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Using Implicit Association Tests for the assessment of implicit personality self-concepts of extraversion and neuroticism in schizophrenia

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ABSTRACT

There is evidence from research based on self-report personality measures that schizophrenia patients tend to be lower in extraversion and higher in neuroticism than healthy individuals. Self-report personality measures assess aspects of the explicit self-concept. The Implicit Association Test (IAT) has been developed to assess aspects of implicit cognition such as implicit attitudes and implicit personality traits. The present study was conducted to investigate the applicability and reliability of the IAT in schizophrenia patients and test whether they differ from healthy individuals on implicitly measured extraversion and neuroticism. The IAT and the NEO-FFI were administered as implicit and explicit measures of extraversion and neuroticism to 34 schizophrenia patients and 45 healthy subjects. For all IAT scores satisfactory to good reliabilities were observed in the patient sample. In both study groups, IAT scores were not related to NEO-FFI scores. Schizophrenia patients were lower in implicit and explicit extraversion and higher in implicit and explicit neuroticism than healthy individuals. Our data show that the IAT can be reliably applied to schizophrenia patients and suggest that they differ from healthy individuals not only in their conscious representation but also in their implicit representation of the self with regard to neuroticism and extraversion-related characteristics.

1. Introduction

Extraversion and neuroticism are two core dimensions of most models of personality structure (Eysenck, 1967; Costa and McCrae, 1995). *Extraversion* is defined as a predisposition toward sociability, assertiveness, and social interaction whereas *neuroticism* is defined as the general tendency to experience negative affective states. During the last decades, several studies have demonstrated that patients suffering from schizophrenia tend to be lower in extraversion and higher in neuroticism than healthy individuals (Berenbaum and Fujita, 1994). These personality features seem to be important in understanding the onset and course of illness. For example, data from longitudinal studies indicate that individuals with high neuroticism have an increased risk to develop schizophrenia and other psychoses (Lonnqvist et al., 2009). Moreover, low extraversion and high neuroticism have been found to be linked to avoidant coping (Lysaker and Taylor, 2007) and poor work functioning (Lysaker et al., 1998). These studies have relied exclusively on self-report personality questionnaires. Thus, it appears that patients' self-description of traits can provide important information about aspects of their day-to-day behaviors and social functioning.

Personality research with normal populations has also shown that self-reported individual differences have meaningful consequences for vocational and interpersonal life outcomes (Ozer and Benet-Martínez (2006)). Interestingly, in the last years evidence has emerged that indirect measures of personality can valuably complement direct personality measures (i.e., questionnaires) in the prediction of actual behavior (Asendorpf et al., 2002; Steffens and Schulze Konig, 2006; Back et al., 2009). According to the Behavioral Process Model of Personality (BPMP, Back et al., 2009) reflective processes lead to conscious representations of the self (e.g., "I like having people around"). Individual differences in these representations of the self are termed the *explicit self-concept of personality* which is assessed

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with direct measures of personality such as personality questionnaires. Individual differences in associative representations of the self have been referred to as the *implicit self-concept of personality* (Asendorpf et al., 2002). Associative representations of the self (e.g., "me"–"tense") result from repeated activation of the self, as a concept in an associative network, together with patterns of impulsive behavioral activation, automatic motivational orientations and perceptual processes. The implicit self-concept of personality can be measured with indirect tests such as the Implicit Association Test (IAT; Greenwald et al., 1998).

The IAT is a word sorting task that assesses the strength of associations between concepts by comparing reaction times. The underlying assumption of the IAT is that if two concepts are highly associated, the sorting will be faster when the two associated concepts share the same response key than when they share different response keys. The IAT measures aspects of the implicit self-concept of personality by combining the categorization of items into the categories *me* and *others* with the classification of items into two opposing personality trait categories (e.g., *introversion* vs. *extraversion*). IATs assessing extraversion and neuroticism were found to predict spontaneous extraverted and strained or nervous behavior in healthy individuals above and beyond direct measures (Egloff and Schmukle, 2002; Schnabel et al., 2006; Steffens and Schulze Konig, 2006; Back et al., 2009).

A main objective of the present study was to investigate for the first time the applicability and reliability of IATs in schizophrenia patients. In addition, we wanted to examine whether patients suffering from schizophrenia differ from healthy individuals on implicitly measured extraversion and neuroticism. We administered IATs to assess the implicit personality self-concepts of extraversion and neuroticism in schizophrenia. The NEO Five-Factor Inventory (NEO-FFI; Costa and McCrae, 1992) was given to measure the explicit self-concept of extraversion and neuroticism. For the direct and indirect measures it was hypothesized that individuals with schizophrenia would manifest higher neuroticism scores and lower extraversion scores compared to healthy individuals. If practical application of IATs turns out to be satisfactory, these indirect tests could be administered in future studies on individual differences as additional predictors of the course of illness and treatment outcome in schizophrenia.

2. Methods

2.1. Participants

Our sample encompassed 34 schizophrenia patients and 45 healthy controls. For all participants, exclusion criteria were a history of neurological disease, severe head trauma causing a loss of consciousness, and substance abuse during the last 6 months. All subjects had normal or corrected-to-normal vision. Control subjects were thoroughly investigated by trained psychologists and were free of any lifetime history of psychiatric disorders, as diagnosed by the Structured Clinical Interview for DSM-IV, Axis I disorders (SCID) (Wittchen et al., 1997). Patients' diagnoses were established by senior psychiatrists and confirmed by trained interviewers with the SCID interview. In addition, all patients were administered a structured protocol of the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1989) and the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1984) (see Table 1 for demographic and clinical data). Three patients were excluded from data analysis because of abnormal termination of IAT testing. At the time of testing all schizophrenia patients were clinically stabilized and did not suffer from acute psychotic symptoms. The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the University of Münster. After a complete description of the study, written informed consent was obtained. Participants received a financial compensation.

Table 1
Demographic and clinical characteristics of patients with schizophrenia and healthy controls (means and standard deviations (in brackets) or frequencies; *P*: significance of two sample t-test or chi-square-test).

	Patients	Controls	*t* [*or Chi*^{2}]	*P* (*two-tailed*)
Age	29.5 (7.4)	30.2 (8.9)	−0.4	0.72
Sex (m/f)	22/9	33/12	[0.05]	0.82
Education years	11.9 (1.6)	12.2 (1.4)	−0.8	0.45
Parental education years [a]	10.9 (1.9)	11.0 (1.7)	−0.1	0.93
BDI	12.8 (7.1)	3.3 (5.4)	6.6	< 0.001
STAI-T	48.2 (9.7)	31.3 (7.4)	8.6	< 0.001
Age of illness onset	22.5 (6.0)	–		
SANS	37.3 (13.6)	–		
SAPS	17.8 (12.9)	–		

BDI: Beck Depression Inventory; STAI-T: State Trait Anxiety Inventory- trait version; SANS: Scale for the Assessment of Negative Symptoms; SAPS: Scale for the Assessment of Positive Symptoms.

[a] Education years of parent with the highest degree.

2.2. Implicit association test

The IAT consisted of two subtests, the first measuring neuroticism and the second assessing extraversion. The IAT was administered on a personal computer with the Inquisit program (Draine, 2004). In the neuroticism subtest stimuli from the categories *me* (*me, my, own, I, self*) and *others* (*they, your, them, you, others*) as well as items from the categories *anxiety* (*anxious, nervous, fearful, uncertain, afraid*) and *calmness* (*calm, relaxed, restful, at ease, balanced*) were presented. The IAT neuroticism subtest comprised five blocks. In the first block, comprising 20 trials (each item was presented twice), participants practiced discriminating items belonging to the category *me* from those belonging to the category *others* (target discrimination). In Block 2, the same procedure was conducted with respect to attribute discrimination; participants were required to sort items into *anxiety* and *calmness* categories. The critical Blocks 3 and 5 each consisted of 60 trials. In these trials, participants categorized items into two combined categories, each including the attribute and the target concept assigned to the same key. In Block 3 (*me+anxiety* block) the categories *me* and *anxiety* were assigned to the left key, whereas the categories *others* and *calmness* were assigned to the right key. In Block 5 (*me+calmness* block), the categories *anxiety* and *calmness* switched keys. Attribute and target stimuli were presented alternately in a randomized order for each participant. In Block 4, this switched key assignment of attribute discrimination was practiced (20 trials).

As mentioned above, a total of two such subtests were presented. Since it was necessary to practice discriminating the items *me* and *others* only in the first IAT, the IAT consisted of a total of 9 blocks (5 blocks for the neuroticism subtest, and 4 blocks for the extraversion subtest). In the extraversion subtest stimuli from the categories me and others and items from the categories extraversion (*sociable, talkative, active, impulsive, outgoing*) and introversion (*shy, reticent, passive, deliberate, reserved*) were presented. As in the neuroticism subtest, the extraversion subtest consisted of two practice blocks (blocks 1 and 3) each comprising 20 trials and two critical blocks (blocks 2 and 4) each comprising 60 trials. In Block 2 (*me+extraversion* block) the categories *me* and *extraversion* were assigned to the left key, whereas the categories *others* and *introversion* were assigned to the right key. In Block 4 (*me+introversion* block), the categories *extraversion* and *introversion* switched keys.

Participants were told that they would be required to make a series of category judgments. In each trial, a stimulus word was displayed in the center of a computer screen. Category labels were displayed on the left- and right-hand sides of the window. Participants used the letter *q* on the left-hand side of the keyboard and the letter *p* on the right-hand side for their answers. They were further instructed: "Please try to be as accurate though also as quick as possible. If your selection is incorrect, you will see a red *X*. To continue to the next judgment, you must make the correct selection." To facilitate fast responses participants had to keep their index fingers on the *q* and *p* keys throughout the experiment. Intertrial intervals had a duration of 150 ms. The computer recorded time between the start of each stimulus presentation and the correct response. After each block mean latencies and error rates were displayed.

We then computed individual IAT scores by using the D algorithm (Greenwald et al., 2003) which is nowadays the standard computation of IAT effects. For this analysis, we (a) eliminated trials with latencies greater than 10,000 ms; (b) error trials were included in the analysis by using the latency between stimulus presentation and correct response (built-in error penalty); (c) we subtracted the mean latency for the critical trials of the *me+anxiety* block (*me+extraversion* block) from the mean latency for the critical trials of the *me+calmness* block (*me+introversion* block); (d) finally, the IAT effect was computed by dividing this difference by the individual respondent reaction time standard deviation.

Scores based on response times such as the *D* score, however, might be distorted by the known large differences in cognitive functioning both within schizophrenia patients and between patients and control participants (e.g., Keefe and Harvey, 2012). Indeed, in the present sample the mean reaction time of critical trials was 1 406 ms (S.D.=495 ms) for schizophrenia patients compared to 1042 ms (S.D.=209 ms) for control participants. For this reason, we did not rely exclusively