construal.

The Face and Person Perception: Extracting Social Knowledge

An influential theoretical account of the mechanisms through which people abstract social knowledge about conspecifics is provided by the Bruce and Young (1986) model of face processing (see also Burton et al., 1990). According to this model, during an initial structural encoding phase, perceivers extract an invariant three-dimensional representation of a face. This stage is common to all types of face (i.e., novel and familiar) and is followed by perceptual operations that extract social knowledge from available stimulus cues, such as information pertaining to the identity (if applicable), sex, age, emotional expression, and gaze direction of the target (Haxby et al., 2000, 2002). Supporting the extraction of this knowledge is a perceptual processing system that abstracts different types of information from the face. In particular, perceptual operations code both the constituent (i.e., featural) elements of faces (e.g., nose, eyes, mouth, hairstyle) and the configural relations among these features (Bartlett & Searcy, 1993; Diamond & Carey, 1986; Farah, Tanaka, & Drain, 1995; Maurer, Le Grand, & Mondloch, 2002; Rhodes, Brake, & Atkinson, 1993; Searcy & Bartlett, 1996).

That perceivers extract both featural and configural information from faces may be functionally important when one considers the basic products of person construal (i.e., category-based vs. person-based representations) and the ease with which this knowledge can be generated (Mason & Macrae, 2004; Turk, Rosenblum, Gazzaniga, & Macrae, 2005). Take, for example, categorical information, such as knowledge of a person's sex. Generally speaking, detection of a single facial feature, usually the hairstyle, is sufficient to establish the sex of a target (Brown & Perrett, 1993; Bruce et al., 1993; Burton, Bruce, & Dench, 1993; Goshen-Gottstein & Ganel, 2000). This is not the case for individuation (i.e., person identification), however. Instead, configural information (e.g., second-order featural relations) is believed to support person identification (see Maurer et al., 2002). An extensive literature has revealed that, under normal viewing conditions, perceivers are skilled at recognizing others, such that a change of clothing, appearance, or setting does little to diminish the accuracy of person identification (Bruce & Young, 1998). What does reliably obstruct person recognition, however, is the presentation of faces in an inverted orientation (Valentine, 1988). Under these conditions, the extraction of configural information is impeded, prompting a reduction in the accuracy of person recognition (Maurer et al., 2002). It is important to note that the extraction of featural information is largely resistant to the effects of inversion (Diamond & Carey, 1986; Endo, 1986; Leder & Bruce, 1998; Lewis & Johnston, 1997; Rhodes et al., 1993; Searcy & Bartlett, 1996; Sergent, 1984; Valentine, 1988; Yin, 1969; Young, Hellawell, & Hay, 1987).

Variability in the ease of knowledge extraction (i.e., featural vs. configural information) from faces under different processing conditions, we suspect, may provide a valuable insight into why category-based responding exerts such a dominant influence on person construal (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003). It is not simply that this mode of thought liberates attentional resources and facilitates memorial organization (Macrae & Bodenhausen, 2000); in addition, category-specifying information may also be the favored product of the perceptual operations that extract social knowledge from faces, particularly in challenging task environments. Relying as it does on configural information, individuation (i.e., identity-based processing) may be compromised by manipulations that impair the extraction of this knowledge from stimuli, such as when faces are presented under suboptimal processing conditions (e.g., inverted faces; see Collishaw & Hole, 2002; Maurer et al., 2002). As the extraction of featural information is less reliant on the quality of the available stimulus inputs (Leder & Bruce, 1998, 2000; Prkachin, 2003; Searcy & Bartlett, 1996), categorical thinking (i.e., person categorization) should not be impeded to the same degree by manipulations of this kind. In other words, category-based responding may dominate social–cognitive functioning because of the relative ease in which triggering information can be extracted from faces, especially in demanding task contexts.

The Current Research

Although previous research has investigated the effects of feature typicality on person categorization and stereotyping (Blair et al., 2004; Livingston & Brewer, 2002; Maddox & Gray, 2002), the current work addresses a related, though distinct issue—the efficiency of the perceptual operations through which perceivers extract category-based and identity-based knowledge from faces. To explore the dynamics of person construal, we conducted three experiments in which we investigated the ease in which social knowledge can be extracted from faces (see also Mason & Macrae, 2004). To establish the functional characteristics of the perceptual processes that support categorization and individuation, we assessed knowledge extraction both under normal viewing conditions and across a range of demanding processing contexts, notably conditions under which participants were presented with inverted (Experiment 1), degraded (Experiment 2), and rapidly presented faces (Experiment 3). In each experiment, our prediction was the same. When presented with faces in challenging task settings, perceivers should experience less difficulty extracting categorical than identity-related knowledge (Maurer et al., 2002), a finding that would demonstrate the inherent perceptual efficiency of category-based processing.

Experiment 1—Extracting Person Knowledge: The Effects of Facial Inversion

Method

Participants and design. Fifteen undergraduates (7 men and 8 women) from Dartmouth College completed the experiment for additional course credit. The experiment had a 2 (target judgment: sex or identity) × 2 (facial orientation: upright or inverted) repeated measures design.

Stimulus materials and procedure. Participants arrived at the laboratory individually and were greeted by a male experimenter. They were seated facing the screen of an Apple Macintosh computer (IMac) and told that the study was an investigation into aspects of face perception. The experimenter explained that a number of faces (in upright [0°] or inverted [180°] orientations) would appear in the center of the computer screen (see Figure 1). On sex trials, participants were required to report, by means of a keypress, whether each face depicted a male or female target. On identity trials, they were requested to report whether each face depicted a familiar or an unfamiliar person (Lewis & Ellis, 1999; Schweinberger, Pickering, Jentzsch, Burton, & Kaufmann, 2002). Participants were instructed to respond as quickly and accurately as possible to each face. During each block of trials (i.e., sex or identity), participants were presented with 40 color faces. On sex trials, the faces comprised 20 unfamiliar women and 20 unfamiliar men. On identity trials, the faces comprised 20 familiar celebrities (10 female and 10 male) and 20 unfamiliar individuals (10 female and 10 male). The celebrities were well known singers or movie stars (e.g., Britney Spears, Bruce Willis, Cameron Diaz) and were selected on the basis of earlier pilot testing. All picture files were standardized in size to 200 × 200 pixels. Each trial consisted of the appearance of a fixation cross for 1,000 ms, followed by a face that remained on the screen until participants made a response (male–female or familiar–unfamiliar). Each face was either presented in an upright or inverted orientation, with the order of presentation of the stimuli randomized for each participant. The order of presentation of the trial blocks (sex or identity) and the meaning of the response keys (male–female or familiar–unfamiliar) were counterbalanced across the sample. The computer recorded the latency and accuracy of each response. On completion of the experiment, participants were debriefed and dismissed.

Results

Mean categorization latencies (on accurate trials) and the proportion of errors committed on sex and identity trials served as the dependent measures of interest. Given the presence of outlying responses in the data set, response times that were slower than 2.5 standard deviations from the mean and trials on which errors were made were excluded from the analysis (2.9% of trials). Prior to the statistical analysis, we performed a log transformation on the data. For ease of interpretation, however, the untransformed means are reported in Figure 2. The response-time data were submitted to a 2 (target judgment: sex or identity) × 2 (facial orientation: upright or inverted) repeated measures analysis of variance (ANOVA). The analysis revealed main effects of target judgment, $F(1, 14) = 197.33$, $p < .001$, and facial orientation, $F(1, 14) = 35.18$, $p < .001$, such that reaction times were faster for judgments of sex than identity and for faces that were upright (i.e., canonical view) rather than inverted in orientation. The analysis also revealed a significant target Judgment × Facial Orientation interaction, $F(1, 14) = 5.61$, $p < .033$ (see Figure 2). Additional analyses showed that reaction times for both judgments of sex, $t(14) = -4.02$, $p < .001$, and identity, $t(14) = -4.73$, $p < .002$, were moderated by facial orientation, with response latencies increasing when faces were presented in an inverted orientation. Inspection of Figure 2 reveals that the reaction time costs of inversion were greater in magnitude for judgments of identity (i.e., individuation) than sex (i.e., categorization).

Figure 1. Examples of stimulus materials for upright and inverted faces (Experiment 1; top panel) and normal and blurred faces (Experiment 2; bottom panel).

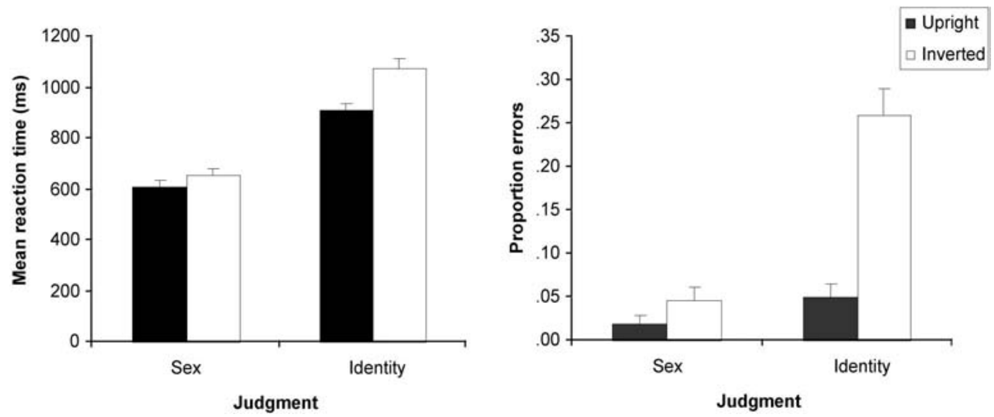

Figure 2. Mean reaction times (ms) and error rates for judgments of sex and identity as a function of facial orientation (Experiment 1). Error bars represent standard errors.

A 2 (target judgment: sex or identity) × 2 (facial orientation: upright or inverted) repeated measures ANOVA was also undertaken on the proportion of errors committed by participants. This revealed main effects of target judgment, $F(1, 14) = 26.65$, $p < .001$, and facial orientation, $F(1, 14) = 54.12$, $p < .001$, such that more errors were committed on judgments of identity than sex and for inverted than upright faces. The analysis also revealed a significant target Judgment × Facial Orientation interaction, $F(1, 14) = 19.98$, $p < .001$ (see Figure 2). Additional analysis showed that only judgments of identity were moderated by facial orientation, $t(14) = -6.55$, $p < .001$, with more errors committed on inverted than upright faces. A comparable effect did not emerge on participants' categorical judgments, $t(14) = -1.47$, *ns*.

Discussion

Replicating previous work on face recognition, the current results demonstrated reductions in the accuracy of person identification (as indexed by familiarity judgments) following facial inversion (Diamond & Carey, 1986; Lewis & Johnston, 1997; Rhodes et al., 1993; Searcy & Bartlett, 1996; Valentine, 1988; Yin, 1969; Young et al., 1987). This effect is likely due to impairments in the extraction of configural information from faces (Maurer et al., 2002). As Collishaw and Hole (2002) have argued, "It appears that configural processing becomes gradually more disrupted the further a face is oriented away from the upright" (p. 287). It is interesting that although person categorization was also impaired by facial inversion, the resultant performance costs were less pronounced than for person identification (see Figure 2). This suggests that, compared with configural information, the extraction of featural information is less dependent on the presentation of faces in a canonical orientation (Leder & Bruce, 1998; Schwaninger & Mast, 1999). As such, at least for intact faces, it is easier for the face-processing system to extract categorical than identity-related information, a perceptual effect that may contribute to perceivers' reliance on category-based responses during subsequent stages of the person-perception process (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000).

Of course, facial inversion is but a single route through which face processing (i.e., person construal) can be impaired. To establish the generality of the effects observed in Experiment 1, in our next study we therefore assessed the efficiency of person categorization under conditions that may also be expected to impede face processing—namely, facial blurring. By applying Gaussian blurs to facial stimuli, one can investigate the influence of different spatial scales on the components and products of the face-processing system (Collishaw & Hole, 2000, 2002). Collishaw and Hole (2000), for example, demonstrated that beyond eight cycles per face width, blurred faces were recognized with reasonable accuracy, but inverted blurred faces were not recognized at levels above chance. It is believed that blurring the face impairs the extraction of configural and featural information but to differing degrees (Boutet, Collin, & Faubert, 2003). With respect to the configural details that support person identification (i.e., individuation), Nagayama, Yoshida, and Toshima (1995) have shown that information at the lowest range of the critical band for face recognition (between 6 and 12 cycles per face width) is essential for successful performance. In the current context, this then gives rise to an interesting prediction. When a Gaussian blur is applied to faces, perceivers should experience greater difficulty extracting identity-based than category-based information from the stimuli. We explored this possibility in our second experiment.

Experiment 2—Extracting Person Knowledge: The Effects of Facial Blurring

Method

Participants and design. Twenty-two undergraduates (9 men and 13 women) from Dartmouth College completed the experiment for additional course credit. The experiment had a 2 (target judgment: sex or identity) × 2 (face type: normal or blurred) repeated measures design.

Stimulus materials and procedure. Participants arrived at the laboratory individually and were greeted by a male experimenter. They were seated facing the screen of an Apple Macintosh computer (IMac) and told that the study was an investigation into aspects of face perception. The study used the same methodology as Experiment 1 but with an important modification. Instead of presenting inverted faces, we showed participants blurred faces on half of the trials in each experimental block (sex and identity). The faces were blurred using the Gaussian filter that is available in Photoshop. On the basis of previous research investigating the dynamics of face processing (Collishaw & Cole, 2002), we used a filter with a radius of seven pixels (Nagayama et al., 1995). Examples of the blurred images are displayed in Figure 1. As in Experiment 1, during each block of trials (i.e., sex or identity), participants were presented with 40 faces. On sex trials, the faces comprised 20 unfamiliar women and 20 unfamiliar men. On identity trials, the faces comprised 20 familiar celebrities (10 female and 10 male) and 20 unfamiliar individuals (10 female and 10 male). Again, participants were instructed to respond as quickly and accurately as possible to each stimulus. The computer recorded the latency and accuracy of each response. On completion of the experiment, participants were debriefed and dismissed.

Results

For each participant, mean reaction times and the proportion of errors committed on sex and identity trials were calculated. The data were trimmed and normalized using the procedures outlined in Experiment 1 (3.3% of trials were excluded from the analysis). The results of 4 participants were dropped from the statistical analysis because of excessive error rates (> 50%) on the identity trials. Participants' mean reaction times were submitted to a 2 (target judgment: sex or identity) × 2 (face type: normal or blurred) repeated measures ANOVA. The analysis revealed main effects of target judgment, $F(1, 17) = 155.70$, $p < .001$, and face type, $F(1, 17) = 26.71$, $p < .001$, such that reaction times were faster for judgments of sex than identity and for normal than blurred faces. The analysis also revealed a significant target Judgment × Face Type interaction, $F(1, 17) = 4.61$, $p < .047$ (see Figure 3). Additional analyses showed that reaction times for both judgments of sex, $t(17) = -4.40$, $p < .001$, and identity, $t(17) = -4.22$, $p < .001$, were moderated by face type, with response latencies increasing as a function of facial blur. Inspection of Figure 3 reveals that the reaction time costs of blurring were greater for judgments of identity than sex.

A 2 (target judgment: sex or identity) × 2 (face type: normal or blurred) repeated measures ANOVA was undertaken on the proportion of errors committed by participants. This revealed main effects of target judgment, $F(1, 17) = 38.76$, $p < .001$, and face type, $F(1, 17) = 19.01$, $p < .001$, such that more errors were committed on judgments of identity than sex and for blurred than normal faces. The analysis also revealed a significant target Judgment × Facial Type interaction, $F(1, 17) = 26.03$, $p < .001$ (see Figure 3). Additional analysis showed that only judgments of identity were moderated by face type, $t(17) = -4.92$, $p < .001$, with more errors committed on blurred than normal faces. A comparable effect did not emerge on participants' categorical judgments, $t(17) = -1.69$, *ns*.

Discussion

Extending the results of Experiment 1, the current study once again demonstrated the efficiency of the perceptual operations through which category-cueing information is extracted from faces. When faces were degraded though the application of a Gaussian filter, greater performance costs were observed for identity-based (i.e., individuation) than category-based (i.e., categorization) judgments (Collishaw & Cole, 2002). This suggests that, under suboptimal processing conditions, categorical construal may be the favored product of the face-processing system. It is worth noting, however, that in the experiments reported thus far, the efficiency of face processing has been investigated under conditions in which perceivers are presented with noncanonical stimulus inputs. Specifically, participants have responded to either inverted or blurred facial images. This then raises an important empirical question. Are the current effects only observed when impoverished stimulus inputs are available, or might they be replicated when canonical images are presented to participants and processing is constrained through the application of a quite different manipulation? By varying the duration of stimulus presentation (i.e., short vs. long), we addressed this issue in our final experiment. We reasoned that the effects observed in Experiments 1 and 2 would extend to the construal of canonical images when the time available to extract information from faces is manipulated. In particular, we expected the rapid presentation of faces to have a more debilitating impact on identity-based than category-based construal.

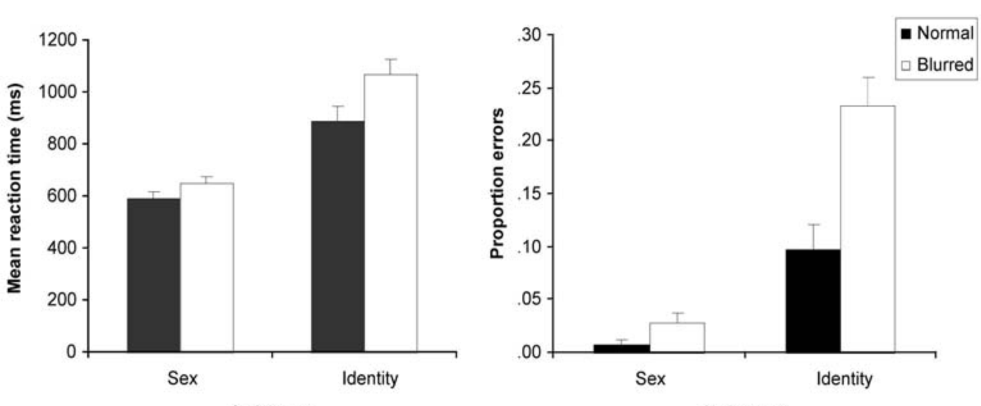

Figure 3. Mean reaction times (ms) and error rates for judgments of sex and identity as a function of face type (Experiment 2). Error bars represent standard errors.

Experiment 3—Extracting Person Knowledge: The Effects of Rapid Stimulus Presentation

Method

Participants and design. Fifteen undergraduates (7 men and 8 women) from Dartmouth College completed the experiment for additional course credit. The experiment had a 2 (target judgment: sex or identity) × 2 (presentation duration: 200 ms or 20 ms) repeated measures design.

Stimulus materials and procedure. Participants arrived at the laboratory individually and were greeted by a male experimenter. They were seated facing the screen of an Apple Macintosh computer (IMac) and told that the study was an investigation into aspects of face perception. The study used the same methodology as Experiments 1 and 2 but with an important modification. Participants made identity-based and category-based judgments on faces that were presented for either 200 ms (50% of trials) or 20 ms (50% of trials). As in the previous experiments, during each block of trials (i.e., sex or identity), participants were presented with 40 faces. On sex trials, the faces comprised 20 unfamiliar women and 20 unfamiliar men. On identity trials, the faces comprised 20 familiar celebrities (10 female and 10 male) and 20 unfamiliar individuals (10 female and 10 male). Participants were instructed to respond as quickly and accurately as possible to each stimulus, and the computer measured the latency and accuracy of each response. On completion of the experiment, participants were debriefed and dismissed.

Results

For each participant, mean reaction times and the proportion of errors committed on sex and identity trials were calculated. The data were trimmed and normalized using the procedures outlined in Experiment 1 (2.6% of the trials were excluded from the analysis). Participants' mean reaction times were submitted to a 2 (target judgment: sex or identity) × 2 (presentation duration: 200 ms or 20 ms) repeated measures ANOVA. The analysis revealed main effects of target judgment, $F(1, 14) = 74.06$, $p < .001$, and presentation duration, $F(1, 14) = 8.26$, $p < .012$, such that reaction times were faster for judgments of sex than identity and for faces that were presented for 200 ms than 20 ms. The analysis also revealed a significant target Judgment × Presentation Duration interaction, $F(1, 14) = 5.06$, $p < .05$ (see Figure 4). Additional analyses showed that only reaction times for judgments of identity, $t(14) = -3.28$, $p < .005$, were moderated by presentation duration, such that response latencies were greater when faces were presented for 20 ms than 200 ms. A comparable effect did not emerge on participants' categorical judgments, $t(14) = -1.32$, *ns*.

A 2 (target judgment: sex or identity) × 2 (presentation duration: 200 ms or 20 ms) repeated measures ANOVA was undertaken on the proportion of errors committed by participants. This revealed a main effect of target judgment, $F(1, 14) = 57.66$, $p < .0001$, and a significant effect of presentation duration, $F(1, 14) = 3.74$, $p < .001$, such that more errors were committed on judgments of identity than sex and for faces that were presented for 20 ms than 200 ms. The analysis also revealed a significant target Judgment × Presentation Duration interaction, $F(1, 14) = 14.48$, $p < .002$ (see Figure 4). Additional analysis showed that only judgments of identity were moderated by presentation duration, $t(14) = -3.02$, $p < .009$, with more errors committed when faces were presented for 20 ms than 200 ms. A comparable effect did not emerge on participants' categorical judgments, $t(14) < 1$, *ns*.

Discussion

Using canonical facial images and a different manipulation of processing difficulty (i.e., duration of stimulus presentation), we found that the current results replicated those reported in Experiments 1 and 2. Under demanding processing conditions (i.e., rapid stimulus presentation), performance costs were greater for identity-based than categorical judgments, thereby revealing the enhanced efficiency of the latter construal. Thus, when limited time is available to extract information from a face, perceivers experience less difficulty computing the sex than identity of a target.

General Discussion

The current findings support the contention that early perceptual processes may contribute to perceivers' tendency to view other social agents in a categorical manner (see also Mason & Macrae, 2004). Across three experiments, the extraction of identity-based knowledge from faces was shown to be less resistant to manipulations of processing difficulty than the extraction of categorical information, both in terms of the speed and accuracy of partici-

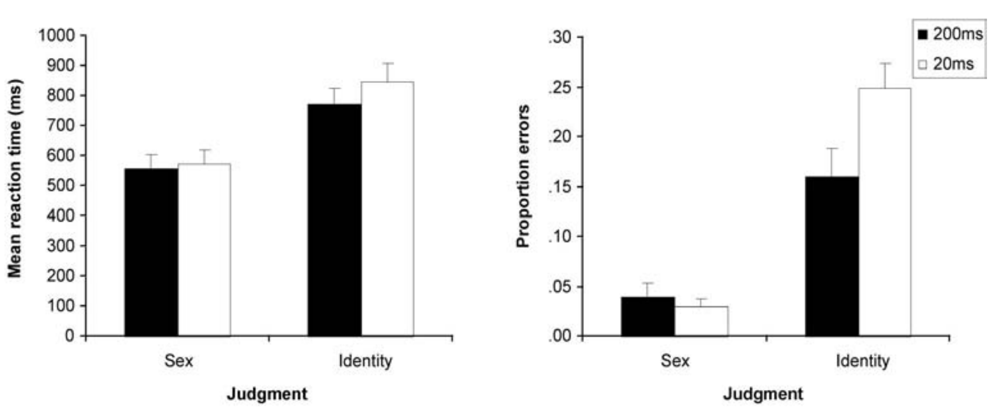

Figure 4. Mean reaction times (ms) and error rates for judgments of sex and identity as a function of presentation duration (Experiment 3). Error bars represent standard errors.

pants' responses. This therefore corroborates the observation that, unlike categorization, individuation is supported by the extraction of configural information from faces (Maurer et al., 2002), a process that is compromised under suboptimal viewing (or processing) conditions (Diamond & Carey, 1986; Rhodes et al., 1993; Searcy & Bartlett, 1996; Valentine, 1988; Yin, 1969; Young et al., 1987). Guided by the extraction of featural information from faces (Goshen-Gottstein & Ganel, 2000), person categorization demonstrates a greater resilience to manipulations of processing difficulty. Our attention now turns to a consideration of the theoretical and practical implications of these findings.

What's in a Face? Categorizing and Individuating Others

Since Allport's (1954) seminal writings, researchers have sought to demonstrate the cognitive benefits that accrue from the adoption of a categorical conception toward others. Although the reported effects are many, the findings can be summarized succinctly and easily—categorical thinking streamlines most aspects of person perception, including decision making, memorial functioning, and attentional processing (see Macrae & Bodenhausen, 2000). Given these economizing effects, categorical thinking has been characterized as an indispensable cognitive tool in the person-perception process (Bodenhausen & Lichtenstein, 1987; Bodenhausen & Wyer, 1985; Gilbert & Hixon, 1991; Macrae et al., 1993; Macrae, Milne, & Bodenhauser, 1994; Pendry & Macrae, 1994). As Gilbert and Hixon (1991) have put it, "The ability to understand new and unique individuals in terms of old and general beliefs is certainly among the handiest tools in the social perceiver's kit" (p. 509). In no sense does the present work seek to dispute this viewpoint; clearly the application of generic knowledge structures simplifies otherwise complex and effortful aspects of the person-perception process. What is questionable, however, is whether cognitive economy is the only determinant of perceivers' preference for category-based responding (Allport, 1954). As demonstrated herein, early perceptual processes (and their associated products) also appear to play an important contributory role to the generation of categorical thinking (Blair et al., 2004; Livingston & Brewer, 2002; Mason & Macrae, 2004).

Three lines of evidence point to perceptual processing as an important determinant of categorical thinking. First, perceivers can extract category-cueing material from faces more rapidly and accurately than identity-triggering information. Second, at least for intact stimuli, the operations that extract category-cueing information demonstrate a resistance to manipulations that impair face processing, such as stimulus orientation and degradation (Maurer et al., 2002; Valentine, 1988). This observation is important as it highlights the perceptual efficiency of categorical thinking. Even when perceivers are presented with stimuli in suboptimal conditions, the face-processing system is still capable of extracting categorical knowledge in a rapid and accurate manner. Third, category activation is sensitive to the typicality of group members. In particular, categorical thinking is moderated by the extent to which individuals possess physical features that are deemed to be typical of the groups to which they belong (see Blair et al., 2004; Livingston & Brewer, 2002; Maddox & Gray, 2002).

What the aforementioned findings suggest is that, given appropriate triggering cues, category-based responding may be the predominant social–cognitive outcome at all stages of the information-processing stream. Prior to the cognitive efficiencies that accrue from the application of category-based knowledge structures in memory (Allport, 1954; Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000), perceptual operations may already be preferentially extracting category-cueing information from faces, especially in challenging task environments. Little wonder, therefore, that categorical thinking should exert such a potent influence on person construal. The processing architecture that supports social–cognitive functioning (Haxby et al., 2000, 2002) would appear to be biased toward category-based responding at all stages of the person-perception process. In this respect, person construal may simply reflect the mind's evolved strategy of imposing a categorical solution on a broad range of problems in perception and cognition (see Harnad, 1987).

Given the perceptual efficiency of category-based construal, does this imply that the products of the person-perception process are inevitably dominated by that which can be computed most easily—categorical judgments? In addressing this important issue, we note two worthy observations. The ultimate benefit of categorical thinking lies in the fact that preexisting knowledge structures can be used to guide information processing and response generation, especially when other sources of person knowledge are absent, ambiguous, or difficult to acquire (Allport, 1954; Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000). It is unsurprising, therefore, that categorical construal is triggered by basic featural cues (Blair et al., 2004; Livingston & Brewer, 2002) and is more resistant to disruption than person-based construal. Such functional properties would be expected of a process that streamlines information-processing and response generation. Ease of categorical construal, however, does not extend to all processing contexts and social targets. Indeed, there are conditions under which individuated responses reliably dominate people's outputs (Fiske & Neuberg, 1990; Kunda & Spencer, 2003).

Any object, including a person, can be identified at multiple levels of abstraction (e.g., woman vs. one's current partner). It is assumed, however, that objects are first perceptually identified at what is termed the *entry level* of categorical representation (Jolicoeur, Gluck, & Kosslyn, 1984). This is the level at which a name can be generated or matched most rapidly to an object. It is noteworthy that for some social targets, particularly highly familiar or relevant others, person recognition is believed to be automatized at the individual or exemplar-based level (Tanaka, 2001; Turk et al., 2005). Thus, although category-based responding may be the least demanding option at all stages of the person-perception process, the face-processing system nevertheless retains the flexibility to generate person-based responses under specific circumstances (e.g., goal-based processing) and for certain targets (e.g., familiar–relevant others). In this way, perceivers are able to negotiate the complex demands imposed by everyday social interaction (Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). Of course, that highly familiar others (e.g., lovers, friends, colleagues) elicit identity-based construal (Tanaka, 2001) has important implications for extant models of person perception and stereotyping (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990). It is commonly assumed that, to thwart stereotyping, perceivers must find targets interesting or involving (see Brewer, 1988). When this condition is satisfied, stereotyping is overridden by person-based processing and its associated outcomes. What recent research suggests, however, is that for some social targets, specifically highly familiar others, identity-based construal may be the dominant product of the perceptual operations that guide face processing (Tanaka, 2001; Tarr & Cheng, 2003; Tarr & Gauthier, 2000). As such, stereotypical thinking (at least as conventionally defined) may never be implemented when perceivers interact with highly familiar others (Turk et al., 2005), a possibility that awaits empirical consideration.

Notwithstanding the inherent flexibility of the face-processing system (Bruce & Young, 1986, 1998; Haxby et al., 2000, 2002; Tarr & Gauthier, 2000), why is it that perceivers so readily adopt a categorical stance when interacting with others? Aside from the cognitive economies that accrue from this mode of thought (Macrae & Bodenhausen, 2000), as demonstrated in the current research and related investigations (Blair et al., 2004; Livingston & Brewer, 2002; Mason & Macrae, 2004), perceptual factors also likely contribute to this preference for categorical thinking. Generally speaking, classifying a person by category is less perceptually taxing than individuating that same target from other members of the group (Tarr & Cheng, 2003; Tarr & Gauthier, 2000). This ease of perceptual processing is undoubtedly important when one can use generic categorical representations in memory to guide cognition and action (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003). It is perhaps no accident, therefore, that perceivers are most likely to think categorically about individuals who belong to groups for which strong beliefs and expectancies are held (e.g., race and sex stereotypes; Brewer, 1988; Fiske & Neuberg, 1990): groups that are characterized by the possession of salient perceptual features (e.g., skin tone, hairstyle). As demonstrated in the current inquiry, as the extraction of these triggering features is resistant to manipulations of stimulus quality and processing difficulty, perceivers can ensure that category-based knowledge structures are always available to guide their interactions with individuals from certain social groups (hence the resilience of some stereotypes to modification or change). In this way, person construal is a constant interplay between top-down cognitive forces (e.g., beliefs, expectancies) and the products of bottom-up perceptual operations (Blair et al., 2004; Livingston & Brewer, 2002; Mason & Macrae, 2004).

Person Construal: One Process or Two?

Humans are remarkably skilled at understanding other social agents. From only a few visual cues, people are able to formulate detailed impressions of others (Brewer, 1988; Fiske & Neuberg, 1990); identify the sex, emotional status, and identity of conspecifics (Bruce & Young, 1986); and infer the hidden internal states (e.g., goals, intentions) that give rise to purposive behavior (Baron-Cohen, 1995; Gallagher & Frith, 2003). When one considers the challenges inherent in daily social exchange, these social–cognitive abilities are striking. So why are social perceivers so adroit at understanding others? In social cognition, two basic processes are believed to subserve person perception—categorization and individuation (see Fiske & Neuberg, 1990). Broadly speaking, categorization refers to people's tendency to characterize others on the basis of the social groups to which they belong. Individuation, in contrast, reflects the tendency to view other people not as members of distinct social groups but rather as unique entities. At least as operationalized in the social–cognitive literature, categorization and individuation are typically indexed through the differential products of memory retrieval (Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000; Macrae et al., 1999), a strategy that gives credence to the viewpoint that person construal is guided by the operation of two distinct cognitive processes.

Prior to the retrieval of information from long-term memory, however, a great deal of social–cognitive processing has already taken place. Most notably, perceivers have resolved the perceptual puzzle of identifying social agents from available visual cues. Capturing, as they do, different solutions or outcomes to the problem of person construal (e.g., group member vs. unique entity), categorization and individuation also operate at these early stages of person perception (Bruce & Young, 1986; Haxby et al., 2000, 2002; Tarr & Cheng, 2003; Tarr & Gauthier, 2000). It is important to note, however, that rather than reflecting the operation of dual cognitive processes, during the early perceptual stages of person construal, categorization and individuation are believed to index different products or outcomes of a common processing mechanism (see Mason & Macrae, 2004). Such a viewpoint is consistent with recent models of object recognition (Tarr & Cheng, 2003; Tarr & Gauthier, 2000). Tarr and Cheng (2003), for example, have proposed that recognition across all object categories (e.g., birds, cars, people) is supported by a single processing system that is tuned by a combination of experience and instruction (Diamond & Carey, 1986; Haxby et al., 2000, 2002; Tanaka, 2001; Tarr & Gauthier, 2000). Within this system, regions of ventral temporal cortex are engaged when people make subordinate-level (i.e., individuated) judgments about stimuli for which they have acquired prior perceptual experience. This includes, but is not restricted to, faces (Tarr & Cheng, 2003; Tarr & Gauthier, 2000).

If a single (albeit modular) system is sufficient to recognize all types of objects at varying levels of specificity, it seems reasonable to conclude that categorization and individuation may reflect different social–cognitive products of this system. Adopting such a viewpoint, Mason and Macrae (2004) have argued that categorization (i.e., category-based representations) and individuation (i.e., person-based representations) are perceptual solutions to the problem of person construal that simply make different demands on the distributed neural network that subserves face processing (see Haxby et al., 2000, 2002). Specifically, as individuation relies on the extraction of more complex information (i.e., configural information) from the face than categorization (Bartlett & Searcy, 1993; Diamond & Carey, 1986; Farah et al., 1995; Maurer et al., 2002; Rhodes et al., 1993; Searcy & Bartlett, 1996), greater activity is observed in regions of ventral temporal cortex during the former than latter construal. Together with findings from brain-imaging investigations (Dubois et al., 1999; Mason & Macrae, 2004; Rossion, Schlitz, Robaye, Pirenne, & Crommelinck, 2001), recent behavioral research also suggests that categorization and individuation are realized through a single processing mechanism (see Calder, Burton, Miller, Young, & Akamatsu, 2001; Ganel & Goshen-Gottstein, 2002; Rossion, 2002). As Ganel and Goshen-Gottstein (2002, p. 865) have reported, "As for the processing of sex and identity . . . results . . . indicate that these facial dimensions are processed by a single system at both a functional level of description and at a neuroanatomical level."

Although the current investigation was not intended to adjudicate between single- and dual-process models of person perception, the results are congenial to a single-route account (Ganel & Goshen-Gottstein, 2002; Rossion, 2002), at least with respect to early perceptual stages of person construal. In each of the reported experiments, manipulations of processing difficulty did not fatally disable person construal. Rather, both categorical and identity-based judgments were impaired by stimulus inversion, degradation, and presentation rate, although the effect on performance was most pronounced for individuation. What this suggests is that in the early perceptual stages of person construal, categorization and individuation may rely on a common processing architecture; it is just that individuation is more sensitive than categorization to the quality of the available stimulus inputs (Tarr & Cheng, 2003; Tarr & Gauthier, 2000). This viewpoint does not imply, however, that classic dual-process models in social cognition are necessarily incorrect in their assertion that categorization and individuation are distinct cognitive processes (Fiske & Neuberg, 1990). Such a statement may be accurate when one considers later stages in the person-perception process, stages in which perceivers organize target-relevant information in memory, allocate attention to current processing concerns, and generate target-related inferences (Macrae & Bodenhausen, 2000; Mason & Macrae, 2004). What is needed is additional research that specifies the precise nature of the underlying perceptual and cognitive operations that guide person construal at all stages of the person-perception process.

Conclusions

One of the fundamental challenges confronting perceivers in their interactions with others is that people can be classified at multiple levels of abstraction (e.g., human, man, singer, Neil Young). Given this state of affairs, categorization and individuation can be taken to capture different social–cognitive solutions to the problem of person construal (e.g., group member vs. individual). In striving to streamline the daunting complexity of the person-perception processes, people prefer to think about others in a categorical- rather than a person-based manner, which is a widely accepted view (Brewer, 1988; Fiske & Neuberg, 1990; Macrae & Bodenhausen, 2000). Driving this tendency is the goal of cognitive economy—of expending as little mental effort as possible for the maximum information-processing gain (Allport, 1954). As demonstrated in the current inquiry, this preference for categorical thinking may also reflect efficiencies in the perceptual operations that guide person construal, notably the operations that extract category-triggering information from faces (Haxby et al., 2000, 2002; Tarr & Cheng, 2003; Tarr & Gauthier, 2000). What this suggests is that, in their attempts to unravel the mysteries of social–cognitive functioning, researchers would benefit from considering the functional significance of early perceptual operations (Blair et al., 2004; Livingston & Brewer, 2002; Mason & Macrae, 2004); then person perception really will be the topic under investigation.

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