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Detection of facial expressions of emotions in schizophrenia

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Abstract

The aim of the present study was to examine spatial processing of facial emotion in schizophrenic patients suffering from affective symptoms. A face-in-the-crowd task using schematic stimuli was administered to schizophrenic patients with flat affect ($n=30$), schizophrenic patients suffering from anhedonia ($n=30$), schizophrenic patients not suffering from anhedonia or flat affect ($n=28$), and a group of healthy controls ($n=30$). Participants searched displays of neutral schematic faces for a face with a positive or negative mouth expression. Schizophrenic patients manifested a general slowing of response speed compared to normal subjects. All patient groups as well as normal subjects found negative faces more quickly than positive faces amongst neutral faces. Unexpectedly, with increasing anhedonia as assessed by psychiatric rating, a more efficient spatial detection of positive facial expression was observed. For flat-affect patients only, efficiency of search for negative facial expression did not differ from that in the neutral face control condition. This response pattern indicates that, in flat-affect schizophrenic patients, spatial search of negative facial expression might be slowed after the initial engagement of search processes. Potential explanations of the face processing effects found in anhedonia are discussed.

Keywords: Schizophrenia; Facial affect; Anhedonia; Affective flattening; Spatial processing

1. Introduction

A number of studies have examined the perception of facial emotions in schizophrenia, and most have yielded evidence that schizophrenic patients are less accurate than normal subjects in their ability to identify and discriminate facial emotion (Feinberg et al., 1986; Walker et al., 1980). Controversy exists as to whether these impairments represent specific deficits or are part of a global cognitive impairment (Penn et al., 2000; Salem et al., 1996).

Research on emotion decoding impairments of schizophrenic patients has frequently been based on static photographs of facial expressions and has assessed primarily controlled or attentive processes. Spatial processing, as well as automatic processing, of facial emotion have been neglected until now, although automatic processes appear to be central to the elicitation of spontaneous affective reactions in everyday life (Scherer, 2001).

According to a two-stage model of perception, object recognition starts with the visual field scanned in parallel for biologically relevant features (preattentive vision). The subsequent integration of features is thought to be a resource-limited serial process, requiring focused attention (attentive vision) (Treisman,

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1986). From adaptive and evolutionary aspects, threat-indicating facial expressions (i.e., expressions of fear or anger), in particular, should be instantly recognizable without processing resources having to be drawn upon (Krebs et al., 1993; Öhman, 1996). Using schematic stimuli, it has been shown that negative faces are detected faster than positive or happy faces in a crowd of neutral faces (Fox et al., 2000; Öhman et al., 2001; White, 1995). Search functions for detection of a negative face are flatter than for detection of a positive face. Detection latencies for negative faces, but not for positive, faces were found to be largely independent of display size (number of faces); that is, negative faces appeared to "pop out" from a crowd, suggesting a nonserial search for negative faces by normal subjects (White, 1995). This is in line with reports that automatic processing ("parallel search") occurs only for negatively valenced stimuli (Hansen and Hansen, 1988; Niedenthal, 1990). Search slopes of less than about 10 ms per item are generally considered to reflect automatic or preattentive visual searching (Nothdurft, 1993). In contrast, happy faces appear to be found during a serial or controlled search. Serial searching or scanning processes imply sequential shifts of the attentional "spotlight" (engage, move, and disengage functions; see Posner and Peterson, 1990).

Emotion processing deficits in schizophrenia have rarely been examined as a function of affective symptoms. Among the most prominent affective symptoms in schizophrenia are flat affect (a diminished expression of emotion) and anhedonia (a lowered ability to experience pleasure) (Andreasen, 1987), both of which, according to factor-analytic studies, have to be seen as constituents of relatively independent symptom dimensions (Mueser et al., 1994; Sayers et al., 1996). The affectively flat exterior of schizophrenic patients may mask an emotionally volatile interior: Schizophrenic patients with diminished facial expressiveness were repeatedly found not to differ from normal controls with respect to subjective emotional experience elicited by affect-evoking stimuli (Kring et al., 1993). However, a lack of emotional expressivity might also reflect a slowed or impaired processing of emotion information (Neale et al., 1998).

According to Meehl (1962), anhedonia is the expression of a genetic defect in the limbic brain system involved with reward. Social isolation is thought to be an observable consequence of this pleasure deficit. In Meehl's (1962, 1990) theory, anhedonia represents a contributor to—or, in some cases, the result of—an "aversive drift" in schizophrenia (i.e., the tendency for activities and people to take on a threatening, negative affective meaning). The aversive drift was interpreted as the consequence of an enduring imbalance between appetitive and aversive brain centers.

The purpose of the present study was to examine for the first time preattentive and attentive spatial processing of facial emotion in schizophrenic patients suffering from affective negative symptoms. To this end, a face-in-the-crowd task using schematic stimuli was administered to three groups of schizophrenic patients (i.e., patients with a flattened affect expression, patients suffering from anhedonia, and patients not suffering from anhedonia or flat affect), as well as to a group of healthy controls. Since reaction time differences between (chronic) schizophrenic patients and normal subjects were expected a priori, our analysis focused on the qualitative pattern of detection latencies and especially on search slopes and the difference between detection latencies for positive faces and those for negative faces. It was hypothesized that anhedonic patients should exhibit an efficient detection of negative faces but should be impaired in the detection of positive faces. Ratings of anhedonia were therefore expected to be positively correlated with the latency difference score "positive face detection – negative face detection."

2. Methods

2.1. Subjects

Participants were 30 schizophrenic patients with flat affect, 30 schizophrenic patients suffering from anhedonia, 28 schizophrenic patients not suffering from anhedonia or flat affect, and 30 healthy subjects. All patients fulfilled the criteria for a DSM-IV diagnosis of schizophrenia (American Psychiatric Association, 1994). Patient diagnoses were based on the German version of the Structured Clinical Interview for DSM-IV (SCID-I; Wittchen et al., 1997). Subjects with additional Axis I disorders or with severe head