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Investigation of the role of the jumping-to-conclusions bias for short-term functional outcome in schizophrenia

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ABSTRACT

Symptom severity and neuropsychological deficits negatively influence functional outcomes in patients with schizophrenia. Recent research implicates specific types of biased thinking styles (e.g. jumping-to-conclusions) in the pathogenesis of schizophrenia. This is the first study to test the impact of jumping-to-conclusions on functional outcome in schizophrenia. The aim of the study was to investigate the association of psychopathology, neuropsychology and JTC with subjective quality of life, vocational outcome and housing status in schizophrenia. Analyses were carried out both cross-sectionally at baseline, and longitudinally over the course of symptomatic improvement in the immediate aftermath of a psychotic exacerbation. Seventy-nine patients with schizophrenia were included in the study. Data concerning the variables of interest were collected at baseline, after one month, and after six months. Positive symptomatology was the most significant predictor of subjective and vocational outcome and changes across time. Verbal memory deficits were associated with functional status cross-sectionally, whereas general cognitive capacity significantly predicted functional changes over time. Improvement of the jumping-to-conclusions bias positively affected vocational outcome. Though limited, the observed effect of this bias on real-world functioning highlights the possible usefulness of interventions aimed at improving (meta)cognitive deficits in schizophrenia.

1. Introduction

Schizophrenia is a severe disorder compromising multiple aspects of everyday functioning and well-being, such as independent living, interpersonal relations and vocational functioning (Green et al., 2004; Couture et al., 2006; Fett et al., 2011). These impairments often persist even after successful pharmacological treatment of psychotic symptoms (Hofer et al., 2006; Leifker et al., 2009). In light of low recovery rates in the disorder (Jaaskelainen et al., 2013), a growing body of research is devoted to understanding the factors associated with functional disability in schizophrenia, in the hope of developing interventions to improve functional recovery and quality of life (Andreasen et al., 2005; Green, 2007; Harvey and Penn, 2010; McDowd et al., 2011).

Several factors have been identified that affect various dimensions of functional outcome and quality of life in schizophrenia. These include premorbid functioning (Hofer et al., 2006), neuropsychological deficits (Green, 1996, 2006), deficits in social cognition (Fett et al., 2011), and severity of psychopathology (Addington and Addington, 1993; Hofer et al., 2006; Ventura et al., 2009). However, the relative importance of these factors is not clear yet (McDowd et al., 2011), possibly depending on the specific patient sample characteristics and functional outcome measures implemented, which differ across various dimensions (e.g. self-report vs. observer-rated).

While the impact of neurocognitive deficits on outcome has been in the spotlight of a large body of research, to the best of our knowledge no study examined whether cognitive *biases* moderate outcome. Cognitive biases are distortions in the acquisition, processing and interpretation of information, and are implicated in the formation and/or maintenance of delusions (Garety and Freeman, 1999; Moritz et al., 2004; Bell et al., 2006; van der Gaag, 2006). The first one of these biases to be observed, and the best one studied so far, is the jumping-to-conclusions bias, i.e. the tendency of patients to arrive at a conclusion based on limited evidence. It is thought to constitute a trait characteristic of schizophrenia (Peters and Garety, 2006; So et al., 2012), but might also be amenable to specific metacognitive interventions (Moritz

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et al., 2011, 2013; Ross et al., 2011; Waller et al., 2011). More importantly, there is some evidence that the latter interventions can lead to improvement of positive symptoms (Aghotor et al., 2008; Moritz et al., 2011; Favrod et al., 2014; Moritz et al., 2013) as well as quality of life (Moritz et al., 2011) in patients with schizophrenia, rendering the jumping-to-conclusions bias especially interesting for research into the outcome of the disorder. So far, the impact of the jumping-to-conclusions bias on the functional outcome and quality of life in patients with schizophrenia has not been investigated. It is possible that the positive effects of metacognitive interventions on quality of life are simply a by-product of symptom improvement, but this does not necessarily have to be the case: Hasty decision-making may foster problems in work and social contexts, since ignoring important evidence and cues might result in serious misjudgements. This effect might be more pronounced in individuals who lack awareness for their cognitive biases, such as patients with schizophrenia (Freeman et al., 2006). Thus, it is conceivable that jumping-to-conclusions has also an independent effect on functioning, over and beyond its association with symptoms.

The present study aimed to assess the relative contribution of the jumping-to-conclusions bias and other well-established factors, including psychopathology and neuropsychological deficits, to subjective and vocational outcomes after an acute psychotic exacerbation in patients with schizophrenia. One important methodological consideration was that most existing studies have either investigated correlates of functional outcome cross-sectionally (e.g. Addington and Addington, 1999; Dickerson et al., 1999b; Dickinson and Coursey, 2002; Hofer et al., 2006; Brekke et al., 2007; Lipkovich et al., 2009), or used baseline scores of the investigated variables to predict future outcomes (e.g. Dickerson et al., 1999a; Norman et al., 1999; Addington and Addington, 2000; Suslow et al., 2000; Velligan et al., 2000; Kurtz et al., 2005; Brekke et al., 2007; Lipkovich et al., 2009) – for extensive reviews on the subject, see (Green et al., 2004; Ventura et al., 2009). However, a question that might have significant implications in terms of shaping treatment priorities is how *changes* of predictor variables in the course of treatment dynamically affect changes in psychosocial functioning and quality of life. To our knowledge, only one study (Mohamed et al., 2008) has dealt with this question so far by assessing the effects of symptoms and neuropsychological deficits on quality of life over the course of treatment.

In the present study, we aimed to investigate the relative contribution of clinical and neuropsychological deficits, but also of jumping-to-conclusions and Theory-of-Mind, to subjective quality of life as well as vocational outcome and living status, both cross-sectionally at baseline, as well as longitudinally over the course of symptomatic improvement. As delineated above, we had reason to expect that jumping-to-conclusions might be associated with functional outcome and/or quality of life. However, we refrained from specific hypotheses regarding the exact nature of this contribution. Given that the jumping-to-conclusions bias is associated with symptoms, and has also recently been linked to working memory deficits (Garety et al., 2013), it was not possible to predict whether this cognitive bias would have a unique, independent effect on the outcome variables.

2. Subjects and methods

2.1. Participants

Participants were patients with a DSM-IV diagnosis of schizophrenia or schizoaffective disorder undergoing an acute psychotic exacerbation. Patients were selected among participants of a randomized controlled trial of two non-pharmacological interventions as adjunctive treatments in patients with psychotic disorders – a metacognitive intervention addressing cognitive biases, and cognitive remediation training focusing on more elementary neuropsychological functions such as attention and memory (Moritz et al., 2013). The study was conducted at two German university hospitals (Hamburg and Heidelberg). Since this was a non-pharmacological intervention trial with an extensive psychological test battery that required sufficient task comprehension and sustained attention, study enrollment occurred after initial clinical stabilization. The study was conducted according to the principles laid out in the current version of the Declaration of Helsinki, and was approved by the local ethics committees.

A diagnosis of schizophrenia was verified by means of the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). Inclusion criteria for participants in the original study were age between 18 and 65 years, and the ability to provide written informed consent. Exclusion criteria were current substance dependence, severe brain damage, and IQ less than 70. Moreover, patients scoring high on suspiciousness ($\geq$ 6 in PANSS item P6) or on hostility and uncooperativeness ($\geq$5 in the respective PANSS items) were excluded from participation. The last exclusion criterion was a requirement for the original randomized controlled trial, because such patients generally do not fare well in group settings (as was the context of the experimental intervention), and might even be disruptive for the group. Although this possibly affects the representativeness of the sample, it should not affect comparability to previous studies, as the exclusion criterion was very high. A score of $\geq$5 on the PANSS item for hostility, for example, corresponds to high irritability and occasional verbally abusive or threatening behavior. To our knowledge, very few studies on neurocognition in schizophrenia have included such patients.

For the present analysis, patients with diagnoses of psychotic disorders other than schizophrenia or schizoaffective disorder, and patients or controls with a history of alcohol or drug dependence in the six months prior to participation in the study were excluded from the original cohort, leading to a final sample of 79 patients. At the time of inclusion in the study, all but six patients (7.6%) were receiving treatment with antipsychotics; the vast majority of patients were treated with atypical antipsychotics or clozapine (n=61, 77.2%), six patients were receiving typical antipsychotics (7.6%), and six patients were treated with both typical and atypical antipsychotics (7.6%). Approximately half of patients (n=36, 45.6%) were receiving adjunctive medication (benzodiazepines, n=8; antidepressants, n=22; antiepileptics, n=10, lithium, n=2).

2.2. Assessments

Sociodemographic data including occupational and living status, as well as information regarding illness history (duration of illness and previous hospitalizations) were collected for all participants (see Table 1 for baseline sociodemographic and clinical information). Baseline assessments included:

(a) Psychopathology, assessed with the PANSS (Kay et al., 1987). Five PANSS factors (positive, negative, disorganization, excitement, distress) (van der Gaag et al., 2006) were calculated; the positive, negative, and disorganization factor scores were used in the analyses.
(b) An estimate of premorbid IQ (Mehrfachwortschatztest, MWT-B; Lehrl, 1991); sum scores were converted to standardized scores for the analyses.
(c) Measures of attention and visuomotor sequencing (Trail Making Test A and B; Reitan and Wolfson, 1985); time to complete the tasks was the variable of interest.
(d) Verbal memory, reflected in the sum scores for immediate and delayed reproduction of short stories in the Rivermead Behavioral Memory test (RBMT; Wilson et al., 1985).
(e) Emotion recognition, as assessed by the Reading-the-Mind-in-the-Eyes Test (RMET; Baron-Cohen et al., 2001); the number of correct responses constituted the variable of interest.
(f) The jumping-to-conclusions bias, assessed with the Fish Task (Moritz and Woodward, 2005). The Fish Task is a computerized variant of the original beads task (Huq et al., 1988), in which subjects are presented with a number of colored beads (e.g. red and blue) in succession and asked to guess which of two jars containing beads in opposite color ratios (e.g. 85:15 and 15:85) the presented beads originate from. In the version of the task used in the present study, beads in jars were replaced by fish in lakes, and participants were additionally asked to provide probability estimates as to the origin of each drawn bead. The main variable of interest was the presence or absence of jumping-to-conclusions, defined as reaching a decision based on two items or less; moreover, the decision threshold (i.e. the lowest probability estimate, at which the subject reached a decision concerning to the origin of a fish) was used as an additional, putatively more sensitive measure of the jumping-to-conclusions bias (Moritz et al., 2012).
(g) Subjective quality of life, assessed with the WHOQOL-BREF (Murphy et al., 2000), a 26-item self-rated scale, which measures the individual's perception of their quality of life. The scale encompasses two questions rating overall quality of life and general satisfaction of the individual with their health, and also provides sum scores for four broad domains: physical health (items related to pain, need for medication, sleep, energy, and the ability to function in everyday life), psychological health (items related to mood symptoms, satisfaction with oneself,

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