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ON CONSTRUING OTHERS: CATEGORY AND STEREOTYPE ACTIVATION FROM FACIAL CUES

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Although the face is unquestionably the most valuable source of information available to social perceivers, quite how humans exploit physiognomic cues to make sense of unfamiliar social targets has yet to be fully elucidated. The present investigation explores the possibility that bottom–up visual processing of faces (e.g., the detection of diagnostic social category features) increases the accessibility of social group knowledge structures in memory. Two experiments were undertaken in which the inevitability and strength of category and stereotype activation were assessed by having participants make judgments on centrally presented words that were flanked by a varying number of congruent or incongruent distracter faces. Results showed that despite perceivers' intentions to ignore them, the mere presence of faces increased the accessibility of sex categories (Experiment 1) and gender stereotypes (Experiment 2). However, whereas category–based responding was modulated by the number of faces present, no such effect was observed for the accessibility of stereotypical knowledge. We consider the implications of these findings for contemporary treatments of person perception.

> Men with small foreheads are fickle, whereas if they are rounded or bulging out the owners are quick–tempered. Straight eyebrows indicate

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> softness of disposition, those that curve out toward the temples, humour and dissimulation. The staring eye indicates impudence, the wrinkling indecision. Large and outstanding ears indicate a tendency to irrelevant talk or chattering.
>
> *(Aristotle, cited in Liggett, 1974, p. 215)*

The belief that the face reveals information about underlying character cuts across national, cultural, and geographical boundaries (Liggett, 1974). In addition to being common and far–reaching, the belief has also survived the test of time—several classical Greek and Roman scholars, including Plato and Aristotle, argued that faces contain clues about people's underlying personalities and dispositions. For over 2,500 years, many notable philosophers, historians, and physicians openly supported the idea that a person's disposition is reflected in the face (Enlow, Moyers, Merow, & Poston, 1982). Widespread interest in physiognomy—the study of the face and its relationship to human ability, potential, and character—peaked at the end of the 18th century when a physician and pastor named Johann Kaspar Lavater produced a formal classification system and set of rules specifying the relationship between the face and the mind (Shookman, 1993). Like his peers, Lavater believed that character is assessed just as well from the shape and size of the forehead, for example, as from observations of behavior. Indeed, 18th- and 19th-century courts commonly used physiognomy to assess immoral tendencies in suspected criminals (Carol & Carol, 2003).

As absurd as it may seem to suggest that the shape of a nose is indicative of trustworthiness, the rules and classification system of the physiognomist are not unlike the ones social perceivers employ to make sense of others. Research indicates that, much like physiognomists, social perceivers use facial features to group people into what they *believe* are meaningful social categories (Allport, 1954; Blair, Judd, & Fallman, 2004; Livingston & Brewer, 2002). Though the rules governing these assessments may not be explicit, social perceivers are influenced *implicitly* by the stereotypical beliefs they maintain about social groups (e.g., individuals with facial stubble (i.e., men) are "aggressive", "intelligent" and "despise grocery shopping"). Determining which social groups have a perceptual basis (Rosch, Mervis, Gray, Johnson, & Boyes–Braem, 1976; Webster, Kaping, Mizokami & Duhamel, 2004) and how beliefs about these groups impact our attitudes and behavior towards specific exemplars are central to understanding social perception.

UNDERSTANDING OTHERS

Social psychologists have spent the better part of the last fifty years trying to identify the strategies and tactics that people employ when they attempt to make sense of others (Allport 1954; Bodenhausen & Macrae 1998; Brewer 1988; Fiske & Neuberg 1990). One of the primary aims of these investigations has been to delineate the conditions under which perceivers construe others based on their applicable social groups (e.g., sex, race, age) instead of in terms of their unique collections of attributes and idiosyncratic propensities (e.g., "purchases organic vegetables," "enjoys barbequed brisket")—(Bodenhausen & Macrae, 1998; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). Until quite recently, the position endorsed by social psychologists was somewhat bleak—mere exposure to a target was considered sufficient to trigger categorical thinking (e.g., that entity is a "man") and the expression of stereotypical beliefs (e.g., that entity probably drives quickly and leaves the toilet seat in an upright position—Bargh, 1994, 1999; Brewer, 1988; Devine, 1989; Dovidio, Evans, & Tyler, 1986; Klauer & Wegner, 1998). More recent developments, however, cast doubt on the assumption that categorical thinking and stereotype activation are inevitable outcomes of person construal. Among other things, how a target is construed depends on the perceiver's goals (Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; Pendry & Macrae, 1996), expectations (Blair & Banaji, 1996), and attitudes (e.g., prejudice level) toward the target in question (Lepore & Brown, 1997; Locke, MacLeod, & Walker, 1994; Moskowitz, Gollwitzer, Wasel, & Schaal, 1999). In other words, top–down processing (e.g., goals, beliefs) shapes the course of social perception.

Although the mind appears to possess the resources necessary to override category and stereotype activation, categorical thinking may still underscore social perception. If social perception is governed by the rules that dictate general object recognition (Biederman, 1987; Marr, 1982), the mere detection of features indicative of group membership (e.g., pale skin) may be sufficient to activate a stored representation of the category in memory. Once a target is classified, access to knowledge associated with the social category may be automatic and unconstrained. Unfortunately, social psychologists tend to downplay the importance of the perceptual processes subserving person construal (but see Blair et al., 2004; Cloutier, Mason, & Macrae, 2005; Eberhardt, Goff, Purdie, & Davies, 2004; Levin, 2000;

Livingston & Brewer, 2002; Locke, Macrae, & Eaton, in press; Macrae, Quinn, Mason, & Quadflieg, 2005; Maddox, 2004; Mason & Macrae, 2004; Quinn & Macrae, 2005; Zebrowitz, 1997). As a result, relatively little is known about which information the visual system spontaneously extracts from faces, how this information is matched to some stored structural description (e.g., "female"), how knowledge associated with the representation is accessed (e.g., "enjoys baking") and how much effort, if any, these processes require (see Logothetis & Sheinberg, 1996, for a review). Accordingly, the present research seeks to determine whether, when confronted with physiognomic cues indicative of a particular social category (e.g., "wrinkled skin"), perceivers automatically classify faces according to a pertinent social concept (e.g., "elderly"), whether they spontaneously access the meaning of this classification (e.g., "loves Florida"), and whether these two processes (i.e., category and stereotype activation) operate with similar efficiency or if their respective processing demands differ.

THE SOVEREIGNTY OF FACES

Faces are unquestionably the most important social stimuli humans encounter. From but the briefest exposure to a face, perceivers gain access to a host of valuable clues to the target's identity (Bruce, 1988; Bruce & Young, 1986), emotional state (Harper, Wiens, & Matarazzo, 1978; Izard, 1977), and the direction in which the target's current interest or attention resides (Butterworth & Jarrett, 1991; Lee, Eskritt, Symons, & Muir, 1998). Humans recognize faces more quickly and accurately than other types of visual information (Yin, 1969) and can remember thousands of individuals over extended periods of time (Bahrick, Bahrick, & Wittilinger, 1975). When one considers how little statistical variation exists among faces (e.g., they all contain the same features in the same basic configurations), the ease with which the mind extracts meaningful social information and distinguishes among faces is extraordinary (Farah, Wilson, Drain, & Tanaka, 1998; Marr, 1982).

Although debate over whether these face–processing skills are innate and what role experience plays in their development continues (see Gauthier & Logothetis, 2000; Gauthier, Skudlarski, Gore, & Anderson, 2000; Kanwisher, 2000), what is clear is that the precursors of these abilities emerge soon after birth. Newborn infants respond

preferentially to simple facelike patterns (Johnson, Dziurawiec, Ellis, & Morton, 1991; Valenza, Simion, Cassia, & Umilta, 1996), they recognize their mother's face by 6 months of age (Bushnell, Sai, & Mullen, 1989), and by 7 months they distinguish among basic emotions (Kotsoni, de Haan, & Johnson, 2001). Dovetailing on these developmental findings is neuropsychological evidence demonstrating that the mechanisms perceivers employ to process faces are supported by a discrete network of brain regions (Haxby, Hoffman, & Gobbini, 2002; Kanwisher, 2000; Kanwisher, McDermott, & Chun, 1997). Irrespective of whether the human brain evolved special–purpose neural machinery selectively involved in the processing of faces (Allison et al., 1994; Gross, Roche–Miranda, & Bender, 1972; Kanwisher et al., 1997) or whether humans develop an expertise for faces through experience (Gauthier, Anderson, Tarr, Skudlarski, & Gore, 1997; Tarr & Gauthier, 2000), the ability to recognize and interpret subtle facial cues greatly simplifies social perception.

FEATURE–DRIVEN CLASSIFICATION

Notwithstanding the gamut of studies suggesting that faces are a special stimulus class (Suzuki & Cavanagh, 1995; see Farah et al., 1998, for a review), making sense of social targets is fundamentally a problem of visual recognition (Gauthier & Tarr, 1997; Gauthier, Williams, Tarr, & Tanaka, 1998; Tarr, 2003; Tarr & Cheng, 2000). It therefore seems appropriate to consider how the mind groups objects according to meaningful perceptual differences (e.g. "extraordinarily long neck," "brown spots," and "big black eyes") and then retrieves knowledge associated with these groupings or object categories from memory (e.g., "lives in a zoo," "herbivore," "called a giraffe"). According to bottom–up recognition models, the mind identifies objects by extracting diagnostic visual cues and matching this information to a prototypical, structural description stored in memory (Bar et al., 2001; Biederman, 1987; Marr, 1982; Posner & Keele, 1968; Rosch et al., 1976b). Through higher level processing, humans gain access to multiple internal representations detailing information about the object's view–independent structure, knowledge about its meaning and purpose, and the object's formal name (see Biederman, 1995, for a review). When unfamiliar people are the locus of attention, perceivers use diagnostic facial cues to identify

(i.e., classify) targets and retrieve stored representations related to the object class from long–term memory. Consequently, the dimensions along which perceivers tend to construe objects, including people, are those with a perceptual basis (Bomba & Siqueland, 1983; Posner & Keele, 1968; Rosch et al., 1976).

Of obvious importance to work in social perception is identifying the dimensions along which people construe social targets. Social psychological research indicates that, in the absence of prior knowledge, perceivers tend to classify targets according to three dominant social categories—sex, age, and race (Brewer, 1988; Fiske, 1999; Fiske & Neuberg, 1990). Consistent with these findings is evidence from face processing research demonstrating that perceivers assess race, sex, and age with remarkable ease (Ellis, 1986) and that they employ common strategies to make these assessments (i.e., they rely on a common pattern of facial features; Schyns, Bonnar, & Gosselin, 2002). Sex is assessed from hairstyle and hair length (Brown & Perrett, 1993; Burton, Bruce, & Dench, 1993), from eyebrow shape and thickness, and from skin tone information (Bruce et al., 1993). Age is assessed by the quantity and color of hair and by skin elasticity, texture, and pigmentation (Berry & MacArthur, 1986; Burt & Perrett, 1995; Mark et al., 1980; see Enlow et al., 1982, for a review). How perceivers determine race is less clear, primarily because the distinctiveness of any given feature depends on the racial group in consideration. In general, perceivers appear to assess race using face shape (Enlow et al., 1982), skin tone, and hairstyle cues (Byatt & Rhodes, 1998; Levin, 2000; Maclin & Malpass, 2001; Maddox, 2004). Clearly the face contains visual cues that perceivers exploit to assess the sex, race, and age of social targets. What remains to be determined is whether perceivers extract these visual cues and match this information to structural descriptions in memory automatically (i.e., whether social classification is driven in a bottom–up manner) or whether attention and intention are necessary.

Classifying a target based on his or her visual appearance is, however, only part of the challenge facing social perceivers. In order to make sense of others, perceivers must also retrieve knowledge associated with the object class from memory (Gilbert & Hixon, 1991). Do perceivers need to allocate cognitive resources (e.g., attention) to access the meaning of a social category, or is this information automatically available once a target is classified? If perceivers automatically classify targets according to available physiognomic cues (i.e., fea-

tures indicative of sex, age, and race) and if stereotype activation is an inevitable consequence of categorization, exposure to faces should be sufficient to activate knowledge associated with the social category in memory. Furthermore, the number of physiognomic facial cues present should influence the magnitude of this effect.

CURRENT INVESTIGATION

The goal of the current investigation is to determine whether the processes underscoring social perception are efficient and whether they unfold independently of focal attention and conscious will. It may be the case, as suggested by several social psychologists (Bargh, 1984; Deaux & Lewis, 1984; Devine, 1989; Dovidio et al., 1986), that exposure to a social target is sufficient to trigger the activation of relevant category representations and the content of these representations in memory. In other words, category and stereotype activation may both be inevitable consequences of bottom–up, visual processing (e.g., detection of features that are indicative of a social group). On the other hand, generating multiple classifications (e.g., sex, age, and race) and accessing knowledge about these groupings may be too demanding to unfold independently of focal attention. It may be the case that effort (e.g., attention) and intention are required to classify social targets (i.e., categorize) and to access knowledge associated with the relevant category representation (i.e., stereotypic information). If categorization and stereotyping are both inevitable consequences of social perception, it follows that the mind must extract diagnostic cues from faces and match this information to stored memory representations with remarkable ease and fluidity. Accordingly, one would expect the accessibility of a social category (e.g., "female") and stereotypically associated information (e.g., "cosmetics," "pink") to increase with the number of diagnostic facial cues present. If, on the other hand, these processes are constrained by attention, intention or if the associations between facial cues and these two types of representations are weak, the accessibility of this information (social categories and stereotypes) should not track with the number of diagnostic facial cues present. To explore these questions, two experiments were undertaken in which the possibility that perceivers classify faces according to sex (Experiment 1) and that they access stereotypic knowledge (Experiment 2) despite intentions to ignore them were assessed. In addition, the *relative* strength or di-

rectness of the associations between sex–specifying facial cues and these two types of representations (e.g., sex categories and gender stereotypes) were approximated by measuring how the magnitude of the effect changed as a function of number of distracter faces (i.e., gender–specifying facial cues) present.

EXPERIMENT 1

METHOD

Participants and Design. Thirty Dartmouth undergraduates (11 males, 19 females) participated in the experiment in return for course credit. The experiment had a 2 (trial type: congruent or incongruent) $\times$ 3 (number of distracter faces: one, two or four) repeated–measures design.

Procedure and Stimulus Materials. Upon arrival in the laboratory, each participant was greeted by a female experimenter and directed to sit in front of a Dell PC computer. The experimenter then proceeded to explain that the experiment was designed to investigate how people classify names by gender. The participant was informed that he or she would see a series of names appear on the screen and that the task was to indicate, via a key press, whether the name was associated with a male or a female. Participants were warned that the names would be flanked by distracting faces and pictures and that their goal was to classify the name as quickly and accurately as possible, while ignoring any distracting images that might also appear on the screen around the name.

A trial consisted of the following sequence of events. A fixation–cross appeared at the center of the screen for 500 ms. This was then replaced with a target name surrounded by four distracters. The name and distracters remained on the screen until the participant registered a response or until 1,500 ms had elapsed. Target words appeared at the center of the screen and were surrounded by (1) a single face in one of four corners, and three scrambled faces (perceptual controls) in the other three corners; (2) two faces in two of four corners, and two scrambled perceptual control faces in the remaining two corners; or (3) four faces in all four corners surrounding the name (see Figure 1). Within a given trial, all of the faces depicted individuals whose sex matched the sex of the target name (e.g., two female faces around the name "Janet"), or all of the distracters depicted individuals belonging to the opposite sex (e.g., four female faces sur-

rounding the name "Andy"). The names used were taken from the U.S. Census Bureau's 1990 popular baby name listings (http://www.census.gov/genealogy/names/). The computer recorded the speed and accuracy of participants' responses. Upon completion of 144 trials (24 per condition), participants were thanked, debriefed, and dismissed.

RESULTS AND DISCUSSION

The dependent measure of interest in this experiment was the median time taken by participants to classify the target names by sex. Trials on which errors were committed (7.7%) were excluded from the analysis, as were the data from one participant who had an error rate that was three standard deviations above the mean. The remaining 29 participants' median gender–categorization times were submitted to a two–factor (trial type: congruent or incongruent) × (number of distracter faces: one, two, or four) repeated measures analysis of variance (ANOVA). This revealed an effect of trial type on response times, $F(1, 28) = 37.71$, $p < .01$, such that response times were faster on congruent ($M = 624$ ms) than on incongruent ($M = 664$ ms) trials. In addition, the analysis also revealed a trial type × number of distracter faces interaction, $F(2, 56) = 4.00$, $p < .03$ (see Figure 2). To explore this interaction, linear trends were computed for the incongruent and the congruent trials separately. Results demonstrated that interference increased linearly with the number of incongruent faces present, $F(1, 28) = 5.40$, $p < .03$ (the quadratic trend was not significant, $F < 1$). In contrast, the linear trend for the congruent trials was not significant, $F < 1$.

The results of Experiment 1 reveal that the number of irrelevant, incongruent flanking stimuli (i.e., faces) present on the screen moderates the magnitude of interference observed when people classify target names by sex. Consistent with findings from the face processing literature demonstrating that perceivers use physiognomic features to assess sex (Brown & Perrett, 1993; Bruce et al., 1993; Burton et al., 1993), these findings suggest that the visual system is extremely sensitive to sex–related physiognomic information and that it will extract this information from faces despite perceivers' intentions to ignore the presented faces. What remains to be determined, however, is whether mere exposure to a face is sufficient to trigger stereotypic thinking and whether the strength of stereotype activation will

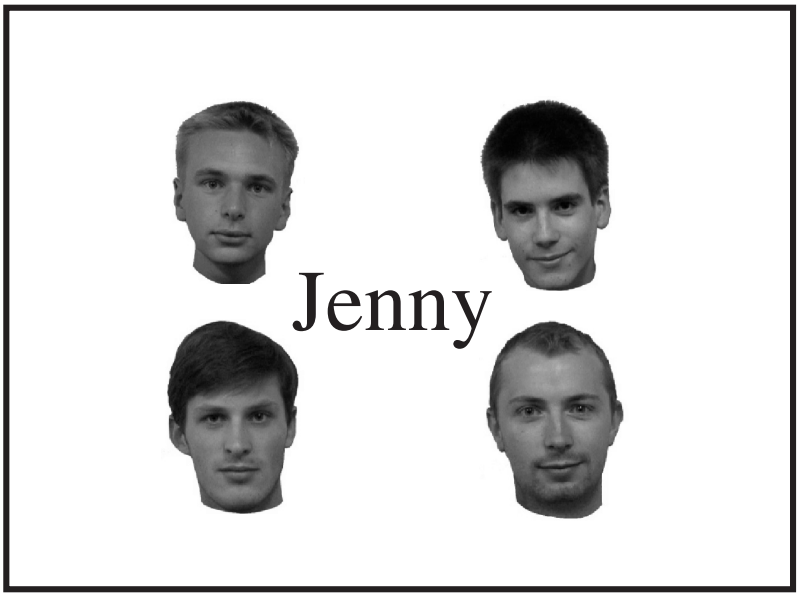

FIGURE 1. Example of an incongruent trial with four irrelevant distracters.

similarly be modulated by the number of distracter faces present. This possibility was explored in our second experiment.

EXPERIMENT 2

METHOD

Participants and Design. Thirty–seven undergraduates (13 males, 24 females) participated in the experiment in return for course credit. The experiment had a 2 (trial type: congruent or incongruent) × 3 (number of distracter faces: one, two, or four) repeated–measures design.

Procedure and Stimulus Materials. The procedure and stimulus materials were identical to those of the first experiment with a single exception. Instead of asking participants to classify names by gender (i.e., make a categorical judgment), participants were asked to classify words as stereotypically male or stereotypically female. Target words were the 36 nontrait gender primes used by Blair and Banaji (1996)—(e.g., ballet, flowers, sports, cigars). Upon completion of 156

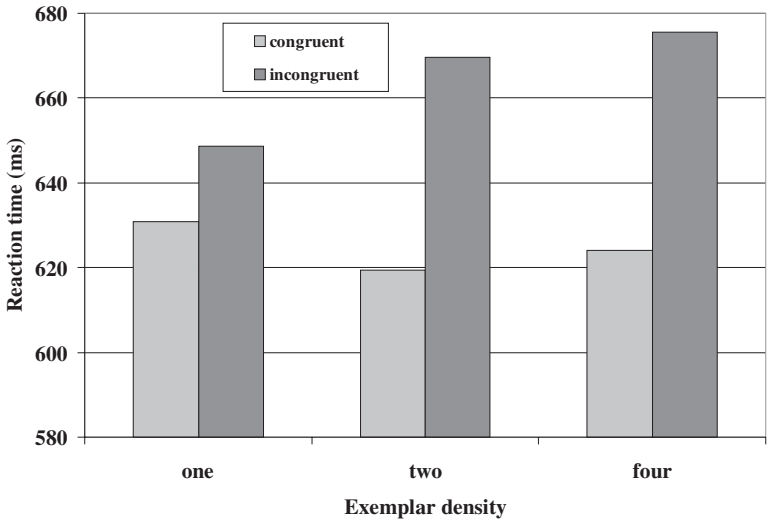

FIGURE 2. Participants' response times on the name-classification task (Experiment 1) as a function of trial type and number of distracter faces.

trials (26 per condition), participants were thanked, debriefed, and dismissed.

RESULTS AND DISCUSSION

The dependent measure of interest in this experiment was the median time taken by participants to classify the target words as stereotypically male or female. Trials on which errors were committed (8.5%) were excluded from the analysis. Participants' median response times were submitted to a two–factor (trial type: congruent or incongruent) × (number of distracter faces: one, two, or four) repeated measures ANOVA. This revealed a main effect of trial type, $F(1, 36) = 5.25$, $p < .03$, such that faster response times were returned on congruent ($M = 761$ ms) than on incongruent ($M = 780$ ms) trials. No other effects were statistically significant (see Figure 3).

Extending the results of Experiment 1, the current study explored the possibility that when confronted by a social target (or targets), perceivers automatically access gender–related knowledge in memory. The results revealed that the presence of even a single *unattended* face is sufficient to activate gender–related semantic information in

memory. Interestingly, however, these effects were small and were not affected by the number of distracting faces flanking the target word. Such a finding suggests that, although faces do elicit activation of stereotypically related knowledge in memory, there may be limits to the magnitude or strength of this effect. It may be the case that, in the absence of attention and controlled processing, automatic access to stereotype–related knowledge is limited.

GENERAL DISCUSSION

Given the complexities inherent in social exchange, the efficiency with which humans make sense of social situations is astounding. Of the many sophisticated mechanisms the mind evolved to deal with the challenges imposed by social interaction, those supporting face processing are among the most impressive. Humans detect complex social messages transmitted via facial movements (Edwards, 1998), they distinguish among and remember faces with impressive ease (Ellis, 1975) and they intuit mental states (e.g., "terribly bored") from subtle facial cues (Baron–Cohen, Wheelwright, & Jolliffe, 1997). Of interest to the current investigation is whether focal attention is required to construe people in terms of their facial appearance or whether, in the presence of diagnostic facial cues (e.g., "stubble," "hairstyle"), perceivers spontaneously classify targets (e.g., "male") and access the meaning of these classifications from long–term memory (e.g., "technically savvy"). Several social psychologists have suggested that exposure to a target is sufficient to trigger categorical thinking and elicit stereotypical beliefs (Bargh, 1984, 1999; Deaux & Lewis, 1984; Devine, 1989; Dovidio et al., 1986; Fiske & Neuberg, 1990). If such a position is valid, then the mere presence of diagnostic facial features should increase the accessibility of an object class and associated knowledge in memory.

Experiment 1 explored the possibility that the mind classifies target faces by sex independently of both conscious effort and attention. Consistent with this position, task–irrelevant faces modulated participants' performance on a forename–classification task (i.e., responses were faster to forenames flanked by gender–congruent than by gender–incongruent faces). This effect, moreover, was moderated by the number of faces flanking the target name such that, as the number of incongruent faces increased, so did the magnitude of the interference observed. Dovetailing on evidence that humans are ad-

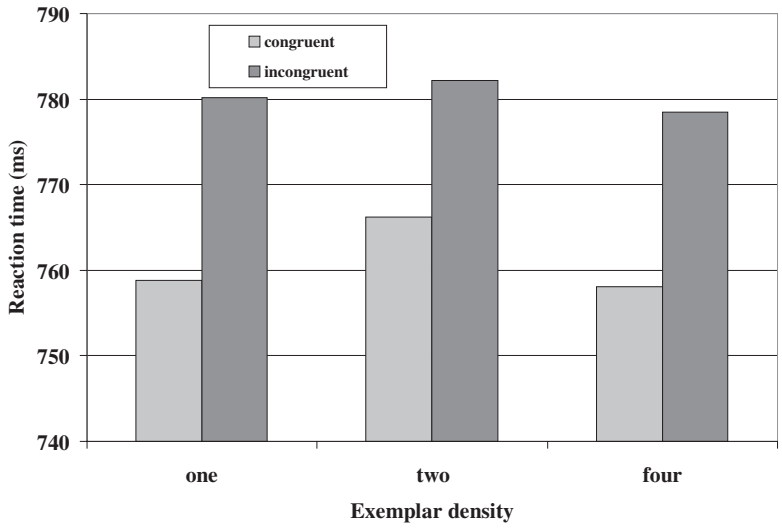

FIGURE 3. Participants' response times on the word-association task (Experiment 2) as a function of trial type and number of distracter faces.

ept at determining sex from facial features (Brown & Perrett, 1993; Bruce et al., 1993; Burton, et al.,1993), these findings suggest that perceivers are extremely sensitive to sex–specifying featural information and, in the absence of top–down processing operations (e.g., goals, expectations), they efficiently extract physiognomic features from faces and match this information to a category representation in memory.

Consistent with the sensitivity to physiognomic sex cues observed in Experiment 1 are recent findings indicating that complex objects can be classified even when attention is allocated elsewhere (Lavie, Ro, & Russell, 2003; Li, Van–Rullen, Koch, & Perona, 2002; Liu, Harris, & Kanwisher, 2002; Rousselet, Fabre–Thorpe, & Thorpe, 2002; Thorpe, Fize, & Marlot, 1996). Results of several investigations indicate that, in addition to detecting simple salient stimuli (Braun & Julesz, 1998; Treisman & Gelade, 1980), humans are able to access sophisticated higher level representations (e.g., semantic) presented outside the focus of attention. In other words, the "gist" of certain complex stimuli is available preattentively (Biederman, 1972; Li et al., 2002; Wolfe, 1998). Particularly relevant to the present investigation are findings from a recent study by Reddy, Wilken, and Koch

(2004) demonstrating that this perceptual efficiency extends to faces. In accordance with the effects observed in Experiment 1, their results indicate that sex can be assessed from faces even in the absence of focused attention. Lending further credence to the suggestion that sex classification unfolds independently of attention are recent event-related potential (ERP) and magnetoencephalography (MEG) findings demonstrating that the average latency of face–sex selective responses is too rapid (on the order of 100–150 ms) to depend on attentional allocation (Liu et al., 2002; Mouchetant–Rostaing, Giard, Bentin, Aguera, & Pernier, 2000; Schendan, Ganis, & Kustas, 1998; Yamamoto & Kashikura, 1999). In light of these findings, it seems reasonable to conclude that the human visual system is extremely sensitive to physiognomic sex–specifying cues and that, even in the absence of focused visual attention, the mind uses this information to rapidly classify faces in a categorical manner.

Classifying a target, however, is only part of the challenge facing social perceivers. In order to generate expectations and contextualize someone's behavior, perceivers must access the meaning associated with a pertinent social category from memory (Gilbert & Hixon, 1991). Accordingly, Experiment 2 explored the possibility that mere exposure to physiognomic sex cues is sufficient to increase the accessibility of semantically related information. Consistent with this position, the results of Experiment 2 demonstrated that congruent faces decreased the amount of time participants needed to classify target words as stereotypically "male" or "female," compared to conditions in which the target words were flanked by gender–incongruent faces. However, unlike the results of Experiment 1, this effect was not qualified by the number of distracting faces present on the screen. The absence of such an effect is noteworthy and warrants further discussion.

It is generally assumed among social psychologists that stereotypes are automatically activated when members of a social category are encountered (Bargh, 1994; Deaux & Lewis, 1984; Devine, 1989; Dovidio et al., 1986; Fiske & Neuberg, 1990). Stereotypes are conceptualized as distinct traits or attributes that become associated with a category in a conceptual network after frequent and consistent co–occurrence (Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Fiske, 1982; Higgins & King, 1981; Stephan & Stephan, 1993). Once a category representation is activated, excitation is thought to spread spontaneously through the pertinent knowledge network to linked

stereotypic attributes and traits (Collins & Loftus, 1975). In contrast to traditional views that posit a direct, fated link between category and stereotype representations (e.g., Allport, 1954; Hamilton, 1981), results of the present investigation suggest that the spreading of activation from a category representation to nodes of associated knowledge is constrained. The current investigation found that an increase in the accessibility of the categories "male" and "female" was not followed by an equivalent increase in the accessibility of stored knowledge about these categories. Consistent with several studies demonstrating that category and stereotype activation are distinct processes (e.g., Lepore & Brown, 1997), the absence of a one–to–one relationship between category and stereotype activation in the current investigation reinforces the importance of maintaining a clear distinction between the processes employed to classify (e.g., categorize) a target and those involved in the retrieval of generic knowledge (e.g., stereotypes) related to the category in memory.

Despite several notable advances made by social psychologists in the realm of person perception, a thorough understanding of the mechanisms employed by social perceivers is hampered by the field's tendency to overlook the early perceptual processes involved in person construal (but see Blair et al., 2004; Cloutier et al., 2005; Levin, 2000; Livingston & Brewer, 2002; Maddox, 2004; Mason & Macrae, 2004; Quinn & Macrae, 2005; Zebrowitz, 1997). For the most part, researchers have assumed that a category label (i.e., the word "female") is the symbolic equivalent of a true visual exemplar (i.e., a female face). As a result, the dominant stereotype activation models are mostly semantic–based (i.e., they are not explicit about how a visual input activates a category node in the first place). Although these models speak to the manner in which the mind represents social knowledge, how this information is retrieved when an exemplar is encountered remains unspecified.

The aim of the present investigation was to determine whether exposure to an unattended visual exemplar (i.e., a face) is sufficient to trigger activation of categorical and stereotypical information in memory. Given the focus of the present investigation (the perceptual operations underscoring category and stereotype activation), it seems appropriate to consider the results in light of theoretical face processing models (e.g., Bruce & Young, 1986; Burton, Bruce, & Johnston, 1990). According to these models, the visual system transforms two-dimensional images projected onto the retina into meaningful

representations of a person through a series of sophisticated processing steps. This process begins when the mind extracts diagnostic information from faces and constructs a "structural representation" or a set of codes describing physical aspects of the face (Bruce & Young, 1986). In addition to containing information that helps distinguish among individuals, this abstract representation is thought to incorporate aspects of the face that are essential to classify the face according to social categories (see Davies, Ellis, & Shepherd, 1981 and Ellis, 1975, for reviews). Once a target's structural description is computed, the face processing system generates visually derived "semantic codes" that contain information about a target's age, sex, and race by matching the target's structural description to stored prototypes. It is at this point in the processing stream that a target is likely classified according to sex. In order to access stereotypic knowledge, the face processing system interfaces with semantic systems where associated knowledge is stored (Bruce & Young, 1986). As is evident by this description, the distinction between categorization (i.e., classifying a face according to sex, age, or race) and stereotyping (i.e., retrieving relevant knowledge from memory) from a face processing perspective is clear—categorization and stereotyping are distinct operations.

The present results indicate that even in the absence of focal attention, faces tend to trigger category and stereotype activation. Within a face processing framework, the current findings suggest that the mind computes a "structural representation," generates a visually derived "semantic code" and retrieves semantically related knowledge from memory in a relatively effortless, fluid manner (Bruce & Young, 1986). Two outstanding goals in person perception research are specifying the relationship between categories and stereotypes and delineating the factors that moderate their activation. We suggest that a fruitful approach to resolving these issues may involve considering the questions using models of face processing as a guiding framework (e.g., Bauer, 1986; Bruce & Young, 1986; Burton et al., 1990). It may be the case that factors that influence the face processing system's ability to generate a "structural representation" or compute a "semantic code" are those that moderate category activation. Stereotype activation, in turn, may also depend on these factors together with the availability of resources to retrieve semantic knowledge from memory.

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