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Accurate perception of negative emotions predicts functional capacity in schizophrenia

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ABSTRACT

Several studies suggest facial affect perception (FAP) deficits in schizophrenia are linked to poorer social functioning. However, whether reduced functioning is associated with inaccurate perception of specific emotional valence or a global FAP impairment remains unclear. The present study examined whether impairment in the perception of specific emotional valences (positive, negative) and neutrality were uniquely associated with social functioning, using a multimodal social functioning battery. A sample of 59 individuals with schizophrenia and 41 controls completed a computerized FAP task, and measures of functional capacity, social competence, and social attainment. Participants also underwent neuropsychological testing and symptom assessment. Regression analyses revealed that only accurately perceiving negative emotions explained significant variance (7.9%) in functional capacity after accounting for neurocognitive function and symptoms. Partial correlations indicated that accurately perceiving anger, in particular, was positively correlated with functional capacity. FAP for positive, negative, or neutral emotions were not related to social competence or social attainment. Our findings were consistent with prior literature suggesting negative emotions are related to functional capacity in schizophrenia. Furthermore, the observed relationship between perceiving anger and performance of everyday living skills is novel and warrants further exploration.

1. Introduction

Facial affect perception (FAP) can be defined as the ability to interpret the affective states of others through nonverbal cues (LaBar et al., 2003). FAP deficits are well-recognized in schizophrenia (Mandal et al., 1998; Edwards et al., 2002) and are characterized by a large effect size (Kohler et al., 2010). Moreover, previous research suggests that FAP may be more closely associated with social functioning than neurocognition (Couture et al., 2006; Fett et al., 2011), and may even mediate the impact of neurocognition on social functioning (Brekke et al., 2005; Addington et al., 2006; Bell et al., 2009; Meyer and Kurtz, 2009) Collectively, these findings highlight the importance of FAP as a potential treatment target for improving social functioning. However, many researchers posit that FAP performance may be underscored by neurocognitive function (Sachs et al., 2004), particularly attention (Combs and Gouvier, 2004; Combs et al., 2008). Therefore, neurocognition should still be considered when examining the details of the FAP impairment and its association with social functioning (Fett et al., 2011).

Several studies examined whether the perception of specific types of facially expressed emotions were impaired within schizophrenia, but these findings were mixed. Where some studies suggest that individuals with schizophrenia demonstrated greater difficulty at perceiving negative emotions in general (e.g., fear, sadness) (Brüne, 2005; Lee et al., 2010), others indicate that individuals with schizophrenia were only impaired in perceiving specific negative emotions (Edwards et al., 2002; Bediou et al., 2005; Goghari and Sponheim, 2013). For example, Lee et al. (2010) found that individuals with schizophrenia had reduced accuracy at perceiving sad, fear, and angry expressions when compared with controls, whereas Goghari and Sponheim (2013) found this impairment was only significant for the perception of anger.

Additionally, a few studies suggest that individuals with schizophrenia have poorer FAP accuracy on both positively and negatively valenced trials (Lee et al., 2010). Thus, the literature remains unclear as to whether FAP deficits are present across all valences (e.g., positive, negative, neutral) of facial affect, or

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whether there is a deficit that is specific to one or more emotional valences (Kucharska-Pietura et al., 2005; Marwick and Hall, 2008). Hence, the determination of which emotions present the greatest perceptual difficulties for individuals with schizophrenia might shed light on the mechanisms underlying this deficit, and in turn, inform treatment efforts designed to target FAP impairments in schizophrenia (Wölwer et al., 2005).

Furthermore, there is evidence that deficits in perceiving specific types of emotions, particularly negative emotions, may be more directly related to social functioning than a general FAP deficit across all emotions (Hofer et al., 2009; Bae et al., 2010). Prior studies suggest that the misperception of negative facial affect may be related to poorer social functioning (Hofer et al., 2009) and the accurate perception of negative facial affect has been linked to greater social functioning (Bae et al., 2010). In addition, research by Brittain et al. (2012) demonstrated that affect perception for negative stimuli significantly predicted self-reported functioning after controlling for symptomatology.

In contrast to the above findings, one study found that higher social functioning was associated with accurately perceiving positive facial affect (e.g., happiness) (Meyer and Kurtz, 2009), while others found no evidence of an association between FAP performance and social functioning (Kee et al., 2003; Cohen et al. 2006; Pijnenborg et al., 2009). Discrepancies across studies looking at FAP and social functioning may be the result of methodological differences, as these studies varied in the number of emotions examined in each FAP task. Moreover, several studies relied solely on self-report measures of social functioning (Kee et al., 2003; Hofer et al., 2009; Pijnenborg et al., 2009; Bae et al., 2010; Brittain et al., 2012), when the use of performance-based measures may be more ecologically valid (Harvey et al., 2011). Nevertheless, determining whether the perception of particular displays of facial affect is directly related to social functioning is a timely issue, as recent research indicates social cognitive training (including a FAP component) yielded moderate-to-large effect size improvements on social functioning assessments in schizophrenia (Kurtz and Richardson, 2012).

In the present study, we investigated whether accurately perceiving positive, negative, and neutral facial expressions was significantly related to social functioning among individuals with schizophrenia. To address this question, we administered a 2-option forced-choice FAP task, a neurocognitive battery, and symptom rating assessments. To build on prior research, we included three social functioning measures in order to provide a multimodal examination of functional capacity, social competence, and social attainment. Our first objective was to examine whether individuals with schizophrenia had a general FAP deficit across all types of facially displayed affect or whether they had particular deficits in perceiving positive, negative, or neutral displays of facial affect. Our second objective was to investigate the unique contribution of positive, negative, or neutral FAP to social functioning, after accounting for neurocognition and symptoms. Lastly, we performed exploratory analyses to assess whether the perception of specific emotions was related to social functioning.

2. Methods

2.1. Participants

Participants included 59 individuals with schizophrenia (SCZ), and 41 healthy control subjects (CON), who were group-matched for age, gender, parental socioeconomic status (Barratt, 2005) and ethnicity (see Table 1). They were recruited from the Northwestern University Schizophrenia Research Group registry, which included SCZ currently receiving outpatient mental health services in the Chicago metropolitan area and who consented to be registered as potential research subjects. CON were recruited using Craig's List and flyers posted at local colleges and neighborhoods around the service providers. The Northwestern University Institutional Review Board approved this study. All subjects provided informed consent.

Table 1
Demographic and clinical characteristics of study sample.

	CON ($n=41$)	SCZ ($n=59$)	χ^2/F-Statistic
Mean age (S.D.)	33.52 (9.03)	35.51 (9.39)	−1.1
Gender (% male)	56.1%	62.7%	0.4
Mean SES (S.D.)	26.85 (10.73)	23.97 (11.95)	1.2
Race			
% Caucasian	46.3%	44.1%	0.2
% African-American	41.5%	40.7%	
% other	12.2%	15.2%	
Duration of illness			
Mean years (S.D.)	–	14.77 (9.61)	–
Chlorpromazine Equivalent (mg)			
Mean dose (S.D.)	–	363.30 (223.76)	–
Global neurocognition	0.38 (0.58)	−0.32 (0.57)	35.91***
Clinical symptoms			
Positive symptoms	–	3.04 (1.86)	–
Negative symptoms	–	3.00 (1.07)	–
Disorganized symptoms	–	1.82 (1.21)	–
Social functioning			
Functional capacity[a]	82.92 (10.79)	74.10 (13.77)	11.45***
Social competence[b]	4.47 (0.59)	3.40 (0.80)	44.43***
Social attainment	142.41 (11.53)	126.78 (12.83)	38.78***

Note. CON, control subjects; SCZ, individuals with schizophrenia.
[a] Completed by $n=40$ CON and $n=57$ SCZ.
[b] Completed by $n=33$ CON and $n=49$ SCZ.
*** $P<0.001$.

To confirm diagnosis, all study participants were assessed using the Structured Clinical Interview for DSM-IV (First et al., 2002) administered by a master's or PhD level researcher. Subjects were included if they were 18–55 years old, had a diagnosis of schizophrenia (SCZ) or if they did not have any axis I diagnoses (CON). All subjects were excluded if they met DSM-IV criteria for substance abuse or dependence within the past 6 months, mental retardation, or if they lacked English proficiency. Additionally, CON were excluded if they had a first-degree relative with a psychotic disorder (including bipolar disorder).

2.2. Study measures

2.2.1. FAP task

The FAP task was modified from a version created by Derntl et al. (2009) and administered using PRESENTATION Software (http://www.neurobs.com). We used a standardized stimulus set (Gur et al., 2002) that consisted of static images of male and female faces depicting five emotions: happy, sadness, disgust, fear, angry, and neutrality. For each trial, a single affective facial expression was presented in the center of the screen, with a named emotion displayed on each side (see Supplemental Fig. 1). Target choices were paired with all other options (e.g. anger is paired with happy, sadness, disgust, fear, and neutrality), with each target being shown 20 times, with 10 male and 10 female faces, for a total of 120 trials. Participants made a forced choice response (within 5 s) by selecting the emotion that best described the displayed face. Participants were instructed to do so as quickly and as accurately as possible. The task took approximately 12 min to complete. The mean accuracy across the sad, fear, angry, and disgust trials reflected 'negative emotions,' while happy trials reflected the perception of positive emotions. We operationalized accuracy as the number of correct trials divided by the difference between the total number of trials and the number of missing trials.

2.2.2. Social functioning measures

Three social functioning measures were administered to both SCZ and CON subjects. Functional capacity was measured with the brief version of the UCSD Performance-based Skills Assessment (UPSA-B) (Mausbach et al., 2007), during which participants completed several everyday tasks or living skills related to finances (i.e., writing a check to pay a bill) and communication (i.e., completing a role-play exercise to simulate rescheduling one's doctor's appointment).

Social competence was assessed using the Social Skills Performance Assessment (SSPA) (Patterson et al., 2001). During the SSPA, subjects engaged in two role-plays with a confederate, which involved (1) meeting a new neighbor and (2) making a request from a landlord; these role-plays were video-recorded for