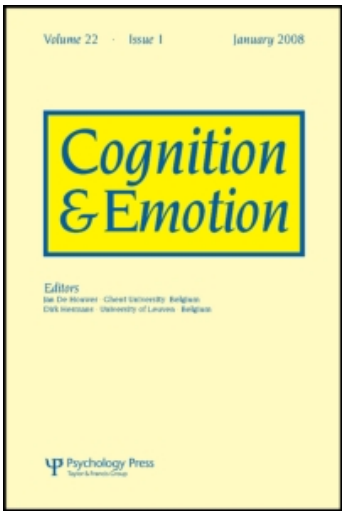

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Affective reactions to facial identity in a prosopagnosic patient

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Affective reactions to facial identity in a prosopagnosic patient

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This study probes whether a prosopagnosic patient can make accurate explicit affective judgements towards faces. Patient MJH was shown photographs of faces of well-liked family members and public figures rated as "evil" by opinion polls. MJH was asked to rate each face on two 7-point scales (Likeability and Pleasantness). Since he is unable to explicitly recognise faces, his ratings were based on his evaluative reaction to the faces presented. In a second phase of the experiment, MJH was told the name of the faces previously presented and asked to rate them using the same scales. MJH's Likeability ratings during the picture-viewing phase of the experiment and the explicit phase were highly correlated. Based on these findings, we propose that thought consists of an explicit declarative and an implicit emotional aspect, which may become dissociated in prosopagnosia.

In this paper, we use dissociations observed in prosopagnosia (PA) to explore non-linguistic forms of knowledge. Specifically, we investigate the extent of a PA patient's emotional, or affective, knowledge of faces in the absence of explicit recognition abilities.

Prosopagnosia comes in two broad types: (1) apperceptive: defined by a *perceptual* deficit in the visual processing of faces; and (2) associative: where the deficit is at the level of *memory*, or retrieval (e.g., De Renzi, Faglioni, Grossi, & Nichelli, 1991). Our subject, MJH, falls into the former category; his specific deficit is an inability to employ visual information to individuate faces. As is well documented (e.g., Michelon & Biederman, 2003), MJH is particularly poor at recognising faces of people, even when those individuals are well known. He describes the task of recognising faces as a tenuous process, relying on local cues to decipher the "experience of vacuity" he has when viewing a face (see Duchaine, 2006; Duchaine, Yovel, Butterworth, & Nakayama, 2006, for recent discussions of prosopagnosia).

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Part of our motivation for the present research derives from work by Bauer (1984; see Faulkner & Foster, 2002; Greve & Bauer, 1990; Le, Raufaste, Roussel, Puel, & Demoet, 2003, for related findings), who compared the accuracy of a psychophysiological index of recognition (GSR) with a verbal report in the Guilty Knowledge Task. Briefly, Bauer showed a PA patient two sets of faces; one set contained faces of familiar people and the other contained faces of unfamiliar people. The patient was asked whether he had seen each face before. Although PA patients have almost no explicit memory for faces, the guilty knowledge task allows the investigator to see whether the patient exhibits a non-explicit autonomic reaction to faces that he or she fails to recognise. Bauer found that a PA patient's skin conductance responses were a more accurate predictor of objective correctness than were his verbal reports.

These results have a number of interesting implications, two of which we address in the present paper: (1) Are PA patients aware of their emotional "knowledge"? and (2) Can they use this "knowledge" to make accurate evaluative judgements about faces they are unable to explicitly recognise?

Bauer's work provides evidence that explicit knowledge in the form of verbal report can be dissociated from autonomic arousal. The goal of the present research is to examine whether a PA patient can access his autonomic affective reaction to facial identity through use of emotion-rating scales. We hypothesise that MJH has affective reactions to unrecognised faces. This follows from work conceptualising emotions and affective arousal as implicit forms of thought linked by psychophysiological factors (e.g., LeDoux, 1993; Panksepp, 2005; Russell, 2005). From this perspective, MJH should be able to make accurate evaluative judgements of faces even though he cannot recognise them explicitly. We hypothesise this is due to a dissociation between explicit knowledge of facial identity (deficient in PA) and affective "knowledge" deriving from his intact autonomic reactions to the faces.

METHODS

Participant

Patient MJH, a 39-year-old, right-handed male with 16 years of education, is an apperceptive prosopagnosic patient. His specific deficit is an inability to employ visual information to individuate faces. Since a full case description has been published already (Michelon & Biederman, 2003), a brief summary is presented here. As the result of a serious accident incurred at age 5, patient MJH sustained lesions (confirmed by MRI) in his left visual cortex and right fusiform gyrus. In consequence of these injuries, he was rendered unable to identify people from visual inspection of their faces. In other respects, his

functioning is normal—recent neuropsychological evaluation showing him to be alert, attentive, socially well-adjusted and free of cognitive or intellectual impairment.

Materials

The experiment was conducted on a computer running the program SuperLab. MJH was presented a series of photographs depicting the faces of (a) well-known figures rated as "evil" by public opinion polls (e.g., Stalin and Osama Bin Laden; see Figure 1) and (b) well-liked family members (see Figure 2). Differences in photograph quality and appearance of faces of familiar and evil people were controlled by manipulating each scanned photograph in the same manner: using Microsoft™ Picture Manager, we desaturated (-100%) each photo until it had no colour. Faces were digitally cropped from desaturated photographs using the program PAINT. The pictures were approximately equated for visual features such as brightness and contrast. All possible non-facial cues to recognition, including hair and physical context, were removed. Each picture took up between 4 and 20 degrees of visual angle. Pictures of faces were presented on the screen, one at a time. Duration of each facial presentation was determined by MJH (on average, MJH spent less than a minute looking at each face stimulus). There were no systematic differences in viewing time across face categories.

For each target person presented, MJH was asked to complete two 7-point paper-based Likert scales: one represented a Like–Dislike metric, the other a Pleasant–Unpleasant metric.

Figure 1. Example of an evil face.

Figure 2. Example of a family face.

Procedure

In the first phase of the experiment, MJH saw a random presentation of 12 photographs of the faces of friends and family members (for example, his parents and sisters) as well as four faces of individuals viewed by the general public (and, as confirmed by MJH's spouse several weeks prior to the experiment, by MJH) as "evil". Since MJH has some ability to recognise the emotional expressions of faces (Michelon & Biederman, 2003), all photographs used in our study depicted the target persons smiling (see Figures 1 and 2).

The faces were presented one at a time on the computer screen. MJH was told he would be able to look at each face for as long as he desired. He was asked to rate each face on two 7-point scales (Likeability and Pleasantness). Specifically, he was told that for each face, two judgements would be required. First, he was to examine the stimulus face and decide if the face was that of someone he liked or disliked. Second, he was asked to decide whether the face was that of a person he found pleasant or unpleasant. Since MJH was unable to explicitly recognise any of the faces presented, he was informed he could make his ratings based on his emotional responses (if any) to the picture being viewed.

In the second phase of the experiment, MJH was asked to explicitly rate the same targets previously presented visually, but now specified solely by name, on the same two scales used to rate faces. The names were presented in a different, random, order than the faces.

Analysis

Scores were sorted into (a) pictures of familiar people and pictures of "evil" people, and (b) type of scale: Likeability and Pleasantness. A Pearson product coefficient was computed between the face-viewing (implicit) and name-based (explicit) conditions for the likeability ratings, pleasantness ratings and both scales combined. Finally, a two-sample repeated measures *t*-test was performed between the ratings for familiar and evil targets.

RESULTS

MJH was unable to explicitly identify any of the faces presented. Ratings of likeability based on visual presentation for familiar ($M = 1.75$) and evil ($M = 5.00$) faces differed reliably, $t(24) = 5.72$, $p < .01$. By contrast, pleasantness ratings for familiar ($M = 2.45$) and evil ($M = 2.00$) target faces were not significantly different, $t(24) = 0.356$, $p < .1$.

Of direct relevance to the hypotheses under consideration, the correlation between likeability scores across conditions (i.e., name-based vs. face-based ratings) was $r = .639$, $p < .01$. By contrast, the correlation between pleasantness scores across conditions failed to attain significance ($r = .07$, *ns*).

CONCLUSIONS

MJH's likeability ratings collected during the face-based ratings phase of the study were highly correlated with those he made during the name-based ratings phase. This suggests he has affective knowledge in the absence of explicit recognition of faces. That is, affective reactions seemed to be available to MJH when he used the phenomenological measure of likeability.

By contrast, the correlation between pleasantness ratings across conditions failed to attain significance. One possible reason for this finding is that MJH may not have fully understood what was meant by the Pleasantness scale. Echoing this concern, during the face-rating phase of the study, MJH repeatedly asked the experimenter whether pleasantness referred to the face being viewed or the person whose face it was. By contrast, he had no difficulty understanding either the meaning or referent of likeability ratings during both phases of the study.

In sum, two findings—(1) the correlation of likeability scores across conditions and (2) the significant difference between likeability ratings for faces of familiar and evil targets—support the view that MJH is capable of responding in an emotionally meaningful manner to faces he is unable to recognise at a cognitive/semantic level of analysis.

Previous studies using GSR have found implicit reactions in PA patients to faces of familiar people in the absence of explicit recognition (e.g., Bauer, 1984). The present study extends these findings by offering evidence that such implicit reactions may be explicitly available (i.e., can be tapped by conscious processes that work upon affective judgements) and are reasonably consistent with later explicit judgements on emotional rating tasks. It remains to be determined whether MJH's GSR measurements show a direct relation to his responses on emotion scales. A future project entails using GSR to investigate whether MJH has emotional knowledge of the faces of people that he is not personally familiar with (e.g., celebrities).

MJH lost his ability to recognise faces when he was 5 years old. Nonetheless, our data suggest that he retains emotional reactions to faces of people he has met since that time: His explicit memory for faces is deficient due to his recognition disability, yet he seems to have learned emotional associations to faces he could not have explicitly processed in the first place. This suggests that MJH may retain unconscious emotional memory for faces.

Returning to the question we raised concerning PA patients' awareness of their emotional "knowledge", our findings suggest that MJH can become aware of knowledge he has of faces by consulting his phenomenological affective reaction to the unrecognised face. He does not seem fully aware of this knowledge; this was evidenced by his confession that he did not know whose faces he was looking at and his expressed lack of confidence in subsequent emotional ratings of the unrecognised faces. As to whether identification is dissociated from perception, our study suggests that MJH gave accurate emotional ratings to faces without being able to identify them. That is, he perceived a given face, to the extent that he was able to provide veridical emotional reactions, while simultaneously being incapable of recognising that face's identity.

Implications

A number of recent treatments of mind have proposed that thought, knowledge and memory consist of at least two aspects: (1) explicit, declarative; and (2) implicit, emotional (e.g., Damasio, 1994; LeDoux, 1996; Panksepp, 1998; Russell, 2003). According to this framework, there are two parts to thought, one given to being thought explicitly and one given to being felt: i.e., a cognitive component and an affective component that interact but are essentially separate. Our preliminary work with patient MJH lends support to this view.

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