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Facial emotion recognition in paranoid schizophrenia and autism spectrum disorder ☆

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ABSTRACT

Schizophrenia (SZ) and autism spectrum disorder (ASD) share deficits in emotion processing. In order to identify convergent and divergent mechanisms, we investigated facial emotion recognition in SZ, high-functioning ASD (HFASD), and typically developed controls (TD). Different degrees of task difficulty and emotion complexity (face, eyes; basic emotions, complex emotions) were used. Two Benton tests were implemented in order to elicit potentially confounding visuo-perceptual functioning and facial processing. Nineteen participants with paranoid SZ, 22 with HFASD and 20 TD were included, aged between 14 and 33 years. Individuals with SZ were comparable to TD in all obtained emotion recognition measures, but showed reduced basic visuo-perceptual abilities. The HFASD group was impaired in the recognition of basic and complex emotions compared to both, SZ and TD. When facial identity recognition was adjusted for, group differences remained for the recognition of complex emotions only. Our results suggest that there is a SZ subgroup with predominantly paranoid symptoms that does not show problems in face processing and emotion recognition, but visuo-perceptual impairments. They also confirm the notion of a general facial and emotion recognition deficit in HFASD. No shared emotion recognition deficit was found for paranoid SZ and HFASD, emphasizing the differential cognitive underpinnings of both disorders.

1. Introduction

Schizophrenia (SZ) and autism spectrum disorder (ASD) share several symptoms of social dysfunction, for example flat facial affect and poor eye contact (Sasson et al., 2011). Because of the clear distinction by age of onset, developmental trajectories, and the existence of psychotic symptoms in schizophrenia (Kolvin et al., 1971), autism and schizophrenia were separated in clinical diagnostic systems. Still, underlying genetic risk factors are partly shared (Gilman et al., 2012). Symptomatic overlap in social cognition deficits in SZ (Penn et al., 2008) and ASD (Harms et al., 2010; Weigelt et al., 2012) may be explained either by shared underlying neural function, by unique disorder specific pathways or by a mixture of both leading to a similar cognitive phenotype (Sasson et al., 2011). Only a few studies to date have compared both disorders directly to elicit overlapping and dissociating cognitive mechanisms.

Facial emotion recognition (FER) and the ability to infer the mental state of others are crucial concepts within the area of social cognition (Sasson et al., 2011). FER is typically investigated using six basic emotions according to Ekman and Friesen (1971). One widely applied task for the recognition of mental states from emotions, which includes complex emotions, such as jealousy, annoyance or boredom, is the Reading the Mind in the Eyes (RME) test (Baron-Cohen et al., 2001). Difficulty of FER also depends on the quantity of information presented, with the whole face containing more information than the eyes only.

In SZ, the vast majority of studies found pervasive FER impairments in a wide range of patients and age groups (e.g. Addington et al., 2006; Comparelli et al., 2013; review: Kohler et al., 2010; Chan et al., 2010), most consistently for negative basic and complex emotions (Penn et al., 2000; Couture et al., 2008). Only a few findings of intact FER challenge the concept of FER impairments as a general trait (Chan et al., 2008; Pomarol-Clotet et al., 2010). Several factors seem to influence FER performance in SZ, such as medication, age of onset, chronological age, illness severity, SZ subtype and symptom severity (Kohler et al., 2003, 2010; Chambon et al., 2006).

The majority of studies in adolescents and adults with ASD reported FER impairments compared to controls (e.g. Humphreys et al., 2007; Wallace et al., 2008; Kuusikko et al., 2009; reviewed by: Harms et al.,

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2010), particularly when faces expressed subtle (Rump et al., 2009) or complex emotions (Baron-Cohen et al., 1997, 2001). Still, there are some reports of intact performance, mainly when using unambiguous stimuli (Baron-Cohen et al., 1997; Rump et al., 2009; Jones et al., 2011).

Only a few studies directly investigated FER similarities and differences of SZ and ASD (Bölte and Poustka, 2003; Craig et al., 2004; Couture et al., 2010; Eack et al., 2013; Lugnegård et al., 2013). Bölte and Poustka (2003) reported impaired FER on a computerized basic emotion task only for young adults with ASD, but not for SZ. Craig et al. (2004) found impaired mentalizing abilities (RME) in patients with paranoid symptoms and Asperger's Syndrome. A different attribution style of both groups implied distinct underlying mechanisms of mentalizing problems. Couture et al. (2010) observed intact RME performance but clear deficits in a task with emotional photographs from movies in SZ and ASD. Furthermore, an SZ subgroup with negative symptoms performed more similar to individuals with HFASD than to a paranoid SZ subgroup. In contrast, a recent study detected mentalizing deficits in a group of individuals with SZ, but not in a group with Asperger's Syndrome (Lugnegård et al., 2013).

Different processes underlying FER impairments were identified for both disorders, namely impairments in face processing in ASD (reviewed in Weigelt et al., 2012), and face as well as visuo-perceptual processing deficits in SZ (Butler et al., 2009; Norton et al., 2009; Strauss et al., 2010).

In order to identify disorder-specific mechanisms of emotion processing in paranoid SZ and HFASD, we compared FER abilities on different levels of emotion and stimuli complexity. To further study the underlying processes of FER, basic visuo-perceptual and face identity tasks were also compared. We hypothesized the paranoid SZ group to show less FER and facial identity difficulties than the HFASD group, but still to perform worse compared to TD, as has been proposed recently (Sasson et al., 2011).

2. Methods

2.1. Participants

The sample included 19 IQ and gender matched individuals with paranoid SZ, 22 participants with HFASD and 20 controls (Table 1). All participants had a nonverbal IQ >70, obtained by the Raven SPM (Kratzmeier and Horn, 1988). General exclusion criteria were chronic medical conditions and substance abuse. The age ranged from 14 to 33 years (M = 22.1; SD = 5.3), and participants were recruited over a period of three years. Ethical approval was obtained from the local Ethical Committee.

Individuals with SZ received a clinical diagnosis of paranoid schizophrenia (F20.0) according to ICD-10 (WHO, 1992) and were recruited from the Department of Psychiatry of Goethe University Frankfurt, Germany. Experiments were conducted when they showed stabilized emotions, in some cases after hospitalization. Prior to testing, diagnoses were corroborated by the PANSS interview in which paranoid symptom ratings had to be rated maximum on a scale of 0–3 for study inclusion. All SZ individuals experienced two or more psychotic episodes with clear paranoid symptoms and received atypical antipsychotic medication (e.g. Clozapine, Risperidon); additionally, one individual received SSRI, one received benzodiazepine and 2 patients anticholinergic medication. Chlorpromazine equivalents are shown in Table 1. For three participants, dose of medication was not available.

HFASD participants were outpatients and were recruited from the Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy of Goethe University, and from parent and patient organizations. HFASD individuals were diagnosed according to ICD-10 (WHO, 1992) by experienced clinicians based on the German version of the Autism Diagnostic Interview—Revised (ADI-R) (Le Couteur et al., 2003; Bölte et al., 2006) and the German version of the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 2001; Rühl et al., 2004). The majority of HFASD participants were medication free; four took a serotonin-reuptake inhibitor (SSRI) and three received methylphenidate.

Control participants were recruited by advertisements in local schools and universities. Psychiatric and neurological disorders were controlled for by the Achenbach scales, the Social Responsiveness Scale (Bölte and Poustka, 2008), and a medical history interview.

2.2. Tasks

2.2.1. Benton Visual Form Discrimination Test (BVFD)

The Benton Visual Form Discrimination Test (Benton et al., 1983) measures simple visuo-perceptual skills and visual form discrimination. Each of the 16 item contains one target figure and four multiple choice items. The maximum score is 32. No time limit is set.

2.2.2. Benton Facial Recognition Test (BFRT)

In the short form of the BFRT (Benton et al., 1983), subjects are presented with 13 neutral faces as reference. They are asked to select identical faces (1 point each) in a set of six photographs, presented in

Table 1
Means (SD) of demographic variables, disorder specific measures and FER task performance.

	SZ (n = 19)	ASD (n = 22)	TD (n = 20)	Statistics	p
Gender (m:f)	14:5	18:4	17:3	$chi^2 = 1.57$	.457
IQ	100.1 (12.0)	100.1 (13.3)	105.4 (10.5)	F = 1.23	.301
Age	25.5 (4.9)	20.9 (5.6)	20.1 (3.8)	F = 4.92	**.011**
Age range	14–32	14–33	15–27		
PANSS positive	15.4 (5.0)				
PANSS negative	18.2 (6.3)				
PANSS total	65.7 (16.7)				
Length of illness, in months[a]	72.9 (44.5)				
Age at first episode[a]	19.9 (4.3)				
Chlorpromazine equivalent[b]	476 (300)				
ADOS total		11.6 (3.8)			
Range		7–20			
ADI-R communication		15.1 (4.4)			
Range		8–22			
ADI-R social interaction		20.8 (6.7)			
Range		8–32			
ADI-R repetitive behavior		5.8 (2.6)			
Range		1–12			

Note: ASD — Autism Spectrum Disorder; ADOS — Autism Observation Scale; ADI-R — Autism Diagnostic Interview Revised; BFRT — Benton Facial Recognition; BVFD — Benton Form Discrimination; FEFA — Frankfurt Test for the Recognition of Facial Affects; RME — Reading the Mind in the Eye; TD — typically developing; a — information not available for two patients; b — dose not available for three patients. Bold values indicate significance at p < .05.

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