

A face with a cue: Exploring the inevitability of person categorization

DOUGLAS MARTIN* AND C. NEIL MACRAE
School of Psychology, King's College, University of Aberdeen, UK

Abstract

Recent research has explored the dynamics of categorical thinking, with debate centering on the putative automaticity of this process. In a further investigation of this topic, the current inquiry assessed the influence of critical category-cueing facial features on overt (i.e., category identification) and covert (i.e., category priming) measures of sex categorization. The results revealed that when a critical sex-specifying facial cue (i.e., hairstyle) was present, priming effects emerged even under suboptimal processing conditions (i.e., facial blurring). When this cue was absent, however, priming no longer occurred. Interestingly, category identification was largely unimpeded by feature removal or facial blurring. Taken together, these results underscore the efficiency of categorical thinking and the importance of task objectives and feature-based processing in person perception. Copyright © 2007 John Wiley & Sons, Ltd.

How can one see a . . . woman and yet fail to categorize her instantly as such?
Gilbert and Hixon (1991, p. 515)

When is a woman not a woman? The answer—at least according to Gilbert and Hixon (1991)—when she's a card turner and encountered in a mentally demanding task environment. Confronted with an Asian woman displaying to-be-completed word fragments (e.g., *ri_e*), Gilbert and Hixon were interested in the extent to which participants would furnish stereotypic responses on critical experimental trials (e.g., *rice* rather than *ripe*). Their reasoning was quite straightforward. If such completions were provided, it would indicate that participants had gained access to stereotypic knowledge through the spontaneous categorical construal of the card turner. As it turns out, this is exactly what happened, except when participants were required to perform a concurrent mental activity (i.e., digit-rehearsal) during the task. Under these conditions, resource depletion impeded the

*Correspondence to: Dr Douglas Martin, School of Psychology, King's College, University of Aberdeen, Aberdeen AB24 2UB, Scotland, UK. E-mail: d.martin@abdn.ac.uk

generation of stereotypic items, prompting Gilbert and Hixon (1991) to conclude that category activation is not an inevitable consequence of exposure to a target (Allport, 1954), an assumption that had dominated research and theorizing in social psychology for almost 50 years (Brewer, 1988; Fiske & Neuberg, 1990).

Notwithstanding the force of Gilbert and Hixon's (1991) challenge to orthodox theoretical wisdom (Allport, 1954), arguably the most intriguing aspect of their findings emerged not when participants completed word fragments, but rather when they were probed about their experiences during the experiment. Almost without exception, participants reported seeing a female Asian card turner, a somewhat puzzling occurrence given their failure to classify the assistant as such during the task. Herein, then, lies something of a puzzle. How could participants be cognizant of the assistant's category membership, yet fail to access this knowledge during the fragment-completion task? Is it really possible to see a woman, verbally identify her as such, yet fail to activate the relevant category-based representation in memory? We revisited this intriguing question in the current investigation.

EXPLORING PERSON CATEGORIZATION

Guided by the assumption that categorical thinking is as inescapable facet of social-cognitive functioning (Allport, 1954; Bargh, 1999; Brewer, 1988; Fiske & Neuberg, 1990), researchers have employed non-reactive experimental procedures (e.g., semantic priming) to explore the process of person categorization. The fruits of this endeavor have been impressive, with an extensive literature charting the determinants and consequences of category activation (Bargh, 1999; Blair, 2002; Macrae & Bodenhausen, 2000). While initial investigations echoed Allport's (1954) conviction that it is impossible to encounter an individual without triggering the relevant categorical representation in memory (i.e., *unconditional* automaticity—Bargh, 1999; Brewer, 1988; Devine, 1989; Dovidio, Evans, & Tyler, 1986), recent research has qualified this assertion through the identification of factors that reliably modulate category activation (i.e., *conditional* automaticity—Blair, 2002; Macrae & Bodenhausen, 2000). In a by no means exhaustive list, category activation has been shown to be attenuated (or eliminated) when: (i) person construal is irrelevant to people's current processing concerns (Macrae, Bodenhausen, Milne, Thorn, & Castelli, 1997; Wheeler & Fiske, 2005); (ii) attentional resources are depleted (Gilbert & Hixon, 1991); and (iii) perceivers are motivated to avoid categorical thinking (Lepore & Brown, 1997; Locke, Macleod, & Walker, 1994; Wittenbrink, Judd, & Park, 1997). In other words, category activation is moderated by the internal state (e.g., attentional capacity, processing goals, personal beliefs) of the perceiver.

Extending this flexible account of the categorization process, recent work also points to the facial characteristics of to-be-construed targets as an important determinant of category activation (Blair, Chapleau, & Judd, 2005; Blair, Judd, & Chapleau, 2004; Blair, Judd, Sadler, & Jenkins, 2002; Livingston & Brewer, 2002; Locke, Macrae, & Eaton, 2005; Maddox & Gray, 2002). For example, targets with Afrocentric facial features are more likely to elicit stereotype-based reactions and evaluations than their less prototypical counterparts (Blair et al., 2004, 2005; Livingston & Brewer, 2002). Similarly, strength of category activation is modulated by the facial typicality of presented exemplars, such that typical targets facilitate access to category-related knowledge in memory (Locke et al., 2005). What these findings and others suggest is that feature-based information plays a pivotal role in the person-perception process (Schyns, 1998). Extending work of this kind, we suspect that further consideration of how facial cues shape the process and products of person

construal may inform current understanding of when person registration does and does not trigger category activation.

FEATURE DETECTION AND PERSON CONSTRUAL

As Tarr and Cheng (2003, p. 23) have observed, 'Visual recognition of objects is an impressively difficult problem that biological systems solve effortlessly.' Nowhere is this more apparent than in the domain of person perception where even the merest of glances at a face is sufficient to furnish an abundance of information about its owner (e.g., sex, age, emotional status). How exactly a person is construed is guided by a variety of factors, but most notably the quality of available visual inputs and the processing goals that are operating during stimulus appraisal (Schyns, 1998). Bound tightly to basic perceptual operations, person categorization is driven by the presence of critical featural cues in the available visual inputs (Bruce & Young, 1986), cues that are sufficient to support category identification (Schyns, Bonnar, & Gosselin, 2002; Schyns & Oliva, 1999). Recent research has demonstrated that isolated facial cues drive sex categorization when perceivers are required to sex a face (Schyns et al., 2002). The efficiency of feature-based categorization is evidenced by the observation that featural cues are extracted from faces very early in the visual processing stream (Liu, Harris, & Kanwisher, 2002; Mouchetant-Rostaing & Giard, 2003), thereby enabling perceivers to undertake a rapid categorical appraisal of others.

For researchers interested in the dynamics of person construal, feature-based accounts of the categorization process give rise to a number of interesting empirical possibilities. In particular, feature availability may determine the course and products of the person-perception process. When critical category-specifying facial cues are present, it is possible that person categorization may occur even when the task confronting perceivers is challenging (cf. Gilbert & Hixon, 1991) and does not demand the explicit classification of a target (cf. Schyns et al., 2002). That is, cue registration may be sufficient to trigger category activation (Liu et al., 2002; Macrae & Martin, *in press*). In the absence of these critical cues, however, it is possible that spontaneous person categorization may fail to occur, even under optimal face-processing conditions and despite the fact that perceivers are able to identify applicable target-relevant categories when explicitly probed. In other words, (i) cue availability may determine whether category activation has the appearance of an unconditionally or conditionally automatic mental process (Bargh, 1989; Blair, 2002); and (ii) the products of person construal may depend on the manner in which person perception is probed. To explore these possibilities, we examined the effects of cue availability on overt and covert measures of sex categorization in both optimal and suboptimal processing environments (Cloutier, Mason, & Macrae, 2005).

THE PRESENT RESEARCH

Although perceivers use a range of facial information to establish the sex of a target (e.g., stubble, eyebrow shape/thickness), by far the most reliable cue when it comes to sexing a face is a person's hairstyle (Brown & Perrett, 1993; Burton, Bruce, & Dench, 1993; Goshen-Gottstein & Ganel, 2000). Indeed when instructed to report the sex of a target, perceivers frequently only attend to hair cues to accomplish this task (Goshen-Gottstein & Ganel, 2000). But would hair cues trigger category activation in task contexts in which overt classification is not perceivers' primary concern? Not only do

we suspect that they would (see Macrae & Martin, in press), but also that activation will persist even under conditions that impair the efficiency of face processing, such as stimulus degradation (Cloutier et al., 2005). Given the automaticity of feature extraction from faces (Liu et al., 2002), it is unlikely that person categorization would be fatally disabled in perceptually demanding task environments, after all these are precisely the settings in which categorical thinking is believed to be most useful to perceivers (Macrae & Bodenhausen, 2000). Thus, detection of a critical sex-specifying feature is likely to prompt spontaneous category activation (Bargh, 1999), even when faces are encountered in challenging visual environments.

A quite different pattern of effects may emerge when hair cues are unavailable to perceivers. Specifically, category activation may fail to occur even under optimal face-processing conditions. If spontaneous categorization is driven by the detection of a dominant sex-specifying cue (Macrae & Martin, in press; Schyns et al., 2002), then removal of the cue should impede the emergence of this effect. Paradoxically, however, we do not anticipate that feature removal will prevent perceivers from successfully identifying the sex of a target. As other sex-specifying cues remain present in the face (e.g., eyebrow shape), it is likely that perceivers will be able to utilize this information if they are explicitly requested to report the sex of a target. Importantly, however, while this information will support category identification, it will not trigger the spontaneous categorization of the target. As such, the overt (i.e., prompted categorization) and covert (i.e., category priming) products of person construal can be dissociated (Gilbert & Hixon, 1991).

To explore these predictions, we used a standard semantic priming procedure and investigated the effects of intact (i.e., hair present) and cropped (i.e., hair absent) faces on person construal. To assess the efficiency of person categorization, we varied the ease with which information could be extracted from faces by perceptually degrading (i.e., blurring) the priming stimuli to varying degrees (Cloutier et al., 2005). Following completion of the priming task, participants were also required to sex the canonical and blurred faces (i.e., priming stimuli). In this way, we were able to contrast the effects of cue availability and facial blurring on the products of prompted and spontaneous construal.

METHOD

Participants and Design

Thirty-six undergraduates from the University of Aberdeen (30 females, 6 males) participated in the experiment. The experiment had a 2 (face: intact or cropped) \times 6 (blur: 0, 3, 6, 9, 12, or 15 pixels) \times 2 (trial type: matching or mismatching) repeated measures design.

Procedure and Stimulus Materials

Participants arrived at the laboratory individually, were greeted by a male experimenter, seated at a Viglen PC, and informed that the study comprised an investigation of people's ability to classify faces by sex. It was explained that a series of faces would appear in the center of the screen and the task was simply to indicate, via a key press, whether the target person was male or female. The priming stimuli comprised grayscale digital headshots (250 \times 320 pixels) of 144 unfamiliar individuals (72 men and 72 women) in frontal pose, displaying neutral facial expressions, standardized for pupil distance from the camera. To create the visually degraded (i.e., blurred) primes, additional versions of each face

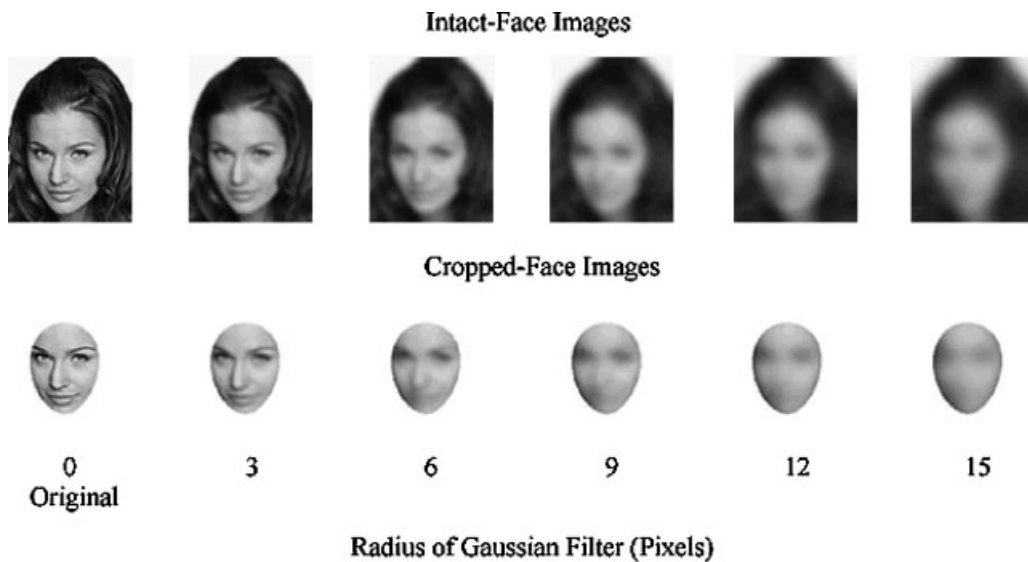


Figure 1. Examples of stimulus materials

(intact and cropped) were created by digitally altering the original images using the Gaussian filter that is available in Adobe Photoshop (Version 8.0). Stimuli were generated by applying a Gaussian filter of increasing radius to the images (3, 6, 9, 12, and 15 pixels, respectively), with higher values representing greater distortion (see Figure 1 for examples of stimuli). To create the cropped primes, a standard oval mask was used to remove hair cues from the faces. Although in total there were 1728 prime images created (144 individual faces \times 2 face condition \times 6 blur condition), participants only viewed each individual prime face twice, once in the intact face condition and once in the cropped face condition. Thus, the extent that a single prime image was blurred remained constant within subjects but was counterbalanced across participants. The target stimuli comprised an additional 144 headshots of 144 unfamiliar people (72 men and 72 women). Both prime and target face images consisted males who had short hair and were clean-shaven and females who had long hair and were not wearing make-up.

Each trial comprised the appearance of a fixation cross (500 ms) which was replaced by a priming stimulus (200 ms). A target face (male or female) then appeared on the screen and remained until a response was made. The inter-trial interval was 1500 ms. Participants completed 288 trials, with each face appearing twice, once in the intact-prime condition and once in the cropped-prime condition. The order of presentation of the trials was randomized and the computer recorded the accuracy and latency of each response. The meaning of the response keys (i.e., male/female or female/male) was counterbalanced across participants.

Following the priming task, participants completed a sex-categorization task on the facial primes. Participants were instructed that they would be presented with a series of faces, some of which would be blurred. Their task was to indicate, via a key press, the sex of the person. Each trial comprised the appearance of a fixation cross (500 ms), which was then replaced by a target face which remained on the screen until a response was made. Participants completed 288 trials (144 intact faces and 144 cropped faces). The order of presentation of the trials was randomized and the computer recorded the accuracy and latency of each response. The meaning of the response keys (i.e., male/female or female/male) was counterbalanced across participants. On completion of the task, participants were debriefed and dismissed.

RESULTS

Category Priming

The dependent measure of interest was the time taken by participants to classify the target items by sex. Trials on which errors were committed (3%) were excluded from the analysis. Median reaction times were submitted to a 2 (face: intact or cropped) \times 6 (blur: 0, 3, 6, 9, 12, or 15 pixels) \times 2 (trial type: matching or mismatching) repeated measures analysis of variance (see Figure 2). This revealed a significant face \times trial type interaction, $F(1, 35) = 10.67$, $p < .01$, $\eta^2 = 0.234$. *Post-hoc* Tukey tests showed that whereas participants responded faster on matching than mismatching trials following intact facial primes (respective *M*s: 687 ms vs. 703 ms; $p < .05$; Figure 2, top panel), a comparable effect did not emerge when target faces followed cropped facial primes (respective *M*s: 678 ms vs. 667 ms; Figure 2, bottom panel). Importantly, this effect was not qualified by stimulus degradation [face \times blur \times item type, $F(5,175) = 1.02$, ns], thereby revealing the efficiency of feature detection from intact faces.

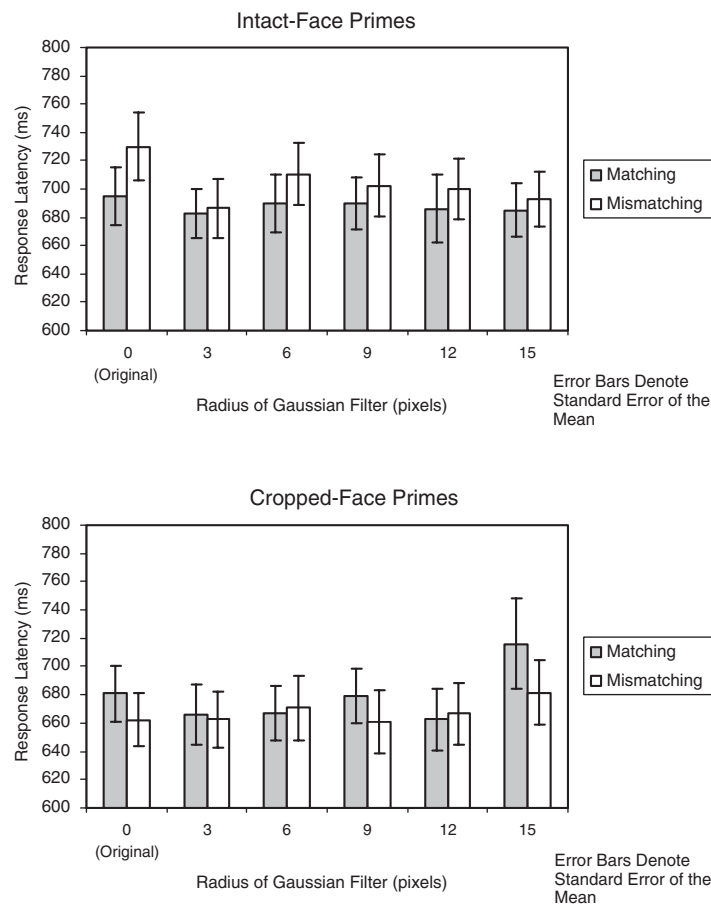


Figure 2. Task performance as a function of prime, blur and trial type (intact-face primes, top panel; cropped-face primes, bottom panel)

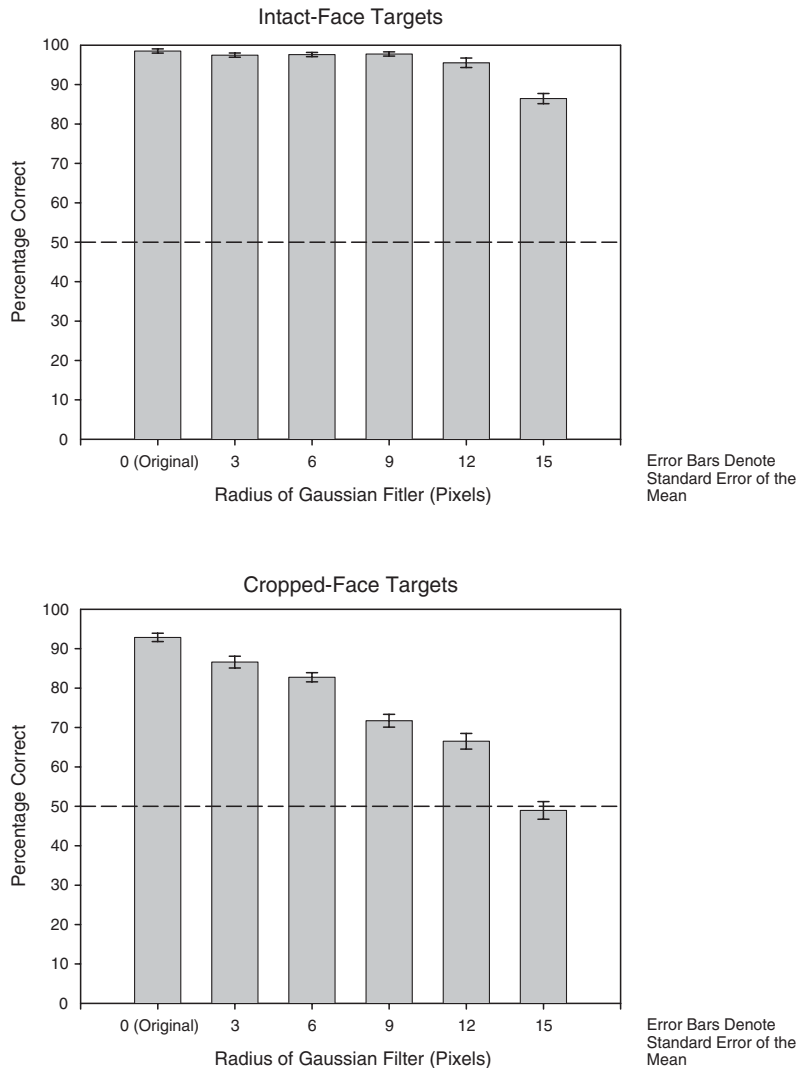


Figure 3. Percentage of intact and cropped face targets correctly classified (intact-face targets, top panel; cropped-face targets, bottom panel)

Category Identification

The dependent measure of interest was the percentage of targets that were correctly classified by participants (see Figure 3). To establish if task performance exceeded chance in each of the experimental conditions, participants' scores were contrasted with 50% (i.e., chance performance; *t*-tests, Bonferroni corrected). These analyses revealed significant performance (all p 's < .0001) in all but one condition (cropped facial prime, radius 15 pixels, percentage correct = 50.7%). Thus, participants were able to report the sex of visually degraded faces, even when hair cues were absent.

GENERAL DISCUSSION

Even casual observers of social psychological writings would be hard pressed to ignore one of the field's recent intellectual disagreements—whether or not category (and stereotype) activation is an unconditionally automatic mental process (i.e., the 'cognitive monster' debate—see Bargh, 1999). As one would expect of such a dispute, the views expressed by the opposing camps were decidedly polarized (see Bargh, 1999; Blair, 2002; Macrae & Bodenhausen, 2000). Endorsing Allport's (1954) account of the unconditional automaticity of category activation, Bargh (1999, p. 366) opined that, 'It would be nice if stereotypes were found not to be activated automatically . . . but the relevant research evidence largely contradicts this rosy picture.' Countering this position and favoring instead the viewpoint that category activation is malleable, Blair (2002, p. 255) argued that '... automatic stereotypes can be moderated by a wide variety of events.' So which account is correct? Is category activation an inevitable, inescapable element of the person-perception process (Bargh, 1999), or can it be avoided (Blair, 2002; Macrae & Bodenhausen, 2000)?

The current findings reveal the complex character of person construal. Depending on the presence of critical facial cues, spontaneous category activation (as indexed via category priming) can appear to be both an inevitable *and* avoidable consequence of target registration. When hair cues were present (i.e., intact faces), priming effects emerged regardless of the quality of the available visual inputs. These effects were eliminated, however, when hair cues were absent (i.e., cropped faces), even under optimal face-processing conditions (Goshen-Gottstein & Ganel, 2000). So in what sense is category activation automatic? Scrutiny of the visual operations that drive person categorization may illuminate this issue. Rather than characterizing category activation as an obligatory mental event (Brewer, 1988; Fiske & Neuberg, 1990), it may be more accurate to restrict this description to the perceptual processes that extract information from faces (Liu et al., 2002; Mouchetant-Rostaing & Giard, 2003). Operating in a mandatory fashion, these basic visual processes extract feature-based information from faces (e.g., hair cues, gaze direction), information that supports a range of person-related judgments, including sex categorization (Haxby, Hoffman, & Gobbini, 2000, 2002). When however these visual operations are unable to detect critical sex-specifying cues (i.e., hair cues)—as is the case when cropped faces are the stimuli of interest—category activation fails to occur. Thus, whether or not spontaneous category activation emerges is a function of feature availability.

But does failure to categorize a target imply that people are unable to identify the sex of the individual in question? The answer is a resounding no. When required to report the sex of the facial primes, participants were remarkably adept at this task. Indeed, neither missing hair nor stimulus distortion did much to impair their performance. Importantly, these findings corroborate Gilbert and Hixon's (1991) observation that, under certain processing conditions, category activation and category identification can be dissociated. That is, the ability to report the sex of an individual does not imply that the person has been spontaneously categorized as such; just as the ability to report the race of a card turner was not contingent on the spontaneous activation of that racial category when the individual was initially encountered (Gilbert & Hixon, 1991).

In the present study, the dissociation between automatic and explicit construal can likely be traced to the diagnostic featural cues (e.g., hair cues) that ordinarily guide the categorization process (Schyns, 1998; Schyns et al., 2002). When these cues are present, categorization proceeds in a spontaneous manner (Liu et al., 2002). When, however, these cues are absent, automatic categorization is impeded while explicit categorization remains intact. At first blush, the current findings appear to contradict Gilbert and Hixon (1991). As category-specifying facial cues were always present, why did their participants fail to activate the relevant representation when cognitively busy? The weakness of Asian stereotypes in the sample under consideration may provide a clue. In the face of a weakly held

stereotype, cognitive busyness may obstruct category activation. It remains to be seen, however, if busyness would similarly impede sex categorization (i.e., strong stereotype). It is possible, for example, that both busy and non-busy participants may have categorized the card turner by sex in the paradigm employed by Gilbert and Hixon (1991). As sex categorization was never assessed, it is unclear if this was indeed the case. What is apparent, however, is that self-reported incidences of categorical thinking should not be taken as hard and fast evidence that spontaneous categorization has occurred. It would seem that sometimes participants only categorize a target when they are instructed to do so.

Notwithstanding the current observation that category activation fails to emerge when critical sex-specifying cues (i.e., hair cues) are absent, it is reasonable to question whether such conditions are encountered on a regular basis in life outside the laboratory. Apart from exchanges with bald people and individuals wearing hats, hair cues may rarely be unavailable to perceivers. In this respect, Bargh (1999) is probably accurate in his assertion that categorical thinking frequently dominates social interaction, or at least has the capacity to do so. Although, in a technical sense (and as demonstrated herein), category activation may be a conditionally automatic mental process (Blair, 2002; Macrae & Bodenhausen, 2000), practically speaking it may be the norm rather than the exception during most social interactions. It is perhaps no accident therefore that categorical thinking is most pronounced for groups that are characterized by the possession of a single salient feature (e.g., sex—hairstyle, race—skin tone, age—wrinkles). Through the operation of basic perceptual processes that extract featural information from faces (Liu et al., 2002; Mouchetant-Rostaing & Giard, 2003), these categories can be triggered with rapidity and ease.

While category activation may routinely follow the perceptual registration of triggering featural cues, it is important to note that the impact of this activation is not identical across all processing episodes. Rather, categorical thinking is modulated by the facial typicality of encountered exemplars (Blair et al., 2002, 2004, 2005; Livingston & Brewer, 2002; Locke et al., 2005). As a rapidly emerging literature now demonstrates, through the lens of categorical thinking, typical and atypical group members elicit quite different behavioral reactions (e.g., Blair et al., 2002). Thus, while social-cognitive functioning may take place against the backdrop of categorical thinking, this backdrop can vary with respect to the effects it exerts on person evaluation. In addition, on occasion, dominant category-specifying cues (e.g., hair cues) can actually lead perceivers astray and prompt the generation of errors of categorical construal. Consider, for example, the categorical puzzle posed by a man with long, flowing locks and a woman with short, cropped hair. Given the potency of hair cues (Goshen-Gottstein & Ganel, 2000), how would these targets be spontaneously construed by perceivers? In a recent study, Macrae and Martin (in press) have shown that when ample time is available to process a face, long-haired men and short-haired women elicit veridical categorical responses. When, however, face processing is constrained through rapid stimulus presentation, cue detection prompts the generation of errors of construal; specifically categorical sex changes (Macrae & Martin, in press). Thus, while feature detection can trigger category activation in a rapid and effortless manner, what exactly gets activated and how these representations guide person evaluation is subject to considerable variability.

CONCLUSION

A common tactic in social psychology is to capture the essential characteristics of social-cognitive functioning with an apposite metaphor. For example, if one subscribes to the view (and indeed many do) that capacity limitations constrain social cognition, then the favored characterization of the social perceiver is as a *cognitive miser* (Fiske & Taylor, 1991). In a world of booming, buzzing confusion (i.e.,

information overload), perceivers categorize others not through choice, but necessity. Although popular and appealing, the cognitive miser metaphor conveys an overly rigid portrayal of the social perceiver and the process of person construal. What emerges in the current investigation is that person categorization is an inherently flexible and efficient process, reflecting both the quality of available visual inputs and the manner in which person perception is assessed. When critical category-cueing facial features are present, category activation emerges in an unprompted manner in even challenging environments, a finding that underscores the efficiency of the process. When, however, these critical features are absent, spontaneous category activation does not occur—only when perceivers are explicitly requested to sex a face do they appear to do so. Herein, then, lies the inherent flexibility of person construal. Sometimes the categorical products of person perception emerge in an unprompted, spontaneous manner; while on other occasions their appearance is contingent upon explicit probing. What this suggests is that, under certain conditions, it is indeed possible to encounter a woman, overtly classify her as such, yet fail to activate the relevant category-based representation in memory.

ACKNOWLEDGEMENTS

We thank Lorna Sommerville for her assistance collecting data for this project. We also thank Leonel Garcia-Marques and three anonymous reviewers for their comments on this work. During this research, CNM was supported by a Royal Society-Wolfson Fellowship.

REFERENCES

- Allport, G. W. (1954). *The nature of prejudice*. Reading, MA: Addison-Wesley.
- Bargh, J. A. (1999). The cognitive monster: The case against controllability of automatic stereotype effects. In S. Chaiken, & Y. Trope (Eds.), *Dual process theories in social psychology* (pp. 361–382). New York: Guilford.
- 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.
- Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality and Social Psychology Bulletin*, 6, 242–261.
- Blair, I. V., Chapleau, K. M., & Judd, C. M. (2005). The use of Afrocentric features as cues for judgment in the presence of diagnostic information. *European Journal of Social Psychology*, 35, 59–68.
- Blair, I. V., Judd, C. M., & Chapleau, K. M. (2004). The influence of Afrocentric facial features in criminal sentencing. *Psychological Science*, 15, 674–679.
- Blair, I. V., Judd, C. M., Sadler, M. S., & Jenkins, C. (2002). The role of Afrocentric facial features in person perception: Judging by features and categories. *Journal of Personality and Social Psychology*, 83, 5–25.
- Brewer, M. B. (1988). A dual process model of impression formation. In R. S. J. Wyer, & T. K. Srull (Eds.), *Handbook of social cognition* (pp. 1–36). Hillsdale, NJ: Erlbaum.
- Brown, E., & Perrett, D. I. (1993). What gives a face its gender? *Perception*, 22, 829–840.
- Bruce, V., & Young, A. W. (1986). Understanding face recognition. *British Journal of Psychology*, 77, 305–327.
- Burton, A. M., Bruce, V., & Dench, N. (1993). What's the difference between men and women? Evidence from facial measurement. *Perception*, 22, 153–176.
- Cloutier, J., Mason, M. F., & Macrae, C. N. (2005). The perceptual determinants of person construal: Reopening the social-cognitive toolbox. *Journal of Personality and Social Psychology*, 88, 885–894.
- 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.

- Fiske, S. T., & Neuberg, S. L. (1990). A continuum model of impression formation from category based to individuating processes: Influences of information and motivation on attention and interpretation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 1–74). San Diego, CA: Academic Press.
- Fiske, S. T., & Taylor, S. E. (1991). *Social cognition* (2nd ed.). New York: McGraw-Hill.
- 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 human 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*, *21*, 56–67.
- Lepore, L., & Brown, R. (1997). Category and stereotype activation: Is prejudice inevitable? *Journal of Personality and Social Psychology*, *72*, 275–287.
- Liu, J., Harris, A., & Kanwisher, N. (2002). Stages of processing in face perception: A 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 activation of stereotypes: Individual differences associated with prejudice. *British Journal of Social Psychology*, *33*, 29–46.
- Locke, V., Macrae, C. N., & Eaton, J. L. (2005). Is person categorization modulated by goodness-of category fit? *Social Cognition*, *23*, 417–428.
- 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., Thorn, T. M. J., & Castelli, L. (1997). On the activation of social stereotypes: The moderating role of processing objectives. *Journal of Experimental Social Psychology*, *22*, 471–489.
- Macrae, C. N., & Martin, D. (in press). A boy primed Sue: Feature-based processing and person construal. *European Journal of Social Psychology*.
- Maddox, K. B., & Gray, S. A. (2002). Cognitive representations of black Americans: Re-exploring the role of skin tone. *Personality and Social Psychology Bulletin*, *28*, 250–259.
- Mouchetant-Rostaing, Y., & Giard, M. H. (2003). Electrophysiological correlates of age and gender perception on human faces. *Journal of Cognitive Neuroscience*, *15*, 900–910.
- Schyns, P. G. (1998). Diagnostic recognition: Task constraints, object information and their interactions. *Cognition*, *67*, 147–179.
- Schyns, P. G., Bonnar, L., & Gosselin, F. (2002). Show me the features! Understanding recognition from the use of visual information. *Psychological Science*, *13*, 402–409.
- Schyns, P. G., & Oliva, A. (1999). Dr. Angry and Mr. Smile: When categorization flexibly modifies the perception of faces in rapid visual presentations. *Cognition*, *69*, 243–265.
- Tarr, M. J., & Cheng, Y. D. (2003). Learning to see faces and objects. *Psychological Science*, *7*, 23–30.
- Wheeler, M. E., & Fiske, S. T. (2005). Controlling racial prejudice: Social-cognitive goals affect amygdala and stereotype activation. *Psychological Science*, *16*, 55–63.
- Wittenbrink, B., Judd, C. M., & Park, B. (1997). Evidence for racial prejudice at the implicit level and its relationship with questionnaire measures. *Journal of Personality and Social Psychology*, *72*, 262–274.