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Self-concept, emotion and memory performance in schizophrenia

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ABSTRACT

The "self-reference effect" describes better memory for material someone has related to one's self previously. Schizophrenia can affect aspects of the inner self such as own thoughts or actions. Schizophrenia symptoms, therefore, might not only have an influence on the self-concept, including the self-attribution of positive or negative personality traits, but also reduce the self-reference effect. 15 schizophrenia patients and 15 matched healthy controls were asked to decide on positive and negative personality traits across three separate conditions: self-evaluation, other evaluation (of an intimate person), and during a lexical control task, respectively. An unannounced recognition task followed. Patients revealed a negative bias in the evaluation of themselves and of the well-known other person. The reference to a person (oneself, close other) increased later recognition performance. However, patients with schizophrenia revealed an overall decreased recognition performance. The amount of patients' passivity symptoms, i.e., an increase in the permeability of their "self–other boundary", correlated negatively with their recognition performance for previously self-referred characteristics and traits referred to the intimate other. This was not the case for lexically processed stimuli or an increase of negative symptoms. Our data underline the necessity of taking into account symptom subgroups when dealing with specific cognitive dysfunctions in schizophrenia.

1. Introduction

Recent studies have highlighted an altered self-concept and self-perception as core phenomena of schizophrenia (e.g., Kircher and David, 2003; Kircher and Leube, 2003; Knoblich et al., 2004; Lindner et al., 2005; Kircher et al., 2007; Leube and Pauly, 2008; Leube et al., 2008) or its prodromal phase (Parnas et al., 2005). Already, Kraepelin (1913) thought of schizophrenia as reflecting a disturbed inner integrity of mental personality. This aspect of the disorder might also be revealed in an altered self-attribution of (positive and negative) personality traits. In other emotional tasks, such as the interpretation of facial expressions (Habel et al., 2006) or of odors (Pauly et al., 2008), patients with schizophrenia revealed a comparably negatively biased response pattern. Alternatively, schizophrenia patients might refer positive traits even more often to themselves as compared to healthy subjects. The latter would be in line with the so-called *self-serving bias*, which has been found in studies on the effects of paranoid delusions on attributions in social interactions (for an overview, see Bentall et al., 2001). Schizophrenia patients with positive symptoms tend to attribute negative events to other persons or external causes (Blackwood et al., 2001). Correspondingly, they might also attribute negative personality traits more often (and positive traits more seldom) to other persons.

Although emotional impairments in schizophrenia have been investigated extensively (e.g., Habel et al., 2000; Schneider et al., 2006; Pauly et al., 2008; Seiferth et al., 2009), studies on the interaction of specific cognitive and emotional impairments in schizophrenia are still rare. An altered attribution of positive and negative traits might further interact with cognitive impairments common in schizophrenia, such as a decline of memory performance (Aleman et al., 1999). Memory dysfunctions in patients with schizophrenia spectrum disorders mainly encompass explicit and declarative memory while procedural learning and implicit memory are normally unaffected (Schmand et al., 1992; Kazes et al., 1999). The severity of general memory impairments (Aleman et al., 1999), and more specifically of verbal learning and memory (Wittorf et al., 2004), seems unaffected by the duration of illness, positive symptoms or age (at the onset). However, memory performance can be influenced actively. In healthy subjects, the so-called "self-reference effect" has been known for a long time and describes the phenomenon that self-related personal information is processed rather deeply and elaborately (Symons and Johnson, 1997). After a rating of adjectives

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during an encoding phase guided by structural, phonemic, semantic or self-reference features, words of the latter group were recalled the best in an incidental recall task (Rogers et al., 1977). However, reference to a close other person can increase incidental memory for trait adjectives equally and, therefore, more effectively than judging the imagery, commonness, meaning or sound of the stimuli (Bower and Gilligan, 1979; Miall, 1986). Surprisingly, possible differential impairments in schizophrenia patients have not been investigated so far. In particular, patients affected in their inner self, e.g., experiencing passivity symptoms or, to be more exact, the feeling of being controlled, mind reading, thought broadcasting, thought insertion or thought withdrawal, might show a decreased self-reference effect. It could be argued that an emotional content of stimuli might result in an even deeper processing due to a higher salience or stronger involvement. Indeed, healthy subjects (Miall, 1986) and patients with schizophrenia could remember words with emotional valence better than neutral ones (with an overall better recollection in healthy subjects; Danion et al., 2003).

The understanding of the differential impact of symptom subgroups on specific cognitive and emotional functions is of high clinical relevance. An altered emotional self-concept and potential related memory deficits in schizophrenia may represent a restraint of the patients' well-being, especially if both factors further interact with each other. This study aimed to investigate the emotional self-concept of patients with schizophrenia and the potential effects on their memory for personality traits referred to themselves, an intimate person or processed lexically. We expected a cognitive bias reflected in an altered self-evaluation and a more negative evaluation of close others, especially with increasing positive symptomatology. In addition to an overall reduced memory performance in patients with schizophrenia, we hypothesized a differential influence of passivity symptoms (affecting perception and self-attribution of own actions or thoughts) on the self-reference effect during the recognition of emotional personality traits. This would imply specially pronounced memory performance differences between healthy subjects and patients for previously self-related traits, with the degree of symptomatology correlating with the recognition performance.

2. Method

The study complies with the principles of the Declaration of Helsinki. The local ethics committee approved the protocol. After a detailed description of the study, all participants gave their written informed consent.

2.1. Subjects

Fifteen subacute schizophrenia patients (10 males and 5 females) of the paranoid subtype took part in the study, as well as 15 healthy subjects matched for gender, age and parental education. Accordingly, schizophrenia patients and healthy subjects did not differ in terms of their age [35.60 years (±8.82) for the patients and 34.93 years (±9.72) for the healthy subjects ($t=-0.20$, $df=28.00$, and $p=0.845$)] or parental education [9.37 years (± 2.47) and 10.80 years (± 3.63), respectively ($t=1.26$, $df=28.00$, and $p=0.271$)]. Moreover, the educational level did not differ significantly [12.87 years (±3.64) for the patients and 13.40 years (±3.13) for the healthy subjects ($t=0.43$, $df=28.00$, and $p=0.671$)]. All participants were native speakers. Each participant's medical history was closely screened. Subjects with severe physical, especially neurological, disorders were excluded. Structured clinical interviews for DSM-IV (SCID-I, German version: Wittchen et al., 1997) were performed to affirm the patients' actual diagnosis and to exclude patients with comorbidities and control subjects suffering from mental illness. Healthy subjects with first-degree relatives with mental disorders were also excluded. Psychopathological assessment further included the (5-point) Scales for the Assessment of Positive and Negative Symptoms (SAPS and SANS; Andreasen, 1983, 1984).

On the average, the patients' illness duration was 7.10 years (±7.78). Their SAPS sum scores averaged 16.73 ($SD=19.10$), with a range between 0 and 54. Their SANS sum scores had an average of 39.33 ($SD=24.60$), ranging from 0 to 74. We further focused on SAPS items assessing positive symptoms affecting the self ("*Ich-Störungen*," "dysfunctions of the self" or "ego-disturbances"; Jaspers, 1913), i.e., feelings of being controlled, mind reading, thought broadcasting, thought insertion, and thought withdrawal. Here, patients revealed a mean sum score of 2.93 ($SD=4.57$) with a range between 0 and 14. A mean sum score of 8.00 ($SD=4.18$) on the Hamilton Depression Scale (HAMD; Hamilton, 1960) indicated no clinically relevant depressive symptomatology. On the Global Assessment of Functioning scale (GAF; American Psychiatric Association, 1994) schizophrenia patients scored 48.00 ($SD=16.67$) on the average.

All patients were on atypical antipsychotic medication. Two patients received additional typical neuroleptics, and two patients received selective serotonin reuptake inhibitors (SSRIs). The estimated CPZ equivalents, according to Andreasen et al. (2010) and Kroken et al. (2009), averaged 451.49 mg/d ($SD=222.117$).

2.2. Stimuli and task

All stimuli were presented for 2 s through the Presentation software package (Neurobehavioral Systems Inc., San Francisco, CA) on a laptop. A fixation cross was shown during interstimulus intervals of 1.5–2.5 s (Fig. 1). During the encoding phase, 126 adjectives representing positive (50%) or negative (50%) personality traits were distributed among three conditions in equal parts. Subjects had to decide whether personality traits a) characterized them (self-reference), b) characterized a particular and intimate person, or c) the word included the letter 'r.' The lexical task served as the control condition and should allow for the replication of earlier finding of a comparatively better memory for traits referred to a person (see above). Participants used the right index and middle finger to press the left button if they agreed or the right button if they disagreed. The task started after a short training phase using a separate set of words. Short instructions presented for 5 s before miniblocks of three adjectives indicated the following condition. The sequence of recurring conditions was pseudorandomized. To avoid effects of order, two encoding versions were used, applying the split-half method. Overall the encoding phase lasted about 14 min.

During the recognition task, which followed previously unannounced after a short break, 90 positive and negative adjectives of the encoding phase (targets) were presented, together with 90 new emotional personality traits (distractors). For 16 min, the subjects had to decide whether each personality trait had already been presented in advance or was new.

The positive and negative trait adjectives did not differ in terms of their length ($t=0.52$, $df=214$, and $p=0.607$) or frequency ($t=0.69$, $df=214$, and $p=0.493$), as specified in the *Celex Lexical Database* (Baayen et al., 1993). Furthermore, each of the adjectives was rated in the *Handbook of German Word Norms* (Hager and Hasselhorn, 1994), assuring that imagery ($t=0.02$, $df=214$, and $p=0.986$), concreteness ($t=-0.01$, $df=214$, and $p=0.990$), and the intensity of the valence (i.e., the absolute value of the magnitude of pleasantness or unpleasantness; $t=-1.32$, $df=193.57$, and $p=0.187$) did not differ between positive and negative traits. Plurivalent words (with the standard deviation of the pleasant/unpleasant rating norms crossing the zero point) were not included. Accordingly, positive and negative traits differed significantly in terms of their pleasantness ($t=60.31$, $df=193.57$, and $p<0.001$).

All participants also performed a neuropsychological testing consisting of the German VLMT A (Helmstaedter et al., 2001, comparable to the California Verbal Learning Test by Delis et al., 2000), Trail-Making Tests A and B (TMT; Reitan, 1958), analyzing visuomotor performance and cognitive flexibility, and the Penn Emotion Recognition Test (PERT; Kohler et al., 2004). The MWT-B (Lehrl, 1989), a multiple-choice vocabulary test, served for verbal crystalline intelligence estimation.

2.3. Data analysis

Two-sample *t*-tests were performed to compare the demographic data of the two groups. Since the Kolmogorov–Smirnov test of normality revealed that not all neuropsychological results were normally distributed, nonparametrical Mann–Whitney–U tests were applied here. All further data fulfilled the requirements for metric analyses. Response patterns during the encoding phase were assessed by the mean percentage of affirmed personality traits and the percentage of correct (true positive and true negative) lexical answers. A 2×2×2 repeated-measures ANOVA with the within-subject factors reference (self or other) and emotion (positive or negative) and the between-subject factor group (patients or controls) was performed for the two evaluation conditions (self and other). The percentages of affirmed positive and negative traits were further correlated with SAPS and SANS sum scores. A separate 2×2 ANOVA with the factors emotion and group was calculated for correct answers during the lexical task.

The number of correct reactions during the recognition condition, i.e., the correctly affirmed and correctly rejected adjectives, and false-alarm rates were analyzed in two 2×2 ANOVAs for the factors emotion (positive or negative) and the between-subject factor group. Hit rates were analyzed with a 3×2×2 repeated-measures ANOVA for the factors previous task (self-evaluation, evaluation of another person, or lexical processing), emotion and group.

Finally, investigating potentially detrimental consequences of an altered self-perception on the self-reference effect, Pearson correlations were calculated between the sum scores for passivity symptoms (see above) and the percentage of correctly recognized previously self-referred positive and negative personality traits. To investigate the specificity of the results, the sum of the remaining SAPS subscores (without passivity symptoms) and the SANS sum score were correlated as well.

The error probability was predefined as $p<0.05$ (two tailed). A correction of the degrees of freedom was undertaken if Levene's test for equality of variances (*t*-tests) or the Mauchly test on sphericity (ANOVA) revealed significant effects. Bonferroni correction was applied to the neuropsychological data ($p=0.003$) and to all ANOVA post hoc tests performed (according to their number).