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'What is more familiar than I? Self, other and familiarity in schizophrenia

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ABSTRACT

Background: Familiarity disorders (FDs) critically impact social cognition in persons with schizophrenia. FDs can affect both relationships with people familiar to the patient and the patient's relationship with himself, in the case of a self-disorder. Skin conductance response (SCR) studies have shown that familiar and unknown faces elicit the same emotional response in persons with schizophrenia with FD. Moreover, in control subjects, one's own face and familiar faces have been shown to activate strongly overlapping neural networks, suggesting common processing. The aim of the present study was to determine whether the mechanisms involved in processing one's own and familiar faces are similarly impaired in persons with schizophrenia, suggesting a link between them.

Method: Twenty-eight persons with schizophrenia were compared with twenty control subjects. Three face conditions were used: specific familiar, self and unknown. The task was to indicate the gender of the faces presented randomly on a screen during SCR recording. Face recognition was evaluated afterwards.

Results: Control subjects exhibited similar SCRs for the familiar and self-conditions, which were higher than the responses elicited by the unknown condition, whereas persons with schizophrenia exhibited no significant differences between the three conditions.

Conclusion: Persons with schizophrenia have a core defect of both self and familiarity that is emphasised by the lack of an increased SCR upon presentation with either self or familiar stimuli. Familiarity with specific familiar faces and one's own face may be driven by the same mechanism. This perturbation may predispose persons with schizophrenia to delusions and, in particular, to general familiarity disorder.

1. Introduction

Since the early 20th century, familiarity disorders (FD) have been described as a failure of affective judgement (Capgras and Reboul-Lachaux, 1923) capable of strongly impacting social interactions. More recently, the literature on schizophrenia has provided evidence for a defect in the feeling of familiarity in front of familiar individuals, despite preserved recognition (Ellis et al., 1997; Hirstein and Ramachandran, 1997). Indeed, by using the skin conductance response (SCR) as a somatic indication of emotional arousal, these studies highlighted a lack of emotion elicited by familiar faces in persons with schizophrenia with FD, even though the patients were able to process visual facial features and to recognise their own and familiar faces (Joshua and Rossell, 2009).

FD has been described as both a self-centred expression of delusion, in which patients do not express a feeling of familiarity in front of their own face, or as subjective double syndrome, in which they recognise a physical double of themselves in strangers (Luauté and Bidault, 1994; Luauté, 2009). Despite the growing literature suggesting that schizophrenia is essentially a self-disease (for a review see Nelson et al., 2014a, b), only a few studies have focused on the ability to recognise one's own face compared with familiar faces in schizophrenia (or in schizotypy), and the studies performed did not reach a clear consensus. Indeed, although some of these studies suggest a general deficit in self-awareness unrelated to familiarity (Kircher et al., 2007; Lee et al., 2007; Yun et al., 2014), others support a general impairment in familiarity including the familiarity of the self, instead of deficits in self-

Abbreviations: SCR, skin conductance response; FD, familiarity disorders; μS, microsiemens.

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awareness alone (Irani et al., 2006; Caharel et al., 2007; Zhang et al., 2012). In addition, these studies have potential biases. First, an explicit judgement of the self or familiarity was required (Caharel et al., 2007; Kircher et al., 2007; Zhang et al., 2012). This implies conscious processes that could not be involved in familiarity, which is described as a relatively fast and automatic process (Yonelinas and Jacoby, 1994). Second, famous rather than specific familiar (e.g., relatives or friends) faces were used (Lee et al., 2007; Zhang et al., 2012; Yun et al., 2014). This is an important psychopathological point because famous or widely known individuals do not induce FD in persons with schizophrenia (Capgras and Reboul-Lachaux, 1923). Moreover, different forms of declarative memory have been shown to be involved depending on the stimulus type. Specific familiarity, including familiarity with self, involves episodic or autobiographical memories, whereas famous individuals recruit semantic memories (Gillihan and Farah, 2005). Finally, the neural circuitry involved in the processing of one's own face and familiar faces strongly overlaps (mainly in the temporo-parietal junction), highlighting the link between them, whilst the processing of a famous face recruits different cortical regions (Qin and Northoff, 2011).

In the present study, we characterised the affective processing involved in both self and familiarity disorders in persons with schizophrenia using SCR recordings in an implicit task on specific familiar (including self) and unknown faces. Under the assumption that in face recognition, the self will be recognised as familiar, it was expected that persons with schizophrenia would exhibit the same lack of emotional arousal in front of themselves as when facing specific familiar individuals.

2. Experimental materials and methods

2.1. Participants

Twenty-eight persons (10 women and 18 men) with schizophrenia or schizoaffective disorder as defined by the DSM IV (APA, 2000) were compared with twenty healthy controls (12 women and 8 men) with no psychiatric disorders, as assessed by the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998).

Exclusion criteria included: having an axis I or axis II diagnosis (DSM IV), being age the under of 18 or above the age of 55, or having a medical history of sensory or neurological disorders. All subjects provided written consent prior to participation. For the patients with guardianship, the guardians were systematically informed and provided oral consent; no patients with tutors were included. The study was approved by the local ethics committee (CPP Nord-Ouest IV, France). Symptom severity in the patients was assessed with the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987; Lançon et al., 1997). Self-disorder was assessed in the persons with schizophrenia using the Self-Face Recognition Questionnaire (SFRQ), a scale initially validated for schizotypy (Larøi et al., 2007). Finally, global functioning of the patients was assessed with the Clinical Global Impression (CGI) Scale (Haro et al., 2003).

2.2. Stimuli

Stimuli were individually tailored for each participant and consisted of a series of full-frontal high-quality colour photographs of neutral-emotion faces (mouth closed). Each face belonged to one of the 3 following conditions: own face, familiar face and unknown face. Two relatives' faces were acquired on a digital camera (iPhone 4S camera, 8 megapixels). A face was considered "familiar" if it had been encountered by the participant at least once each week for a minimum of 6 months. A photograph of each subject was taken as the "self" picture. Unfamiliar faces were chosen from among the Karolinska Directed Emotional Faces (Lundqvist et al., 1998; Goeleven et al., 2008).

Using Adobe Photoshop, the faces were cropped along the face contour so that minimal hair or external cues were visible, with the resulting images subtending 250 pixels in width and 335 pixels in height. The faces were displayed in greyscale on a grey background. The average luminosity and contrast were equalised across the faces. A total of 5 static greyscale pictures were presented, 2 in both the familiar and unknown conditions and one in the self-condition.

2.3. Procedure

To assess the affective processes involved in face processing, SCR was recorded during a gender task within the three familiarity conditions. During each trial, a central fixation cross was presented for 2000 ms to alert the participant to the imminent appearance of the stimulus. The face was then displayed until the participant responded. The two specific familiar and the two unknown faces were displayed four times, whereas the participant's own face was displayed eight times. Stimuli were displayed on a computer screen (Intel computer, Sony screen, resolution 1280 × 1024 pixels, refresh rate 60 Hz) in a random order using E-Prime software (Schneider et al., 2012). To avoid SCR habituation effects, the interval between two successive stimuli randomly varied between 8 and 18 s. All of the participants placed their head on a chin rest with their eyes positioned centrally 60 cm from the monitor. All of the faces overlaid a 9.5 × 11° visual angle. During each trial, the participants were asked to indicate the gender of the face displayed as quickly as possible. A response was entered by pressing one of two keys on a keyboard: "1" if the stimulus was a man and "2" if it was a woman.

At the end of the experiment, the participants had to indicate, in the absence of SCR recording, the name of each individual they recognised. The whole task was run in a dark room and took approximately 15 min to complete.

2.4. Data recording and analysis

2.4.1. Behavioural data

The response accuracy (man/woman) in the gender task was recorded for each stimulus. Afterwards, correct and false recognitions were rated as "1" or "0", respectively, for each face.

2.4.2. SCR data

SCRs were recorded during the gender task only. A commercial skin conductance sampling device (BiopacMP35, Biopac Systems Inc., Goleta, Canada) was used with a constant-voltage method (0.5 V) at a sampling rate of 600 Hz. Ag–AgCl electrodes filled with a 0.05 M NaCl electrolyte solution were attached to the palm side of the middle phalanges of the second and third fingers of the participants' hands.

Then, SCRs were measured using BSL-pro software©. SCRs were determined using the standard latency criterion of 1–4 s. The first peak of amplitude within this latency window was recorded. Trials for which the stimulation did not produce a peak in SCR were included in the mean data for each participant; in these cases, we considered the SCR value to be zero. The magnitude and the latency of the SCRs were measured. To normalise the data, the amplitude of the SCR measurement was logarithmically transformed [log(1 + amplitude)] and statistical analyses were conducted on the magnitude based on the average SCR amplitude calculated afterwards (Dawson et al., 2000; Boucsein et al., 2012).

2.4.3. Statistical analysis

All statistical analyses were performed using SPSS 15.0 and the level of significance was set at $p = 0.05$. Greenhouse–Geisser corrected repeated measures ANOVA was applied to behavioural responses in the gender and recognition tasks and to SCR data in the gender task only. The patient mental health status (healthy controls, persons with schizophrenia) was selected as the between-subjects factor and the familiarity condition (specific familiar, self, and unknown) was selected as the within-subjects factor. Specific group or condition comparisons were conducted using Student's t-tests. Spearman's correlations were run between the SCR magnitude and age, antipsychotic dosage, benzodiazepine dosage, symptom severity, the CGI and the SFRQ.