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Implicit emotion perception in schizophrenia

Fabien Trémeau ^{a, b, c, *}, Daniel Antonius ^{c, d}, Alexander Todorov ^e, Yasmina Rebani ^f, Kelsey Ferrari ^f, Sang Han Lee ^a, Daniel Calderone ^{a, c}, Karen A. Nolan ^{a, c}, Pamela Butler ^{a, c}, Dolores Malaspina ^{c, f}, Daniel C. Javitt ^{a, b}

^a Nathan S. Kline Institute for Psychiatric Research, Orangeburg, NY, United States

^b Department of Psychiatry, Columbia University, New York, NY, United States

^c Department of Psychiatry, New York University School of Medicine, New York, NY, United States

^d University at Buffalo, State University of New York, Buffalo, NY, United States

^e Psychology Department, Princeton University, Princeton, NJ, United States

^f Institute for Social and Psychiatric Initiatives (InSPIRES), New York University School of Medicine, New York, NY, United States

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ABSTRACT

Explicit but not implicit facial emotion perception has been shown to be impaired in schizophrenia. In this study, we used newly developed technology in social neuroscience to examine implicit emotion processing. It has been shown that when people look at faces, they automatically infer social traits, and these trait judgments rely heavily on facial features and subtle emotion expressions even with neutral faces. Eighty-one individuals with schizophrenia or schizoaffective disorder and 62 control subjects completed a computer task with 30 well-characterized neutral faces. They rated each face on 10 trait judgments: attractive, mean, trustworthy, intelligent, dominant, fun, sociable, aggressive, emotionally stable and weird. The degree to which trait ratings were predicted by objectively-measured subtle emotion expressions served as a measure of implicit emotion processing. Explicit emotion recognition was also examined. Trait ratings were significantly predicted by subtle facial emotional expressions in controls and patients. However, impairment in the implicit emotion perception of fear, happiness, anger and surprise was found in patients. Moreover, these deficits were associated with poorer everyday problem-solving skills and were relatively independent of explicit emotion recognition. Implicit emotion processing is impaired in patients with schizophrenia or schizoaffective disorder. Deficits in implicit and explicit emotion perception independently contribute to the patients' poor daily life skills. More research is needed to fully understand the role of implicit and explicit processes in the functional deficits of patients, in order to develop targeted and useful remediation interventions.

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1. Introduction

The expression and perception of emotions are essential in nonverbal communication and social functioning. Researchers have shown that in everyday life, our affective states are made of blended emotions of low to moderate intensity, and our facial expressions are generally quite subtle (Matsumoto and Hwang, 2013; Scherer et al., 2004). Moreover, during daily social exchanges, emotional expressions are processed implicitly. This is in sharp contrast with research on facial emotional recognition conducted in

E-mail address: Ftremeau@NKI.RFMH.ORG (F. Trémeau).

laboratory settings, which most of the time, probes explicit emotion recognition of intense expressions of "pure" emotions. "Implicit" in social cognition does not necessarily mean "unconscious" but refers to the perception of emotions with as little awareness as possible (Fazio and Olson, 2003). The distinction between implicit and explicit processes has been the subject of various theories in social cognition (Chaiken and Trope, 1999), parallels the distinction between automatic and controlled processes (De Houwer et al., 2009), and has received support from neuroimaging studies (Lieberman, 2007).

In order to test implicit processing of emotional faces, investigators have resorted to two types of behavioral techniques, which are differentiated by the use of one or two different stimuli in each trial (see Fazio and Olson, 2003). In priming studies, emotional faces are presented before the task stimuli, and the





^{*} Corresponding author. Nathan S. Kline Institute for Psychiatric Research, 140 Orangeburg Road, Orangeburg, NY 10962, United States.

impact of emotional faces on performances (such as reaction time, accuracy or judgment) is examined. The exposure time of the primes can vary from a few milliseconds to seconds. As the effect of primes tend to dissipate very quickly over time (De Houwer et al., 2009), this method is not optimal when participants take more than a few seconds to choose their answers. The second method (called thereafter incidental task method) is derived from the Emotional Stroop task (Williams et al., 1996), but instead of emotional words, emotional faces are used, and subjects are instructed to process another-than-emotion dimension of the faces such as in sex- or age-classification tasks (which is called the incidental task). Consequently, emotional expressions are present until participants reach a decision, and a distracting or facilitating effect of emotion on the incidental task is examined.

Implicit studies with non-clinical subjects have shown that emotional faces can modulate psychophysiological responses (Esteves et al., 1994), cognition (Yang et al., 2011) and attitudes (Murphy and Zajonc, 1993). Moreover, not only affect (positive or negative) but also individual emotions (for example: anger versus fear) are processed under implicit conditions, and even during very short exposure times (Rohr et al., 2012). In schizophrenia, more than 200 individual studies and reviews have shown that explicit facial emotional recognition is quite impaired. However, a very different picture emerges regarding implicit processing of facial emotions. Compared to controls, schizophrenia patients showed increased psychophysiological responses when implicitly processing emotional faces (Williams et al., 2007). The impact of emotional faces on cognition was examined, and no differences between schizophrenia patients and controls was reported (Aichert et al., 2013; Becerril and Barch, 2011; Evans et al., 2011; Harvey et al., 2009; Linden et al., 2010; Park et al., 2011; Schwartz et al., 2010, 2013; Sergerie et al., 2010). In an incidental sex-classification task, again no significant group differences were found (van't Wout et al., 2007). In three judgment studies, emotional faces were used as primes, and participants rated the target stimuli (Chinese characters or neutral faces) on pleasantness. A greater judgment shift with negative emotional faces was found in schizophrenia patients in one study (Hoschel and Irle, 2001). In the other two studies (Suslow et al., 2003, 2005), different patterns of priming effects were found according to the presence of affective symptoms in patients and whether subliminal or supraliminal primes were used. However, the significance of the group differences was not reported.

It thus appears that the implicit processing of emotional faces is not impaired in schizophrenia (see also Mano and Brown, 2013). This is quite surprising if one considers other findings that suggest otherwise: 1) early visual processes are impaired when schizophrenia patients look at faces (McCleery et al., 2015) and emotional faces (Butler et al., 2009), 2) patients with schizophrenia show poor strategies when they scan emotional faces (Beedie et al., 2011), 3) behavioral studies found that implicit processing of emotional stimuli is impaired with stimuli other than faces (Dieleman and Roder, 2013), and 4) neuroimaging studies show less neural activation in schizophrenia during implicit tasks than in control subjects (Taylor et al., 2012). Lack of impairment in laboratory studies may be explained by the use of intense, non-blended and prototypal emotional expressions.

In the current study, we used an incidental task (rating social traits) to examine the implicit processing of very subtle emotional expressions. We took advantage of recent advances in social neuroscience that show how implicit perception of facial emotions impacts on social trait judgments. Indeed studies have shown that when looking at people's faces, we rapidly evaluate them on multiple personality and social traits (Bar et al., 2006), and make judgments of their attractiveness and how sociable, trustworthy, dominant and aggressive they are. A major factor involved in our

social trait judgments is facial emotional expression (Montepare and Dobish, 2003), from which we infer not only others' current affective states but also their tendencies and personality traits (Montepare and Dobish, 2003). This reliance on emotional expressions extends to apparently-neutral faces. Researchers have shown that very subtle emotional expressions can be perceived implicitly even in neutral faces and used to form impressions of others in non-clinical subjects (Said et al., 2009b) and people with schizophrenia (Antonius et al., 2013). For example, it has been shown that even a subtle expression of happiness makes people judge a face as more sociable or attractive than a face without such emotional expression (Said et al., 2009b). Consequently, we examined the prediction of ten trait judgments (attractive, trustworthy, intelligent, emotionally stable, fun-to-be-with, sociable, dominant, aggressive, mean and weird) by the subtle emotional expressions of neutral faces in people with schizophrenia or schizoaffective disorder and healthy controls. We hypothesized that the impact of facial emotions would be less in patients than in controls. In a subgroup of patients, we examined the relationship between implicit and explicit emotion perception and performance in daily life skills. We hypothesized that implicit and explicit perceptions were independently linked to social functioning.

2. Material and methods

2.1. Participants

Subjects included 81 individuals with schizophrenia or schizoaffective disorder and 62 non-patient control subjects. Patients were inpatients in a research unit at the Nathan Kline Institute for Psychiatric Research (NKI) or outpatients at Bellevue Hospital, New York. All subjects were English-speaking and between 18 and 65 years of age, and had capacity to give consent. Diagnosis of schizophrenia or schizoaffective disorder was assessed using the Structured Clinical Interview for DSM-IV (SCID, First et al., 1998) or the Diagnostic Interview for Genetic Studies (DIGS, Nurnberger, Ir. et al., 1994). Patients had normal or corrected vision. Non-patient control participants had no psychiatric history and diagnosis as assessed with the Non-patient version of the SCID or the DIGS. They were community subjects who responded to advertisement and volunteered to participate in research studies conducted at NKI or Bellevue Hospital. After complete description of the study to the subjects, written informed consent was obtained. The study was approved by the local Institutional Review Boards.

2.2. Procedures

A computer task was developed with thirty neutral faces (15 females, 15 males) from the Karolinska Faces¹ (Lundqvist et al., 1998). From a previous study (Said et al., 2009b), we selected the nine social traits that were quite easy to comprehend, and we added the positive trait of "fun to be with". Participants were asked to rate faces on these ten social traits, tested in the following sequence: attractive/good looking, mean, trustworthy, intelligent, dominant, fun to be with, sociable, aggressive, emotionally stable and weird. For example, for "intelligent", participants viewed the 30 Karolinska faces one by one, and were asked to rate "how intelligent the person seems to be" on a 1 to 5 point-Likert scale (from "not at all" to "extremely"). For each trait, the presentation order of the 30 faces was randomized and kept constant across subjects. Exposure/response times were not limited.

¹ Female faces: 03, 04, 05, 09, 10, 16, 17, 18, 21, 23, 25, 26, 28, 31, 33. Male faces: 37, 40, 42, 43, 46, 52, 53, 56, 57, 63, 64, 66, 67, 68, 70.

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