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Brief Reports

Memory Confidence and False Memories in Schizophrenia

Fixed false beliefs (*i.e.*, delusions) are a core feature of schizophrenia present in virtually all persons with schizophrenia at some time in the course of their illness. Divergent hypotheses exist on how false beliefs emerge in schizophrenia. Maher (1974, 1999) has argued that delusions are based on altered perceptions or neurocognitive functioning. Delusions in this view are an epiphenomenon reflecting uncompromised rationalizations in response to bizarre experiences. Garety and coworkers hold a different account (Huq et al., 1988, Garety and Freeman, 1999). They hypothesize that deluded patients have a marked reasoning bias, specifically a tendency to jump to conclusions.

In the present article, the view is held that an important aspect of schizophrenia, the proneness to form false beliefs (delusions), may in part reflect overconfidence in incorrect or implausible judgments. Empirical support for this claim has been collected in a recent study in which participants were required to give confidence ratings for source attribution decisions (Moritz et al.[1]). It was demonstrated that patients with schizophrenia committed attribution errors with significantly higher confidence than healthy controls, along with slightly lower confidence for correct responses. This response pattern was not correlated with the degree of current psychopathology. We concluded that healthy controls attach "not trustworthy" tags to false responses in a memory task to a greater degree than patients with schizophrenia. In other words, healthy participants are more skeptical about memory responses that turn out to be wrong.

We hypothesize that a consequence of this putative impairment to handle incorrect judgments with greater caution is a corruption of knowledge. Knowledge in the present context represents the totality of what we strongly believe to be factual; knowledge may thus comprise both correct and incorrect information, as the core-defining characteristic is subjective conviction and not validity.

Because of the strong reliance of reasoning processes on our knowledge (*i.e.*, on what we believe to be factual), it is claimed that once false or implausible information reaches a certain portion of our knowledge store, this is likely to lead to false belief systems and interfere with reality. Memory intrusions or misperceptions per se are in this view a necessary but not sufficient condition for delusions. In fact, a recent study has found that simple memory intrusions are as common in patients with schizophrenia as in patients with depression (Moritz et al., 2001). Essential for forming a delusion is subjective conviction about the truthfulness of these episodes. Although false responses experienced with high confidence can, under certain experimental conditions, also be evoked in normals (*e.g.*, Roediger and McDermott, 1995), memories (see Reisberg, 2001, p. 211) and perceptions in healthy patients are mostly accurate and consensually experienced.

As in the pilot study (Moritz et al.[1]), a source memory task was employed for the present investigation. In line with recent memory research, it was expected that participants with schizophrenia would perform worse regarding source attribution. Degree of knowledge corruption was operationalized as the proportion of incorrect responses given with high confidence out of the overall number of high-confidence responses. It was hypothesized that participants with schizophrenia would display more knowledge corruption than controls.

Methods

Participants. Twenty-three patients with a diagnosis of schizophrenia were recruited from a psychiatric long-term institution (age: 37.67 [±7.94]; gender: 14 male, 9 female; IQ according to NAART: 104.16 [±6.82]; age at first hospitalization: 25.67 years [±8.80], number of hospitalizations: 5.11 [±3.12]). Diagnoses relied on DSM-IV criteria and were made by medical doctors. Patients were excluded if they had an axis I diagnosis other than schizophrenia (including substance abuse), any form of documented or suspected brain damage, or diabetes. Except for two patients treated with haloperidol, all patients received atypical neuroleptic medication at the time of testing (chlorpromazine equivalent dosage: 844.97 mg [±678.85]).

Psychopathological symptoms were assessed using the Signs and Symptoms of Psychotic Illness rating scale (SSPI) blind to neurocognitive results. The SSPI contains good psychometric properties; the intraclass correlation coefficient for the total score was .82 (SSPI; Liddle et al., 2002). The psychomotor poverty syndrome was composed of items tapping underactivity, flattened affect, and poverty of speech. Disorganization comprised the sum scores for inappropriate affect and formal thought disorder. The reality-distortion syndrome was computed as the sum of delusions and hallucinations. The SSPI total score was 16.35 (±4.85) reflecting a subacute clinical state. Fifteen control participants were drawn from hospital staff (age: 34.67 [±9.51]; gender: 10 male, 5 female; IQ according to NAART: 105.51 [±4.87]). Control participants were screened for absence of brain damage and mental illness. All participants gave written informed consent to participate. None of the participants tested in the present experiment participated in an earlier study on this paradigm (Moritz et al.[1]).

Procedure. The experiment consisted of two parts—a learning phase and a recall phase—separated by a 10-minute interval. In the learning phase, the experimenter read 20

[1] Moritz S, Woodward TS, Ruff C, Andresen B (submitted for publication). Source monitoring and memory confidence in schizophrenia.

words from the Kent-Rosanoff association test to the participant and the participant was asked to give a close associate for each word. Participants were told that they later had to recall both primes and self-generated words.

In the recall phase, a list of 60 words was read to the participant. Words belonged to the following four conditions (presented in random order): (1) 20 words from the Kent-Rosanoff association test, (2) 20 associates produced by the participant in response to 1, (3) 10 new words with no associative relation with words from conditions 1 or 2, (4) 10 new words that were related but never identical with words from 1 or 2 (*e.g.*, if the prime word was "bread" and the participant associated "butter," the related new word could be "cheese").

After each presented word in the recall list, the participant was instructed to provide three responses: (1) recognition: new or old word; (2) source memory: for items recognized as old, participants had to determine the source: experimenter or themselves; (3) memory confidence: participants were instructed to rate on a four point scale how certain they were about their source attribution judgment (1 = don't know; 2 = rather uncertain; 3 = rather certain; 4 = convinced).

Strategy of Data Analyses. Following the claim that a fixed false belief is based on a large number of high-confident intrusions (pseudo-facts), the main dependent variable as those responses for which participants gave the highest confidence ratings (*i.e.*, confidence rating score "4"). Since several participants did not commit any errors in some conditions, confidence ratings were collapsed across conditions.

Results

Sociodemographic Variables and Error Analysis. Patients did not differ from controls regarding age, gender distribution, or intelligence (at least $p > .5$ for all analyses). As predicted from previous research (Moritz et al., 2001[1]), participants with schizophrenia made significantly more recognition errors (patients: 7.83 [SD: 4.20]; controls: 3.13 [SD: 2.00], $t[36] = 4.62$, $p < .001$) and source attribution errors than controls (patients: 12.09 [SD: 5.97]; controls: 6.73 [SD: 2.66], $t[36] = 3.77$, $p = .001$). In particular, there was a bias in patients with schizophrenia to misidentify experimenter-generated ($t[36] = 4.09$; $p < .001$) and self-generated words ($t[36] = 2.22$, $p = .033$) as new. Further, participants with schizophrenia more often regarded new, unrelated words as initially read by the experimenter ($t[36] = 3.06$; $p = .005$).

Confidence Ratings. Participants with schizophrenia and controls gave highest confidence ratings comparably often (78.2% versus 84.7%, $t[36] = 1.02$; $p > .3$). To determine whether patients with schizophrenia were differentially more confident for incorrect responses, a two-way mixed ANOVA was conducted with group as between-subject, response type (incorrect versus correct source attribution) as within-subject and the overall percentage of high-confidence responses as the dependent variable. The main effect of the group was not significant ($F[1,36] = .92$; $p > .3$). The main effect of response type ($F[1,36] = 53.91$; $p < .001$) was significant indicating that high-confidence ratings were given more often for correct responses than for incorrect ones. The significant group x response type interaction ($F[1,36] = 5.14$; $p = .03$) is explained by greater confidence for incorrect responses in participants with schizophrenia relative to controls, while patients were slightly less confident for correct responses (Figure 1).

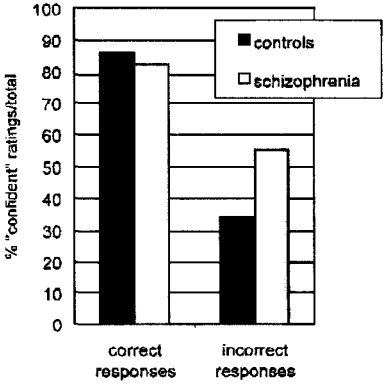

FIG. 1. Percentage of high-confident ratings as a percentage of all ratings separated by response type (correct, incorrect).

The above analysis does not directly address to which degree knowledge is corrupted in schizophrenia, as the degree of confidence in false memories was not expressed as a proportion to the overall number of high-confidence responses. This second analysis revealed that 11.82% (SD: 11.93) of all responses with highest confidence were incorrect in patients with schizophrenia, whereas for healthy participants the error percentage was 4.89% (SD: 5.36; $p = .02$).

Finally, correlations were computed between all memory performance and memory-confidence parameters with the three syndrome scores, as well as the symptom scores for formal thought disorder, delusions, and hallucinations. Formal thought disorder was significantly associated with the tendency to attribute newly related material to oneself ($r = .50$; $p = .01$), whereas psychomotor poverty correlated with a bias to attribute newly related words to the experimenter ($r = .47$, $p = .02$). Delusions and the reality distortion factor were correlated with an overall greater tendency to give high-confidence responses (regardless of whether responses were correct or incorrect; both correlations: $r = .44$; $p = .04$).

Discussion

In line with our hypothesis, memory responses rated with high confidence by patients with schizophrenia contain a large number of intrusions. Put differently, knowledge in patients with schizophrenia is significantly more corrupted with false information than in controls. As our reasoning processes and interpretation of the world rely to a great extent on the correctness of what we (believe we) know, these false cognitions may contribute to the emergence of fixed false beliefs. It was observed that patients with schizo-

phrenia attached a high confidence rating to a greater extent than controls to their incorrect responses but less often to their correct responses (the interaction was significant). This result confirms an earlier finding (Moritz et al.[1]) suggesting that participants with schizophrenia are less able to attach not trustworthy tags to their false memories. In line with our claim that corrupted knowledge is a trait-like determinant of schizophrenia, delusions—the core symptom of schizophrenia—were not correlated with the degree of knowledge corruption. However, participants with current delusions were more biased to rate most responses (irrespective of whether correct or incorrect) as highly confidently remembered.

With respect to simple memory performance, participants with schizophrenia recalled less material than controls and committed overall more intrusions. However, as described, a similar pattern of results might be expected for psychiatric participants who do not share substantial psychopathological features with schizophrenia. In line with our previous study, the present results do not support an earlier theory by Bentall et al. (1991) that participants with hallucinations have a bias to externalize their verbal products: groups did not differ on this variable. Moreover, the present study did not confirm a previous result that patients with schizophrenia commit more errors for related new words (Moritz et al.[1]). Since there is evidence that an externalization bias in patients with hallucinations may be especially pronounced for emotionally valenced material (Morrison and Haddock, 1997), in a new study we intend to employ positively and negatively valenced words along with neutral words.

Subsequent research will have to demonstrate the specificity of this finding to schizophrenia. Although there is indirect evidence that other psychiatric groups rather mistrust their memory performance (*e.g.*, MacDonald et al., 2001, Zitterl, 2001) and hence possibly show a performance pattern similar to controls, this assumption awaits empirical support.

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Comparison of Symptom Profiles of Obese Binge Eaters, Obese Non-Binge Eaters, and Patients with Obsessive-Compulsive Disorder

Binge-eating disorder (BED) is a newly recognized eating disorder characterized by episodic uncontrolled consumption of large amounts of food in the absence of inappropriate compensatory methods that characterize bulimia nervosa (BN), including vomiting, laxative abuse, fasting, or excessive exercise after an eating binge (Devlin, 1996). The provisional criteria for BED, which have been included in DSM-IV Appendix B, specify that the individual must experience significant distress related to binge eating and must endorse several behavioral indicators of loss of control.

Data generated mainly by clinical (Matsunaga et al., 1999; Thornton and Russell, 1997; O'Rourke et al., 1994; Rubenstein et al., 1992), genetic (Bellodi et al., 2001; Cavallini et al., 2000), and treatment studies (Mayer and Walsh, 1998; Pigott and Seay, 1999) suggest the existence of a relationship between classical eating disorders, such as BN and anorexia nervosa (AN), and obsessive-compulsive disorder (OCD). From the clinical standpoint, several studies using the Symptom Checklist-90 (SCL-90), a scale designed to assess several domains of psychopathology, have found increased prevalence of obsessive-compulsive symptoms among patients with classical eating disorders (Bulik et al., 1992; Zubieta et al., 1995; Lennkh et al., 1998). For example, Bulik et al. (1992) reported that women with BN display similar scores as women with OCD in the obsessive-compulsive, phobic anxiety, and anxiety dimensions of the SCL-90. In the same vein, Zubieta et al. (1995) found that patients with either BN or AN exhibited elevated scores in the obsessive-compulsive dimen-